Request for Proposal

FOR

Main Accumulation Areas for Regulated Wastes (MAA)

UNIVERSITY OF CONNECTICUT

STORRS CAMPUS
Storrs, Connecticut

PROJECT NUMBER: 901807

July 24, 2015

ARICHITECT/ENGINEER OF RECORD:

Tai Soo Kim Partners Architects

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INSTRUCTIONS TO PREQUALIFIED BIDDERS

ARTICLE 1 GENERAL PROVISIONS

1.1 Connecticut Sales and Use Tax

1.1.1 The University of Connecticut is a tax-exempt institution. The Contractor shall be familiar with the current regulations of the Department of Revenue Service. The tax on materials or supplies exempted by such regulations shall not be included as part of the Bid. A Sales Tax Certificate is available from the Purchasing Department upon written request.

1.2 Contractor's Qualifications

In the Pre-Qualification to Bid Documents for this project, the University has reserved the right to request additional information from prospective Bidders beyond what may have been submitted in any Application and Statement of Qualifications in response to the Invitation to Pre-Qualify. The University has also reserved the right to find any Bidder to be non-responsible with respect to a specific project notwithstanding the fact that the Bidder may have previously been pre-qualified pursuant to the pre-qualification process. The University reaffirms these reservations of rights. In finding that a Bidder is non-responsible, the University may rely upon any information obtained prior to or subsequent to a finding that Bidder is pre-qualified.

1.2.1 CGS 4b-91 Requires each bid submitted shall include a copy of a prequalification certificate issued by the Commissioner of Administrative Services. The bid shall also be accompanied by an update bid statement in such form as the Commissioner of Administrative Services prescribes. The form for such update bid statement shall provide space for information regarding all projects completed by the bidder since the date the bidder's prequalification certificate was issued or renewed, all projects the bidder currently has under contract, including the percentage of work on such projects not completed, the names and qualifications of the personnel who will have supervisory responsibility for the performance of the contract, any significant changes in the bidder's financial position or corporate structure since the date the certificate was issued or renewed, any change in the contractor's qualification status as determined by the provisions of subdivision (6) of subsection (c) of section 4a-100 and such other relevant information as the Commissioner of Administrative Services prescribes. Any bid submitted without a copy of the prequalification certificate and an update bid statement shall be invalid and considered non-responsible.

1.3 Academic Schedule

1.3.1 It is important to the University, in order to maintain the integrity of its ongoing academic activities, that its rules and regulations and the requirements of the Contract Documents, regarding noise control, traffic control etc. and other matters which may affect its operations be strictly adhered to, and that its academic schedule be maintained. Therefore, all Bidders shall familiarize themselves with and comply with the academic schedule of the University, and its regulations regarding noise, traffic, etc. which are available from Architectural and Engineering Services. No noise generating work shall be allowed during exam periods where the noise will impact classroom functions. Examples of noise generating work include, but are not limited to, sawing, drilling, and hammering/jackhammering. The Contractor shall keep the

University Representative informed as to the location of its operations to enable necessary precautions or co-ordination to be implemented.

1.4 Non-Discrimination and Affirmative Action Provisions

1.4.1 Non-discrimination. References in this section to "Contract" shall mean the execution of AIA 101 or Purchase Order Contract; and references to "Contractor" shall mean the person or entity who will be solely responsible for execution of the work.

(a) The following subsections are set forth here as required by section 4a-60 of the Connecticut General Statutes:

(1) The Contractor agrees and warrants that in the performance of the Contract such Contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, mental retardation, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such Contractor that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the state of Connecticut. The Contractor further agrees to take affirmative action to insure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to their race, color, religious creed, age, marital status, national origin, ancestry, sex, mental retardation, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such Contractor that such disability prevents performance of the work involved; (2) the Contractor agrees, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, to state that it is an "affirmative action-equal opportunity employer" in accordance with regulations adopted by the commission; (3) the Contractor agrees to provide each labor union or representative of workers with which such Contractor has a collective bargaining agreement or other contract or understanding and each vendor with which such Contractor has a contract or understanding, a notice to be provided by the commission advising the labor union or workers' representative of the Contractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment; (4) the Contractor agrees to comply with each provision of this section and sections 46a-68e and 46a-68f and with each regulation or relevant order issued by said commission pursuant to sections 46a-56, 46a-68e and 46a-68f; (5) the Contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Contractor as relate to the provisions of this section and section 46a-56.

(b) If the Contract is a public works contract, the Contractor agrees and warrants that he will make good faith efforts to employ minority business enterprises as subcontractors and suppliers of materials on such public works project.

(c) "Minority business enterprise" means any small contractor or supplier of materials fifty-one per cent or more of the capital stock, if any, or assets of which is owned by a person or persons: (1) Who are active in the daily affairs of the enterprise, (2) who have the power to direct the management and policies of the enterprise and (3) who are members of a minority, as such term is defined in subsection (a) of section 32-9n; and "good faith" means that degree of diligence which a reasonable person would exercise in the performance of legal duties and obligations. "Good faith efforts" shall include, but not be limited to, those reasonable initial efforts necessary to comply with statutory or regulatory requirements and additional or substituted efforts when it is determined that such initial efforts will not be sufficient to comply with such requirements.

(d) Determination of the Contractor's good faith efforts shall include but shall not be limited to the following factors: The Contractor's employment and subcontracting policies, patterns and practices; affirmative advertising, recruitment and training; technical assistance activities and such other reasonable activities or efforts as the commission may prescribe that are designed to ensure the participation of minority business enterprises in public works projects.

(e) The Contractor shall develop and maintain adequate documentation, in a manner prescribed by the commission, of its good faith efforts.

(f) The Contractor shall include the provisions of sections (a) and (b) above in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the state and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the commission. The Contractor shall take such action with respect to any such subcontract or purchase order as the commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with section 46a-56; provided, if such Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the commission, the Contractor may request the state of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the state and the state may so enter.

(g) The following subsections are set forth here as required by section 4a-60a of the Connecticut General Statutes:

(1) The Contractor agrees and warrants that in the performance of the Contract such Contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of sexual orientation, in any manner prohibited by the laws of the United States or of the state of Connecticut, and that employees are treated when employed without regard to their sexual orientation; (2) the Contractor agrees to provide each labor union or representative of workers with which such Contractor has a collective bargaining agreement or other contract or understanding and each vendor with which such Contractor has a contract or understanding, a notice to be provided by the Commission on Human Rights and Opportunities advising the labor union or workers' representative of the Contractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment; (3) the Contractor agrees to comply with each provision of this section and with each regulation or relevant order issued by said commission pursuant to section 46a-56; and (4) the Contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Contractor which relate to the provisions of this section and section 46a-56.

(h) The Contractor shall include the provisions of section (g) above in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the state and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the commission. The Contractor shall take such action with respect to any such subcontract or purchase order as the commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with section 46a-56; provided, if such Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the commission, the Contractor may request the state of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the state and the state may so enter.

(i) For the purposes of this entire Non-Discrimination section, “Contract” or "contract" includes any extension or modification of the Contract or contract, “Contractor” or "contractor" includes any successors or assigns of the Contractor or contractor, "marital status" means being single, married as recognized by the state of Connecticut, widowed, separated or divorced, and "mental disability" means one or more mental disorders, as defined in the most recent edition of the American Psychiatric Association's "Diagnostic and Statistical Manual of Mental Disorders", or a record of or regarding a person as having one or more such disorders. For the purposes of this section, "Contract" does not include a contract where each contractor is (1) a political subdivision of the state, including, but not limited to, a municipality, (2) a quasi-public agency, as defined in Conn. Gen. Stat. Section 1-120, (3) any other state, including but not limited to any federally recognized Indian tribal governments, as defined in Conn. Gen. Stat. Section 1-267, (4) the federal government, (5) a foreign government, or (6) an agency of a subdivision, agency, state or government described in the immediately preceding enumerated items (1), (2), (3), (4) or (5).

1.5 Union Labor

1.5.1 Attention is called to the fact that there may be construction work now being carried on at the site at which this construction is contemplated being done by UNION LABOR. This fact must be kept in mind by all Bidders submitting proposals for this work.

1.6 Labor Market Area

1.6.1 All Bidders shall have read Sections 31-52 and 31-52a of the Connecticut General Statutes, as amended. These references relate to the preference of State citizens, the preference of residents of the labor market area in which the work under the Contract is to be done and the penalties for violations.

1.7 Wage Rates

1.7.1 If this project involves new construction of a building or other structure or improvement, and the total cost of all Work to be performed by Contractors and Subcontractors is $400,000.00 or more, or if the project involves remodeling, refurbishing, rehabilitation, alteration or repair of a building or other structure or improvement, and such total cost is $100,000.00 or more, then:

.1 The wages paid on an hourly basis to any mechanic, laborer or workman employed upon the work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such employee to any employee welfare fund as defined in Subsection (h) of Section 31-53 of the Connecticut General Statutes, shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town in which such project is being constructed. Any Contractor who is not obligated by agreement to make payment or contribution on behalf of such employees to any such employee welfare fund shall pay to each employee as part of his wages the amount of payment or contribution for his classification on each payday.

1.7.2 The State of Connecticut Labor Department Wage Rate Schedule, when required by the University, shall be provided with these documents or will be issued as part of the bid documents or by Bid Clarification/Addendum hereto and is deemed to reflect such customary

or prevailing wages for this project, and is hereby incorporated and made a part of the Contract Documents.

1.7.3 Each contractor who is awarded a contract on or after October 1, 2002 shall be subject to provisions of the Connecticut General Statutes, Section 31-53 as amended by Public Act 02-69, "An Act Concerning Annual Adjustments to Prevailing Wages".

1.7.4 Wage Rates will be posted each July 1st on the Department of Labor Website: www.ctdol.state.ct.us. Such prevailing wage adjustment will not be considered a matter for an annual contract amendment.

1.7.5 Wage rates shall be paid pursuant to Section 31-53 and 31-54 of the Connecticut General Statutes, and any regulations issued hereunder.

1.7.6 **Sec. 31-53b. Construction safety and health course. New miner training program. Proof of completion required for mechanics, laborers and workers on public works projects. Enforcement. Regulations. Exceptions.** (a) Each contract for a public works project entered into on or after July 1, 2009, by the state or any of its agents, or by any political subdivision of the state or any of its agents, described in subsection (g) of section 31-53, shall contain a provision requiring that each contractor furnish proof with the weekly certified payroll form for the first week each employee begins work on such project that any person performing the work of a mechanic, laborer or worker pursuant to the classifications of labor under section 31-53 on such public works project, pursuant to such contract, has completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, has completed a new miner training program approved by the Federal Mine Safety and Health Administration in accordance with 30 CFR 48 or, in the case of telecommunications employees, has completed at least ten hours of training in accordance with 29 CFR 1910.268. (b) Any person required to complete a course or program under subsection (a) of this section who has not completed the course or program shall be subject to removal from the worksite if the person does not provide documentation of having completed such course or program by the fifteenth day after the date the person is found to be in noncompliance.

ARTICLE 2 BIDDERS' REPRESENTATIONS

2.1 The amount of each Bid shall be deemed to include the entire cost and expense of every item of labor, material and overhead necessary to complete the work bid upon, as specified, in full detail ready for use. The risk of all such costs and expenses shall be deemed assumed by the successful Bidder. The University shall assign a University Representative to work with the successful Contractor as a liaison.

2.2 In performing its obligations under this Contract, the Contractor agrees to comply with all applicable states, laws, ordinances, regulations, codes, rules or orders of, or issued by, any governmental body having jurisdiction over the work, location of the work or contract.

ARTICLE 3 BIDDING DOCUMENTS

3.1 Bid Clarifications, Addenda and Interpretations

3.1.1 No interpretations of the meaning of the Drawings, specifications or other Contract Documents will be made orally to any Bidder. Every request for such interpretation must be

made in writing to the University Office of Capital Project & Contract Administration, and to be given consideration shall be received at the specified date outlined within the invitation to bid and/or adjusted by a bid clarification/addenda.

3.1.2 Any and all such interpretations and any supplemental instructions will be in the form of written bid clarification/addenda which, if issued, will be posted on the University's Capital Projects and Contract Administration's Department website; www.cpca.uconn.edu. Failure of any Bidder to receive any such addendum or interpretation shall not release any Bidder from any obligations under his Bid as submitted, provided notice has been sent to the address furnished by such prospective Bidder for the transmittal of notices, addenda and interpretations. It shall be the Bidder's responsibility to make inquiry as to, and to obtain, the Addenda issued, if any.

3.1.3 The number of days shown in 3.1.1 and 3.1.2 may differ from the actual dates given in an Agenda for a Pre-Bid or Pre-Proposal Conference, if so, the number of days listed are, hereby, superseded by the Agenda dates, unless the Bid or Proposal is extended by Addendum, in which case the number of days will again apply unless stated differently in the Addendum.

3.1.4 Bidders shall promptly notify the University of any ambiguity, inconsistency or error which they may discover upon examination of these Contract Documents.

ARTICLE 4 BIDDING PROCEDURES

4.1 Requests for Information

4.1.1 Enclosed with this Invitation to Submit Proposals Manual is a Request for Information Form (RFI). All questions/clarifications must be submitted in writing on this form and before the prescribed RFI Deadline. No verbal questions will be answered. All answers to RFI's will be issued in a Bid Clarification/Addenda. Form is at the end of this document.

4.2 Form of Proposal

4.2.1 Enclosed with this Invitation to Submit Proposals Manual is a Form of Proposal. Bids shall be submitted on a copy of this form. Additional instructions to bidders including information on submission of bids and award and Contract appear on this form. All documents required by these Bid Documents must be returned with your Bid.

4.3 Bids and Rejection of Bids

4.3.1 General Bids shall be for the complete work as specified and shall include the names of any Subcontractors for the classes of work specified in the Form of Proposal, and for each other class of work for which the University has required a separate section and the dollar amounts of their subcontracts, and the General Contractor shall be selected on the basis of such general Bids. It shall be presumed that the general Bidder intends to perform with its own employees all work in such four classes and such other classes, for which no Subcontractor is named. The general Bidder's qualifications for performing such work shall be subject to review by the University pursuant to the Bid and the Contract Documents.

4.3.2 Bids shall be submitted only on the forms furnished for the specific project, which shall include a completed Form of Proposal containing all information required on the Proposal form, executed with an original signature by a duly authorized officer or representative of the Bidder, and, in the case of a Joint Venture, by duly authorized representatives of each Joint Venture. In no event will Bids or changes in Bids made by telephone, email or fax be considered. Any Form of Proposal omitting or adding items, altering the form, containing conditional or alternative Bids, or without the original signature of the Bidder or its authorized representative, may be rejected.

4.3.3 Any Bids received after the scheduled closing time for the receipt of Bids will be returned to the Bidders unopened.

4.3.4 Any Bid once deposited with the University of Connecticut may only be withdrawn by letter of request, signed by the depositing Bidder and presented to the Office of Capital Project and Contract Administration, prior to the time of opening of any Bid for the project designated or identified project.

4.4 Bid Security

4.4.1 Each Bid must be accompanied by a certified check payable to the order of the University of Connecticut, or the Bid may be accompanied by a Bid Bond in the form required by the University, having as surety thereto such surety company or companies acceptable to the University and as are authorized to do business in this State, for an amount not less than 10 per cent of the Bid. All checks submitted by unsuccessful Bidders shall be returned to them after the Contract has been awarded. Bid Security is not required for projects under $50,000.00.

4.4.2 Failure of the successful Bidder to file the required Performance and Labor & Material bonds shall be just cause for the amount of the security deposited with the Bid to be forfeited, any part of the whole of which may be used to make up the difference between the Bid of the defaulting Bidder and the Bid of the next lowest responsible qualified Bidder to whom the work is finally awarded. Failure to execute a contract after award as specified and Bid shall also result in the forfeiture of such Bid Bonds or Certified Check.

4.5 Subcontractors

4.5.1 The Contractor shall not contract with a person or entity who appears on the State of Connecticut Debarment List, the Federal Davis Bacon Act Debarment List, both of which are available through: **http://ctdol.state.ct.us** or the Federal List of Excluded Parties Listing System available through: **http://epls.arnet.gov**

4.5.2 The Bidder shall furnish, with his submitted Bid, as is set forth in the Proposal Form, in the space provided for such purpose, the names and prices of responsible and qualified Subcontractors who are actually to perform the following categories of work under the Base Bid, if their prices exceed $25,000.00:

.1 Masonry
.2 Electrical

.3 Mechanical other than HVAC
.4 HVAC
.5 Any other class of work identified in the Proposal Form for which a blank space has been provided.

4.5.3 The Bidder further agrees that each of the Subcontractors listed on the Proposal Form will be used for the work indicated at the amount stated unless a substitution is permitted by the University.

4.5.4 The Bidder further agrees and warrants that he has made good faith efforts to employ minority business enterprises as Subcontractors and suppliers of materials under such contract and shall provide the Commission on Human Rights and Opportunities with such information as is requested by the Commission concerning his employment practices and procedures as they relate to the provisions of the general statutes governing contract requirements.

4.5.5 Pursuant to Connecticut General Statutes Section 49-41a, for every contract with the University for the construction, alteration or repair of any building or work, (1) the Contractor, within 30 days after payment to the Contractor by the University, shall be required to pay any amounts due any Subcontractor, whether for labor performed or materials furnished, when the labor or materials have been included in a requisition submitted by the Contractor and paid by the University; (2) the Contractor shall include in each of its subcontracts a provision requiring each Subcontractor to pay any amounts due any of its Subcontractors, whether for labor performed or materials furnished, within 30 days after each Subcontractor receives a payment from the Contractor which encompasses labor or materials furnished by such Subcontractor.

4.5.6 Within five days after being notified of the award of a general Contract by the University, or, in the case of an approval of a substitute Subcontractor by the University, within five days after being notified of such approval, the general Bidder shall present to each listed or substitute Subcontractor:

.1 A subcontract in the form set forth in Section 4b-96 of the Connecticut General Statutes and must be executed with all of your named subcontractors in your form of proposal.

.2 A notice of the time limit under this section for executing a subcontract. If a listed Subcontractor fails within five days, Saturdays, Sundays and legal holidays excluded, after presentation of a subcontract by the general Bidder selected as a General Contractor, to perform his agreement to execute a subcontract in the form hereinafter set forth with such general Bidder, contingent upon the execution of the general Contract, the General Contractor shall select another Subcontractor, with the approval of the University. When seeking approval for a substitute Subcontractor, the general Bidder shall provide the University with all documents showing (a) the general Bidder's proper presentation of a subcontract to the listed Subcontractor and, (b) communications to or from such Subcontractor after such presentation. The University shall adjust the Contract Price to reflect the difference between the amount of the price of the new Subcontractor and the amount of the price of the listed Subcontractor, if the new Subcontractor's price is lower and may adjust such Contract Price, if the new

Subcontractor's price is higher. The general Bidder shall, with respect to each listed Subcontractor or approved substitute Subcontractor, file with the University a copy of each executed subcontract within ten days, Saturdays, Sundays and legal holidays excluded, of presentation of a subcontract to such Subcontractor.

.3 In the event of any conflict or inconsistency between the University of Connecticut's Subcontract form and the Contractor's standard Subcontract form, the provisions of the University of Connecticut's Subcontract form shall prevail. Any standard Subcontract form used will be attached as a supplement to the University of Connecticut's Subcontract form.

4.6 LIQUIDATED DAMAGES

4.6.1 Liquidated Damages of **Five Hundred and 00/100 Dollars ($500.00)** per calendar day shall be assessed if the Contractor fails to achieve Substantial Completion, or causes delay to the Substantial Completion of any portion of the Work within the Contract Time.

4.7 **COMMISSION ON HUMAN RIGHTS AND OPPORTUNITIES CONTRACT COMPLIANCE REGULATIONS:**

The contract to be awarded is subject to contract compliance requirements mandated by Sections 4a-60 and 4a-60a of the Connecticut General Statutes; and, when the awarding agency is the State, Sections 46a-71(d) and-81i(d) of the Connecticut General Statutes. There are Contract Compliance Regulations codified at Section-68j-21 through 43 of the Regulations of Connecticut State Agencies, which establish a procedure for awarding all contracts covered by Sections 4a-60 and 46a-71(d) of the Connecticut General Statutes. According to Section 46a-68j-30(9) of the Contract Compliance Regulations, every agency awarding a contract subject to the contract compliance requirements has an obligation to "aggressively solicit the participation of legitimate minority business enterprises as bidders, contractors, subcontractors and suppliers of materials." Minority business enterprise" is defined in Section 4a-60 of the Connecticut General Statutes as a business wherein fifty-one percent or more of the capital stock, or assets belong to a person or persons: "(1) Who are active in daily affairs of the enterprise; (2) who have the power to direct the management and policies of the enterprise; and (3) who are members of a minority, as such term is defined in subsection (a) of Section 32-9n." "Minority" groups are defined in Section 32-9n of the Connecticut General Statutes as "(1) Black Americans . . .(2) Hispanic Americans . . . (3) persons who have origins in the Iberian Peninsula . . . (4)Women . . . (5) Asian Pacific Americans and Pacific Islanders; (6) American Indians . . ." An individual with a disability is also a minority business enterprise as provided by Section 4a-60g of the Connecticut General Statutes. The above definitions apply to the contract compliance requirements by virtue of Section 46a-68j-21(11) of the Contract Compliance Regulations. The awarding agency will consider the following factors when reviewing the bidder's qualifications under the contract compliance requirements:(a) the bidder's success in implementing an affirmative action plan;(b) the bidder's success in developing an apprenticeship program complying with Sections 46a-68-1 to 46a-68-17 of the Administrative Regulations of Connecticut State Agencies, inclusive;(c) the bidder's promise to develop and implement a successful affirmative action plan;(d) the bidder's submission of employment statistics contained in the "Employment Information Form", indicating that the composition of its workforce is at or near parity when compared to the racial and sexual composition of the workforce in the relevant labor market area; and(e) the bidder's promise to set aside a portion

of the contract for legitimate minority business enterprises. See Section 46a-68j-30(10)(E) of the Contract Compliance Regulations.

4.7.1 The following BIDDER CONTRACT COMPLIANCE MONITORING REPORT must be completed in full, signed, and submitted with the bid for this contract. The contract awarding agency and the Commission on Human Rights and Opportunities will use the information contained thereon to determine the bidders compliance to Sections 4a-60 and 4a-60a CONN. GEN. STAT., and Sections 46a-68j-23 of the Regulations of Connecticut State Agencies regarding equal employment opportunity, and the bidders good faith efforts to include minority business enterprises as subcontractors and suppliers for the work of the contract.

1) Definition of Small Contractor:
Section 4a-60g CONN. GEN. STAT. defines a small contractor as a company that has been doing business under the same management and control and has maintained its principal place of business in Connecticut for a one year period immediately prior to its application for certification under this section, had gross revenues not exceeding ten million dollars in the most recently completed fiscal year, and at least fifty-one percent of the ownership of which is held by a person or persons who are active in the daily affairs of the company, and have the power to direct the management and policies of the company, except that a nonprofit corporation shall be construed to be a small contractor if such nonprofit corporation meets the requirements of subparagraphs (A) and (B) of subdivision 4a-60g CONN. GEN. STAT.

2) Description of Job Categories (as used in Part IV Bidder Employment Information)
MANAGEMENT: Managers plan, organize, direct, and control the major functions of an organization through subordinates who are at the managerial or supervisory level. They make policy decisions and set objectives for the company or departments. They are not usually directly involved in production or providing services. Examples include top executives, public relations managers, managers of operations specialties (such as financial, human resources, or purchasing managers), and construction and engineering managers.
BUSINESS AND FINANCIAL OPERATIONS: These occupations include managers and professionals who work with the financial aspects of the business. These occupations include accountants and auditors, purchasing agents, management analysts, labor relations specialists, and budget, credit, and financial analysts.
COMPUTER SPECIALISTS: Professionals responsible for the computer operations within a company are grouped in this category. Examples of job titles in this category include computer programmers, software engineers, database administrators, computer scientists, systems analysts, and computer support specialists
ARCHITECTURE AND ENGINEERING: Occupations related to architecture, surveying, engineering, and drafting are included in this category. Some of the job titles in this category include electrical and electronic engineers, surveyors, architects, drafters, mechanical engineers, materials engineers, mapping technicians, and civil engineers.
OFFICE AND ADMINISTRATIVE SUPPORT: All clerical-type work is included in this category. These jobs involve the preparing, transcribing, and preserving of written communications and records; collecting accounts; gathering and distributing information; operating office machines and electronic data processing equipment; and distributing mail. Job titles listed in this category include telephone operators, payroll clerks, bill and account collectors, customer service representatives, files clerks, dispatchers, shipping clerks, secretaries and administrative assistants, computer operators, mail clerks, and stock clerks.

BUILDING AND GROUNDS CLEANING AND MAINTENANCE:
This category includes occupations involving landscaping, housekeeping, and janitorial services. Job titles found in this category include supervisors of landscaping or housekeeping, janitors, maids, grounds maintenance workers, and pest control workers.
CONSTRUCTION AND EXTRACTION: This category includes construction trades and related occupations. Job titles found in this category include boilermakers, masons (all types), carpenters, construction laborers, electricians, plumbers (and related trades), roofers, sheet metal workers, elevator installers, hazardous materials removal workers, paperhangers, and painters. Paving, surfacing, and tamping equipment operators; drywall and ceiling tile installers; and carpet, floor and tile installers and finishers are also included in this category. First line supervisors, foremen, and helpers in these trades are also grouped in this category..
INSTALLATION, MAINTENANCE AND REPAIR: Occupations involving the installation, maintenance, and repair of equipment are included in this group. Examples of job titles found here are heating, ac, and refrigeration mechanics and installers; telecommunication line installers and repairers; heavy vehicle and mobile equipment service technicians and mechanics; small engine mechanics; security and fire alarm systems installers; electric/electronic repair, industrial, utility and transportation equipment; millwrights; riggers; and manufactured building and mobile home installers. First line supervisors, foremen, and helpers for these jobs are also included in the category.
MATERIAL MOVING WORKERS: The job titles included in this group are Crane and tower operators; dredge, excavating, and lading machine operators; hoist and winch operators; industrial truck and tractor operators; cleaners of vehicles and equipment; laborers and freight, stock, and material movers, hand; machine feeders and offbearers; packers and packagers, hand; pumping station operators; refuse and recyclable material collectors; and miscellaneous material moving workers.

3) Definition of Racial and Ethnic Terms (as used in Part IV Bidder Employment Information):
White (not of Hispanic Origin)- All persons having origins in any of the original peoples of Europe, North Africa, or the Middle East.
Black (not of Hispanic Origin)- All persons having origins in any of the Black racial groups of Africa.
Hispanic- All persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.
Asian or Pacific Islander- All persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands. This area includes China, India, Japan, Korea, the Philippine Islands, and Samoa.
American Indian or Alaskan Native- All persons having origins in any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition

ARTICLE 5 CONSIDERATION OF BIDS

5.1 Every general bid which is conditional or obscure, or which contains any addition not called for shall be invalid; and the University shall reject every such general Bid. The University shall be authorized to waive minor irregularities, which it considers in its best interest, provided the reasons for any such waiver are stated in writing by the University and made a part of the contract file. No such general Bid shall be rejected because of the failure to submit prices for, or information relating to, any item or items for which no specific space is provided in the general Proposal Form furnished by the University, but this sentence shall not be applicable to any failure to furnish prices or information required by

Articles 4.2.1 and 4.4.1 above to be furnished in the form provided by the University. The University also reserves the right to reject any and all bids and again advertise for bids, or to otherwise proceed as permitted under Connecticut General Statues 10a-109a through 10a-109y.

5.2 General Bids shall be publicly opened and read by the University forthwith. The University may require in the Proposal Form that the General Contractor agree to perform a stated, minimum percentage of work with his own forces. The University may also require the General Contractor to set aside a portion of the contract for Subcontractors who are eligible for set aside contracts. The University shall not permit substitution of a Subcontractor for one named in accordance with the provisions of these Instructions or substitution of a Subcontractor for any designated subtrade work bid to be performed by the General Contractor's own forces, except for good cause. The term "good cause" includes but is not limited to a Subcontractor's or, where appropriate, a General Contractor's: (1) Death or physical disability, if the listed Subcontractor is an individual; (2) dissolution, if a corporation or partnership; (3) bankruptcy; (4) inability to furnish any performance and payment bond shown on the Proposal Form; (5) inability to obtain, or loss of, a license necessary for the performance of a particular category of work; (6) failure or inability to comply with a requirement of law applicable to Contractors, Subcontractors, on construction, alteration, or repair projects; (7) failure to perform his agreement to execute a subcontract under Connecticut General Statutes Section 4b-96.

5.3 The general Bid Price shall be the price set forth in the space provided on the general Proposal Form. No general Bid shall be rejected (1) because of error in setting forth the name of a Subcontractor as long as the Subcontractors designated are clearly identifiable, or (2) because the Drawings and specifications do not accompany the Bid or are not submitted with the Bid. **FAILURE TO CORRECTLY STATE A SUBCONTRACTOR'S PRICE MAY BE CAUSE FOR REJECTION OF THE GENERAL BIDDER'S BID.**

5.4 Any General Contractor who violates any provision of Connecticut General Statutes Section 4b-95 may be disqualified from bidding on other contracts that are subject to the provisions of Chapter 60 of the General Statutes for a period not to exceed twenty-four months, commencing from the date on which the violation is discovered, for each violation.

5.5 The University reserves the right to accept or reject any or all Bids within 90 calendar days of the Bid opening, and the Bidder agrees that it may not modify, withdraw, or cancel its Bid and that its Bid Price will be firm for this 90 day period. This 90 day period may be extended by mutual agreement between the University and the Bidder.

5.6 The project will be awarded to the responsible qualified Bidder submitting the lowest Bid in compliance with the Bid requirements and within the budget, subject to the provisions of Connecticut General Statues 10a-109a through 10a-109y.

5.7 The University reserves the right to elect to implement some, all or none of the Alternates and/or Options set forth in the Proposal forms, as may be in the best interest of the University. The low Bid shall be determined by taking the Base Price set forth in the Proposal form as selected by the University, plus the Alternates and/or Options selected by the University.

5.8 The Bidder agrees that if selected as General Contractor, he shall, within ten (10) days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the University, execute a contract in accordance with the terms of the general Bid.

ARTICLE 6 POST- BID INFORMATION

6.1 Affirmative Action

6.1.1 Pursuant to Connecticut General Statutes Section 46a-68d, if this project is estimated to cost more than $50,000.00 then: In the event that the Bidder's Bid is accepted, after acceptance, but before a contract is awarded, the successful Bidder shall file and have approved by the Commission on Human Rights and Opportunities an Affirmative Action Plan. The Commission may provide for conditional acceptance of an Affirmative Action Plan provided written assurances are given by the Contractor that it will amend its plan to conform to affirmative action requirements. The University shall withhold 2% of the total Contract Price per month from any payment made to such Contractor until such time as the Contractor has developed an Affirmative Action Plan, and received the approval of the Commission. Notwithstanding the provisions of Connecticut General Statutes Section 46a-68d, a Contractor subject to the provisions of that Section may file a plan in advance of or at the same time as its Bid.

6.1.2 The University shall not enter into a contract with any Bidder or prospective Contractor unless the Bidder or prospective Contractor has satisfactorily complied with the provisions of Sections 4a-60, 32-9e, 46a-56 and 46a-68c to 46a-68f, inclusive of the Connecticut General Statutes, or submits a program for compliance acceptable to the Commission on Human Rights and Opportunities.

6.1.3 The Contractor shall designate an "Equal Opportunity Contract Compliance Officer" for the project. The Contractor designee, in addition to any other duties assigned by the Contractor, shall have the following responsibilities for the implementation of the Contractor Affirmative Action Plan (AAP) that is required for the project pursuant to Connecticut General Statutes Section's 46a-68c and 46a-68d.

.1 Maintain a project EEO file to include all records, correspondence and other documentation related to the project AAP.

.2 Communicate to and inform all project Contractors and Subcontractors, regardless of tier, and labor referral organizations (if applicable) about project equal opportunity and AAP expectations and performance requirements.

.3 Compile all on-site Contractor <u>MONTHLY EMPLOYMENT UTILIZATION REPORTS</u> (form CHRO cc-257) and submit a cumulative report for the project each month to report on contractor compliance to project AAP hiring goals. The cumulative report shall be submitted to the contract awarding agency and to the Commission on Human Rights and Opportunities by the 15th day following the end of each calendar month during the pendency of the on-site construction work of the project.

.4 Attach a copy of your transmittal letter to CHRO as a document to be submitted with your invoice.

.5 Compile and submit a <u>QUARTERLY SMALL CONTRACTOR AND MINORITY BUSINESS ENTERPRISE PAYMENT STATUS REPORT</u> (form CHRO cc-258) to report on the participation of such Contractors identified to participate on the project. The report shall be submitted to the contract awarding agency and to the Commission on Human

Rights and Opportunities by the 15th day following the end of each calendar quarter during the pendency of the on-site construction work of the project.

.6 Attach a copy of your transmittal letter to CHRO as a document to be submitted with your invoice.

.7 Participate in project job meetings to inform project Contractors about project equal opportunity and AAP performance.

.8 Coordinate "External Communication" section (employment outreach) of contractor AAP for all employment opportunities resultant during the course of the project from all project Contractors and maintain documentation of all contacts and responses.

6.2 Tax Identification

6.2.1 The Contractor shall furnish to the Owner, at the time of execution of the Contract, the following information

.1 The identity and addresses of all subcontractors performing work on the project.
.2 The Connecticut tax registration numbers of the Contractor and all subcontractors.
.3 The Federal Social Security account numbers, or Federal Employer Identification numbers, or both, if applicable, for the Contractor and all subcontractors.

6.2.2 The aforementioned information shall be continuously updated by the Contractor to reflect any additions or changes to the previously identified subcontractors. Any final additions or changes to this information shall be submitted to the Owner with the Contractor's application for final payment.

ARTICLE 7 PERFORMANCE AND PAYMENT BONDS AND CERTIFICATE OF COMPLIANCE.

7.1 Performance Bond

7.1.1 Prior to execution of the Contract, the successful Bidder shall substitute for the check or Bid Bond accompanying his Bid, an executed University of Connecticut Performance Bond, in the amount of 100 per cent of the Contract Price, conditioned upon the faithful performance of the Contract. See Form of Proposal for the appropriate form to be executed.

7.2 Labor and Material Payment Bond

7.2.1 Prior to execution of the Contract, the Bidder shall submit a University of Connecticut Labor and Material Payment Bond in the sum of not less than 100 per cent of the Contract Price, containing the condition that the Contractor will promptly pay for all material furnished and labor, supplied or performed in the prosecution of the work whether or not said material or labor is involved and/or becomes a component part of the structure or structures to be erected. Such additional bond shall be held for the use of each party who, as Subcontractor or otherwise, shall have furnished material or supplies or shall have performed labor in the prosecution of the work as herein provided and who has not been paid therefore. Such additional bond shall provide specifically that any person may bring suit thereon in the name of the person suing, prosecute the same to the final judgment and have execution thereon for

such sum or sums as may be justly due. The State shall not be liable to furnish counsel nor for the payment of any costs or expenses of any such suit. This bond is to be furnished pursuant to Section 49-41 of the General Statutes of Connecticut, and claims thereon shall be subject to the provisions of Connecticut General Statutes Section 49-42. Such forms will be provided with the Letter of Intent to award to be executed.

7.3 Nonresident Contractor Certificate of Compliance

7.3.1 Prior to execution of the Contract, the Bidder shall submit proof that ensures they and all subcontractors being contracted to perform work under the awarded bid; are State of Connecticut resident contractors. Such proof shall be in a form on the awarding Contractor's letter head signed by the owner or principle of the company having authority to ensure that all agreements entered into under this contract are in-state resident contractors. Should the awarding Contractor and/or subcontractors who will perform work under this contract, are nonresident of the State of Connecticut, the awarding Contractor must provide a Certificate of Compliance from the Department of Revenue Services (DRS) for those nonresident firms who will be under contract. This Certificate of Compliance is pursuant to Statue 12-430 as amended by 2005 Connecticut Public Acts 260, 6; Connecticut Agencies Regulations 12-430 (7)-1.

7.4 General Provisions Regarding Bonds

7.4.1 The aforementioned Performance and Payment bonds shall be provided in the forms required by the University, samples of which are appended hereto. If the Contractor is a Joint Venture, all such bonds shall name all joint ventures as principals. The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney. The above bonds shall be required for awards for which the total estimated cost of labor and materials under the Contract is at least $100,000.00. The above bonds shall be acceptable to the University and, as a minimum, issued through a bonding company licensed to transact such business in the State of Connecticut and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the "Treasury Department Circular 570."

ARTICLE 8 AFFIDAVITS/ETHICS AFFIRMATIONS

8.1 Affidavits/Ethics Affirmations to be completed in accordance with the instructions provided on the OPM website for each Affidavits/Ethics Affirmations.

Form 1. Gift and Campaign Contribution Certification (for contract values >$50,000)

Form 5. Consulting Agreement Affidavit (for contract values >$50,000)

Form 6. Affirmation of Receipt of State Ethics Laws Summary (for contract values >$500,000)

Form 7. Iran Certification (for contract values >$500,000)

Nondiscrimination Certification:

Form B. Nondiscrimination Certification (for contract values <$50,000)

Form C. Nondiscrimination Certification (for contract values >$50,000)

8.2 With regard to a State contract as defined in P.A. 07-1 having a value in a calendar year of $50,000 or more or a combination of series of such agreements or contracts having a value of $100,000 or more, the authorized signatory to this submission in response to the State's solicitation expressly state contractors of state campaign contribution and solicitation prohibitions, and will inform its principals of the contents of the notice. See attached **SEEC Form 11.**

Obtain OPM has posted the approved Forms on the OPM Web site - http://www.opm.state.ct.us/secr/forms/ContractAffidavitRequirements.htm

ARTICLE 9 CONTRACT

9.1 A draft of the contract has been provided with the bid documents. The University reserves the right to modify the contract or wave any informality as it deems to be in the best interest of the University. By submitting a bid the Contractor accepts the contract and any modifications that the University deems necessary to it without exception. Exceptions to the contract submitted by the Contractor at any time will not be considered.

REQUEST FOR INFORMATION FORM

PLEASE TYPE -OR- PRINT / SEE INVITATION AND ADDENDA'S FOR RFI DEADLINE

TO: **The University of Connecticut.**
Fax (860) 486-1953

FROM: _____
(Name of Bidding Firm)

ATTN: **Amy Allen**

Contact Name: _____

RFI Deadline: **6/25/2015, 2:00pm**

Phone # :_____ **Fax #** :_____

Specification Section: _____

Drawing No. / Drawing Date: _____

QUESTION (Please be specific): _____

_____

_____

_____

_____

RESPONSE : _____

_____

_____

_____

_____

_____

Signature : _____ **Date:** _____

NOTE: All questions must be submitted in writing before the prescribed RFI Deadline. No verbal questions will be answered. All questions must be submitted in writing on this RFI Form. All answers to RFI's will be issued in a Bidder's Clarification.

STATE OF CONNECTICUT
STATE ELECTIONS ENFORCEMENT COMMISSION
20 Trinity Street Hartford, Connecticut 06106—1628

SEEC FORM 11

NOTICE TO EXECUTIVE BRANCH STATE CONTRACTORS AND PROSPECTIVE STATE CONTRACTORS OF CAMPAIGN CONTRIBUTION AND SOLICITATION BAN

This notice is provided under the authority of Connecticut General Statutes 9-612(g)(2), as amended by P.A. 07-1, and is for the purpose of informing state contractors and prospective state contractors of the following law (italicized words are defined below):

Campaign Contribution and Solicitation Ban

No *state contractor, prospective state contractor, principal of a state contractor or principal of a prospective state contractor*, with regard to a *state contract* or *state contract solicitation* with or from a state agency in the executive branch or a quasi-public agency or a holder, or principal of a holder of a valid prequalification certificate, shall make a contribution to, or *solicit* contributions on behalf of (i) an exploratory committee or candidate committee established by a candidate for nomination or election to the office of Governor, Lieutenant Governor, Attorney General, State Comptroller, Secretary of the State or State Treasurer, (ii) a political committee authorized to make contributions or expenditures to or for the benefit of such candidates, or (iii) a party committee;

In addition, no holder or principal of a holder of a valid prequalification certificate, shall make a contribution to, or solicit contributions on behalf of (i) an exploratory committee or candidate committee established by a candidate for nomination or election to the office of State senator or State representative, (ii) a political committee authorized to make contributions or expenditures to or for the benefit of such candidates, or (iii) a party committee.

Duty to Inform

State contractors and prospective state contractors are required to inform their principals of the above prohibitions, as applicable, and the possible penalties and other consequences of any violation thereof.

Penalties for Violations

Contributions or solicitations of contributions made in violation of the above prohibitions may result in the following civil and criminal penalties:
Civil penalties--$2000 or twice the amount of the prohibited contribution, whichever is greater, against a principal or a contractor. Any state contractor or prospective state contractor which fails to make reasonable efforts to comply with the provisions requiring notice to its principals of these prohibitions and the possible consequences of their violations may also be subject to civil penalties of $2000 or twice the amount of the prohibited contributions made by their principals.
Criminal penalties—Any knowing and willful violation of the prohibition is a Class D felony, which may subject the violator to imprisonment of not more than 5 years, or $5000 in fines, or both.

Contract Consequences

Contributions made or solicited in violation of the above prohibitions may result, in the case of a state contractor, in the contract being voided.

Contributions made or solicited in violation of the above prohibitions, in the case of a prospective state contractor, shall result in the contract described in the state contract solicitation not being awarded to the prospective state contractor, unless the State Elections Enforcement Commission determines that mitigating circumstances exist concerning such violation.

The State will not award any other state contract to anyone found in violation of the above prohibitions for a period of one year after the election for which such contribution is made or solicited, unless the State Elections Enforcement Commission determines that mitigating circumstances exist concerning such violation.

Additional information and the entire text of P.A 07-1 may be found on the website of the State Elections Enforcement Commission, www.ct.gov/seec. Click on the link to "State Contractor Contribution Ban."

Definitions:
"State contractor" means a person, business entity or nonprofit organization that enters into a state contract. Such person, business entity or nonprofit organization shall be deemed to be a state contractor until December thirty-first of the year in which such contract terminates. "State contractor" does not include a municipality or any other political subdivision of the state, including any entities or associations duly created by the municipality or political subdivision exclusively amongst themselves to further any purpose authorized by statute or charter, or an employee in the executive or legislative branch of state government or a quasi-public agency, whether in the classified or unclassified service and full or part-time, and only in such person's capacity as a state or quasi-public agency employee.

"Prospective state contractor" means a person, business entity or nonprofit organization that (i) submits a response to a state contract solicitation by the state, a state agency or a quasi-public agency, or a proposal in response to a request for proposals by the state, a state agency or a quasi-public agency, until the contract has been entered into, or (ii) holds a valid prequalification certificate issued by the Commissioner of Administrative Services under section 4a-100. "Prospective state contractor" does not include a municipality or any other political subdivision of the state, including any entities or associations duly created by the municipality or political subdivision exclusively amongst themselves to further any purpose authorized by statute or charter, or an employee in the executive or legislative branch of state government or a quasi-public agency, whether in the classified or unclassified service and full or part-time, and only in such person's capacity as a state or quasi-public agency employee.

"Principal of a state contractor or prospective state contractor" means (i) any individual who is a member of the board of directors of, or has an ownership interest of five per cent or more in, a state contractor or prospective state contractor, which is a business entity, except for an individual who is a member of the board of directors of a nonprofit organization**,** (ii) an individual who is employed by a state contractor or prospective state contractor, which is a business entity, as president, treasurer or executive vice president, (iii) an individual who is the chief executive officer of a state contractor or prospective state contractor, which is not a business entity, or if a state contractor or prospective state contractor has no such officer, then the officer who duly possesses comparable powers and duties, (iv) an officer or an employee of any state contractor or prospective state contractor who has *managerial or discretionary responsibilities with respect to a state contract,* (v) the spouse or a *dependent child* who is eighteen years of age or older of an individual described in this subparagraph, or (vi) a political committee established or controlled by an individual described in this subparagraph or the business entity or nonprofit organization that is the state contractor or prospective state contractor.

"State contract" means an agreement or contract with the state or any state agency or any quasi-public agency, let through a procurement process or otherwise, having a value of fifty thousand dollars or more, or a combination or series of such agreements or contracts having a value of one hundred thousand dollars or more in a calendar year, for (i) the rendition of services, (ii) the furnishing of any goods, material, supplies, equipment or any items of any kind, (iii) the construction, alteration or repair of any public building or public work, (iv) the acquisition, sale or lease of any land or building, (v) a licensing arrangement, or (vi) a grant, loan or loan guarantee. "State contract" does not include any agreement or contract with the state, any state agency or any quasi-public agency that is exclusively federally funded, an education loan or a loan to an individual for other than commercial purposes.

"State contract solicitation" means a request by a state agency or quasi-public agency, in whatever form issued, including, but not limited to, an invitation to bid, request for proposals, request for information or request for quotes, inviting bids, quotes or other types of submittals, through a competitive procurement process or another process authorized by law waiving competitive procurement.

"Managerial or discretionary responsibilities with respect to a state contract" means having direct, extensive and substantive responsibilities with respect to the negotiation of the state contract and not peripheral, clerical or ministerial responsibilities.

"Dependent child" means a child residing in an individual's household who may legally be claimed as a dependent on the federal income tax of such individual.

"Solicit" means (A) requesting that a contribution be made, (B) participating in any fund-raising activities for a candidate committee, exploratory committee, political committee or party committee, including, but not limited to, forwarding tickets to potential contributors, receiving contributions for transmission to any such committee or bundling contributions, (C) serving as chairperson, treasurer or deputy treasurer of any such committee, or (D) establishing a political committee for the sole purpose of soliciting or receiving contributions for any committee. Solicit does not include: (i) making a contribution that is otherwise permitted by Chapter 155 of the Connecticut General Statutes; (ii) informing any person of a position taken by a candidate for public office or a public official, (iii) notifying the person of any activities of, or contact information for, any candidate for public office; or (iv) serving as a member in any party committee or as an officer of such committee that is not otherwise prohibited in this section.

END OF INSTRUCTION TO BIDDERS

Bid Submission

FOR

Main Accumulation Areas for Regulated Wastes (MAA)

UNIVERSITY OF CONNECTICUT

STORRS CAMPUS
Storrs, Connecticut

PROJECT NUMBER: 901807

Submitted By:

_____

UNIVERSITY OF CONNECTICUT
MAIN ACCUMULATION AREAS FOR REGULATED WASTES (MAA)
#901807

FORM OF PROPOSAL

Proposal Submission Checklist

The following documents and information shall be submitted and included as your bid proposal. All documents must be submitted in a sealed envelope reflecting the submitting firm's name and address; addressed to CPCA attention to the appropriate purchasing agent, clearly stating the project name and project number. All required documents are to be included and executed in their original condition as issued.

- ☐ Ethics Forms
- ☐ Bid Bond
- ☐ Fully executed Form of Proposal
- ☐ Copies of prequalification certificate and an updated statement as prescribed by Commissioner of Administrative Services for the State of Connecticut.
- ☐ How did you learn about this Project?
  - Hartford Courant
  - Waterbury Republican
  - Norwich Bulletin
  - DAS
  - CPCA Website
  - Other_____

Contractors Certification

By submitting a bid proposal, the bidder is attesting to the review, reading, understanding, and acceptance of the information and requirements of the project contained within the bid documents without exception. By submitting a bid proposal, the Bidder represents that they have examined the site, and accept the conditions under which the work will be performed and we have read, evaluated, understand, and accepted all the Contract Documents, including those documents provided for on the Disk, and their content in their entirety and have included all provisions necessary to accomplish all work according to the information and requirements prescribed therein without exception.

SUBMITTED BY:
Firm: _____ Date: _____

Address: _____

SUBMITTED BY: _____

Print Name: _____

Title: _____

Telephone: _____

 Contractor's Initials:_____

FORM OF PROPOSAL

University of Connecticut
Amy Allen, Purchasing Agent II
Capital Project & Contract Administration
3 North Hillside Road, Unit 6047
Storrs, Connecticut 06269-6047

Dear Ms. Allen:

1. In accordance with Connecticut General Statutes Sections 10a-109a through 10a-109y and pursuant to, and in compliance with your Invitation to Bid, the Notice and Instructions to Bidders, the Form of Contract, including the conditions thereto, the form of required bond, I (we) propose to furnish the labor and/or materials installed as required for the project named and numbered on the FORM OF PROPOSAL of this proposal to the extent of the Proposal submitted herein, furnishing all necessary equipment, machinery, tools, labor and other means of construction, and all materials specified in the manner and at the time prescribed strictly in accordance with the provisions of the Contract including specifications and/or drawings together with all addenda issued and received prior to the scheduled closing time for the receipt of the bids, and in conformity with requirements of the University of Connecticut and any laws or departmental regulations of the State of Connecticut or of the United States which may affect the same, for and in consideration of the price(s) stated on the said FORM OF PROPOSAL, hereof.

2. The Lump Sum Base Bid by me (us) on the FORM OF PROPOSAL includes all work indicated on the drawings and/or described in the specifications (including the furnishing and installing of all required materials, labor, equipment and allowances where applicable), except:

   A. Work covered by Alternates as may be listed on the FORM OF PROPOSAL.

   B. Contingent work covered by Unit Prices as may be listed on the FORM OF PROPOSAL.

   C. Work covered by Options as may be listed on the FORM OF PROPOSAL.

3. This proposal is submitted subject to and in compliance with the foregoing and following conditions and/or information.

   A. AWARD: All proposals shall be subject to the provisions and requirements of the Bid Documents and for purpose of award, consideration shall be given only to proposals submitted by qualified and responsible bidders.

   B. COMMENCEMENT AND COMPLETION OF WORK: Contractor shall commence and complete the work in accordance with the requirements of the Contract Documents.

   C. If the Contractor fails to complete the work within the time required by the Contract Documents, the University shall have the right to assess liquidated damages as provided in Paragraph 9.11 of the General Conditions.

   D. CONTRACTORS INSURANCE REQUIRED:
      1. The limits of liability and coverages shall be those set forth in Article 11 of the General Conditions included with this bid package (or as previously executed with the on-call trade contract).

   E. REQUIRED PERCENTAGES OF WORK AND SET-ASIDES

.1 If awarded this contract, we (I) as the General Contractor on this Project shall be required to perform not less than 10% of the completed dollar value of the Work with its own forces.

.2 We (I) as the General Contractor on this project shall award not less than 25% of the total Contract Price to subcontractors who are certified and eligible to participate under the State of Connecticut Small Business Set Aside Program, of which 6.25% (of the total Contract) must be awarded to Women Owned or Minority Businesses. This requirement must be met even if the General Contractor is certified and eligible to participate in the Small Business Set Aside Program. To facilitate compliance with this requirement for set aside subcontractors, submit a list of certified set aside contractors to be used on this project along with the dollar amounts to be paid to each, on the form provided, and a copy of their current certification must be attached. This information will be considered as part of your bid proposal and failure to comply with any portion of this requirement, including but not limited to failure to list or meet the necessary dollar amount of percentage of the bid price will be cause to reject your bid.

F. NONDISCRIMINATION & LABOR RECRUITMENT:

We (I) agree that the Contract awarded for this project shall be subject to the Executive Orders No. Three and Seventeen, promulgated June 16, 1971 and February 15, 1973 respectively and to the Guidelines and Rules of the State Labor Department implementing Executive Order No. Three and further agree to submit reports of Compliance Staffing on Labor Department Form E.O.3-1, when and as requested.

G. FEDERAL & STATE WAGE DETERMINATIONS AND PRICING CONSIDERATION:

.1 Each contractor who is awarded a contract on or after October 1, 2002 shall be subject to provisions of the Connecticut General Statutes, Section 31-53 as amended by Public Act 02-69, "An Act Concerning Annual Adjustments to Prevailing Wages".

.2 In determining bid price, consideration should be given to Section 31-53 of the General Statutes of Connecticut as amended by Public Act 02-69, "An Act Concerning Annual Adjustments to Prevailing Wages". Such prevailing wage adjustment will not be considered a basis for an annual contract adjustment.

.3 The State of Connecticut Labor Department Wage Schedule where required, shall be provided with these documents, typically with the Bidders' Convenience Package, or will be incorporated in the Contract Documents as an Addendum. At the time of bidding, the bidder agrees to accept the current prevailing wage scale, as well as any annual adjustment to the prevailing wage scale, as provided by the Connecticut Department of Labor. Wage Rages will be posted each July 1st on the Department of Labor website: www.ctdol.state.ct.us . Such prevailing wage adjustment will not be considered a basis for an annual contract amendment.

H. CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY & NON-SEGREGATED FACILITIES:

We (I) acknowledge that we (I) and our subcontractors are obligated to fill out the forms provided by the University of Connecticut Office of Capital Project and Contract Administration and to agree to certify to the compliance of non-segregated facilities.

FORM OF PROPOSAL

I. NOTICE TO EXECUTIVE BRANCH STATE CONTRACTORS AND PROSPECTIVE STATE CONTRACTORS OR CAMPAIGN CONTRIBUTION AND SOLICITATION BAN.

With regard to a State contract as defined in P.A. 07-1 having a value in a contract year of $50,000 or more or a combination or series of such agreements or contracts having a value of $100,000 or more, the authorized signatory to this submission in response to the State's solicitation expressly acknowledges receipt of the State Elections Enforcement Commission's notice advertising prospective principals of the contents of the notice. See Attachment SEEC Form 11.

4. ACCOMPANYING THIS PROPOSAL IS:

A. A CERTIFIED CHECK drawn to the order of the University of Connecticut in the amount of 10% of the Bid, i.e.:
_____ DOLLARS $_____

and drawn on the _____
(STATE BANK & TRUST COMPANY)

_____ located at _____
(A NATIONAL BANKING ASSOCIATION) (CITY & STATE)

which is understood shall be cashed and the proceeds thereof used so far as may be necessary to reimburse the State of Connecticut for losses and damages arising by virtue of my (our) failure to file the required Bonds and execute the required contract in this proposal as accepted by the University of Connecticut.

OR;

B. A BID BOND having as surety thereto a Surety Company for Companies authorized to transact business in the State of Connecticut and made out in the penal sum of 10% of the bid, (Bids $50,000 and greater) i.e.:

_____ DOLLARS $_____

If the bidder is a joint venture, the Bid Bond shall specifically identify and include each joint venturer as a principal.

C. If the bidder is a joint venture, a copy of the executed Joint Venture Agreement shall be submitted along with the bid materials.

5. We (I), the undersigned, hereby declare that I am (we are) the only person(s) interested in the proposal and that it is without any connection with any other person making any bid for the same work. No person acting for, or employed by, the State of Connecticut is directly interested in this proposal, or in any contract which may be made under it, or in expected profits to arise therefrom. This proposal is made without directly or indirectly influencing or attempting to influence any other person or corporation to bid or refrain from bidding or to influence the amount of the bid of any other person or corporation. This proposal is made in good faith without collusion or connection with any other person bidding for the same work and this proposal is made with distinct reference and relation to the plans and specifications prepared for this Contract. I (We) further declare that in regard to the conditions affecting the work to be done and the labor

and materials needed, this proposal is based solely on my (our) investigation and research and not in reliance upon any representations of any employee, officer or agent of the State.

6. Each class of work set forth in a separate Section of the Specifications and designated as a subtrade in Item 2A of the proposal pages shall be the matter of a subcontract made in accordance with the procedures set forth in the Bid and Contract Documents.

7. The undersigned agrees that, if selected as General Contractor, he shall, within ten (10) days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the University of Connecticut, execute a contract in accordance with the terms of this general bid.

8. The undersigned agrees and warrants that he has made good faith efforts to employ minority business enterprises as subcontractors and suppliers of materials under such contract and shall provide the Commission on Human Rights and Opportunities with such information as is requested by the Commission concerning his employment practices and procedures as they relate to the provisions of the Connecticut General Statutes governing contract requirements.

9. The undersigned acknowledges that should their submitted Form of Proposal fail to have included a copy of your firms prequalification certificate and an updated statement accompany their bid submission, that their bid will be invalid and considered non-responsive. Per CGS 4b-91 amended.

Contractor's Initials:_____

FORM OF PROPOSAL

A. STANDARD BID BOND:

NOW ALL MEN BY THESE PRESENTS,

That we, _____ hereinafter called the principal, of _____, as principal, and _____, hereinafter called the Surety, a corporation organized and existing under the laws of the State of _____, and duly authorized to transact a surety business in the State of Connecticut, as Surety, are held and firmly bound unto the State of Connecticut, as obligee, in the penal sum of ten (10) percent of the amount of the bid set forth in a proposal hereinafter mentioned, _____, in lawful money of the United States of America, for the payment of which sum, well and truly to be made to the Obligee, the Principal and the Surety bind, themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH,

That, whereas the Principal has submitted or is about to submit a proposal the other obligee related to a contract for the Project Referenced above.

NOW, THEREFORE, if the said contract be awarded to the Principal and the Principal shall, within such time as may be specified, enter in the said contract in writing with the State of Connecticut and give the required bonds, with surety acceptable to the Oligee, or if the Principal shall fail to do so, pay to Obligee the damages which the Obligee may suffer by reason of such failure not exceeding the penal sum of this bond, then this obligation shall be void, otherwise to remain in full force and effect.

SIGNED, SEALED AND DATED this _____ day of _____, 20___

_____	_____	_____	_____
Witness	Surety	Witness	Principal
	_____		_____
	Title		Title

Contractor's Initials:_____

B. The undersigned proposes to furnish all labor and material required for:

Main Accumulation Areas for Regulated Wastes (MAA)
#901807

University of Connecticut
Storrs, CT

in accordance with the accompanying Drawings and Specifications prepared by:

Tai Soo Kim Partners Architects

The Contract Price specified below subject to additions and deductions according to the terms of the Contract Documents.

C. BID CLARIFICATIONS:

The undersigned acknowledges receipt of the following Bid Clarifications issued during the bidding period and has included all changes therein in the above base bid amount.

Clarifications/Addenda #_____, Dated_____
Clarifications/Addenda #_____, Dated_____
Clarifications/Addenda #_____, Dated_____
Clarifications/Addenda #_____, Dated_____

D. PROPOSED BASE CONTRACT PRICE:

Having carefully examined the Bid Documents for the above reference project, and having visited the project site and examined all conditions affecting the work, the undersigned, upon written notice of award of contract, agrees to provide all labor, supervision, materials, tools, construction equipment, services, safety, insurance, bonds, and to pay all applicable taxes, and other costs necessary or required to complete the Work of this Bid in full accordance with all Bid Documents and within the required timeframe as indicated by the proposed schedule for the Lump Sum Bid of:

_____US Dollars

($_____) (which incorporates all allowances as may be listed in the plans and specifications)

(Show the amount in both words and figures. In case of discrepancy, amount shown in words will govern.)

The University reserves the right to elect to implement some, all or none of the Alternates and/or Options set forth in the Proposal forms, as may be in the best interest of the University. The low Bid shall be determined by taking the Base Price set forth in the Proposal form as selected by the University, plus the Alternates and/or Options selected by the University.

E. SCHEDULE OF ALTERNATES: (Revised 7/15/15)

Provide Alternate Prices which reflect the work of the bid package under which this bid proposal was submitted and shall remain ***valid for the life of the project*** and include **all costs** for a complete installation. All pricing is inclusive of all costs of wages, applicable taxes, benefits, and applicable insurance. The Prices herein shall remain valid for the life of the project and include all costs for a complete installation. Alternate prices are good for both adds and deducts.

Alternate No. 1:

Vegetative Roof Pre-Grown Modular System – Provide modules, growing media, plants and edging, as shown on the drawings and specified in Specification Section 075423.

Add: $_____

Alternate No. 2:

Building Envelope Air Leakage Test – Provide Orifice Blower Door Test as specified in Section 019119.

Add: $_____

Alternate No. 3:

Provide stainless steel in lieu of painted galvanized steel for all exterior hand rails, guard rails, and associated items.

Add: $_____

END OF ALTERNATES

F. SCHEDULE OF UNIT PRICES:

All rates are inclusive of all costs of wages, applicable taxes, benefits, applicable insurance. The rates provided will be negotiated and included as part of the contract and of your subcontracts. The Unit Prices herein shall remain valid for the life of the project and include all costs for a complete installation. Unit prices are good for both adds and deducts.

Unit Price 1: Temporary Excavation Support

Description: Provide additional Temporary Excavation Support including excavation, backfilling, tie backs, soil nails and all work required for a complete installation.

$_____ Per Fifty (50) Square Feet of Exposed Excavation Face

Unit Price 2: General Rock Excavation

Description: Provide general rock excavation in open areas by ripping. Legally dispose of excavated materials off-site.

$_____ Per Cubic Yard

Unit Price 3: Trench Rock Excavation

Description: Provide trench rock excavation in by ripping. Legally dispose of excavated materials off-site.

$_____ Per Cubic Yard

Unit Price 4: Sprinkler Head in Acoustical Lay in or Suspended Gypsum Board Ceiling

Description: Provide additional fire sprinkler head in acoustical lay in or gypsum board ceiling.

$_____ Per One (1) Sprinkler Head and Associated Piping

Unit Price 5: Sprinkler Head in Area Without Ceiling

Description: Provide additional fire sprinkler head.

$_____ Per One (1) Sprinkler Head and Associated Piping

Unit Price 6: Fire Alarm Horn Strobe

Description: Provide additional fire alarm horn strobe with 25 feet of circuiting.

$_____ Per One (1) Fire Alarm Horn Strobe with Associated Circuiting

Unit Price 7: Smoke Detector

Description: Provide additional smoke detector with 25 feet of circuiting.

$_____ Per One (1) Smoke Detector with 25 Feet of Associated Circuiting

Unit Price 8: Duplex Electrical Receptacle

Description: Provide additional duplex electrical receptacle with 25 feet of circuiting.

$_____ Per One (1) Duplex Electrical Receptacle with Associated Circuiting

Unit Price 9: Data Drop

Description: Provide additional data drop with 100 foot cabling.

$_____ Per One (1) Data Drop with Associated Cabling

End of Unit Prices

G. SCHEDULE OF LABOR RATES:

The following are hourly wage rates for all tradesmen associated with this project for performing extra work. These rates are fully loaded (including benefits, applicable taxes, and worker compensation insurance) and are in accordance with the prevailing wages of the trade having jurisdiction in areas where the work is performed. The wage rates shall be valid for the life of the project. ***NOTE: Further, no mark-up shall be allowed on the premium time portion of the wage rate. At the request of the University, the Contractor will submit labor rate summary sheets, which justify all submitted labor rates. All rates are subject to thorough analysis and subject to reduction if deemed inaccurate by The University of Connecticut.***

TRADE: _____ **Attachments: Y / N**

Submit one sheet for each Labor Trade (Division) used on project. Copy as needed.

Foreman	Straight Time	Time and One Half	Double Time
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____

Journeyman	Straight Time	Time and One Half	Double Time
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____

Apprentice	Straight Time	Time and One Half	Double Time
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____

Laborer	Straight Time	Time and One Half	Double Time
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____
_____	$_____	$_____	$_____

End Labor Rates

H. SCHEDULE OF VALUES:

The undersigned agrees that the Schedule of Values submitted with this Bid is a true representation of the distribution of the costs of this project and equals the Stipulated Sum shown above. The Schedule of Values is an integral part of this proposal. Please indicate N/A for those divisions of work not applicable. The costs provided below include the complete cost for furnishing and installing of materials, labor, and equipment required to provide the complete scope of work for each specified division (includes the costs of applicable taxes, insurance, bonds, overhead, profit, small tools, travel, parking, supervision, etc.). The "TOTAL" price must equal your total lump sum bid proposal.

Division	Group	
01	General Conditions	$
02	Existing Conditions	$
03	Concrete	$
04	Masonry	$
05	Metals	$
06	Wood, Plastics, Composites	$
07	Thermal & Moisture Protection	$
08	Openings	$
09	Finishes	$
10	Specialties	$
11	Equipment	$
12	Furnishings	$
13	Special Construction	$
14	Conveying Equipment	$
*21	Fire Suppression	$
22	Plumbing	$
*23	HVAC Heating, Ventilating, Air Conditioning	$
25	Integrated Automation	$
26	Electrical	$
27	Communications	$
28	Electronic Safety and Security	$
*31	Earthwork	$
32	Exterior Improvements	$
33	Utilities	$
34	Transportation	$
35	Waterway and Marine Construction	$
*40	Process Integration	$
41	Material Process & Handling Equipment	$
42	Process Heating, Cooling & Drying Equipment	$
43	Process Gas & Liquid Handling, Purification & Storage Eqmt.	$
44	Pollution & Waste Control Equipment	$
45	Industry Specific Manufacturing Equipment	$
46	Water & Wastewater Equipment	$
*48	Electrical Power Generation	$
Insurance		$
Bonds		$
Allowances	(where applicable)	$
TOTAL		$

**Gap in numerical sequence, reserved for future expansion*

Contractor's Initials:_____

FORM OF PROPOSAL

I. The subdivision of Work in the proposed Contract Price is as follows:

ITEM 1 WORK BY GENERAL CONTRACTOR:
For all work other than that to be done by subcontractors included in Item 2A and Item 2B.

$_____(ITEM 1)

Note: In accordance with paragraph 3.E.1 this amount, together with work by the general contractor as listed in Item 2A below, must be at least 10% of the total bid price.

ITEM 2A WORK BY SUBCONTRACTORS NAMED:

Subcontractors and prices for the following trades must be listed (if such prices exceed $25,000). However, the general bidder may list himself together with his price if he customarily performs any of the trades specified. If the general contractor requires a performance and/or labor & material payment bond then the general contractor must indicate below which of the subcontractors are subject to this requirement. The amount (%) shall not exceed the subcontractor's price listed below.

DESCRIPTION	NAME OF SUBCONTACTOR	DOLLAR AMOUNT	LABOR & MATERIAL BOND	PERFORMANCE BOND
MASONRY				
ELECTRICAL				
MECHANICAL WITHOUT HVAC				
HVAC				

A copy of the executed agreement between the successful bidder and the named subcontractors above must be presented to the Office of CPCA at time of contract signing. The contract may not be executed until copies of executed agreements are received by CPCA.

ITEM 2B WORK BY SUBCONTRACTORS NOT NAMED:

$_____
(INCLUDES ALL SUBCONTRACT WORK NOT LISTED IN ITEM 2A)

The undersigned agrees that each of the subcontractors listed on this FORM OF PROPOSAL will be used for the work indicated at the amount stated, unless a substitution is permitted by the University.

J. SET-ASIDE CONTRACTOR SCHEDULE

In accordance with Section 5.2 of our Notice and Instructions to Bidders, it is a requirement to list below the names of each currently certified set aside contractor anticipated to be used for this project, along with the dollar amount to be paid each contractor.

The responsibility for listing a qualified and certified set aside contractor, Women Owned Businesses or Minority Businesses, rests solely with the proposer and not the State. **We acknowledge that listing a subcontractor who does not qualify shall be considered the same as not listing one at all and the proposal may be considered non-responsive and subject to rejection.**

Name	Address	Amount

The amount is NOT LESS THAN 25% of the proposed base contract price as stated on the Form of Proposal, Section D.

CERTIFICATE OF ELIGIBILITY HAS BEEN OBTAINED THROUGH THE FOLLOWING WEBSITE; https://www.biznet.ct.gov/SupplierDiversity/SDSearch.aspx
FOR EACH OF THE NAMED CONTRACTORS AND IS BEING SUBMITTED WITH THIS FORM.

The Undersigned agrees that each of the subcontractors listed on the proposal form will be used for the work indicated at the amount stated, unless a substitution is permitted by the awarding authority.

_____ _____
Authorized Signature Title

_____
Company Name

K. BIDDER CONTRACT COMPLIANCE MONITORING REPORT

PART I - Bidder Information

<table>
<tr><td>Company Name
Street Address
City & State
Chief Executive</td><td rowspan="2">Bidder Federal Employer
Identification Number_____
Or
Social Security Number_____</td></tr>
<tr><td>Major Business Activity
(brief description)</td></tr>
<tr><td>Bidder Parent Company(If any)</td><td rowspan="2">Bidder Identification
(response optional/definitions in Instruction to Bidders page 18)

-Bidder is a small contractor. Yes__ No__

-Bidder is a minority business enterprise Yes__ No__
(If yes, check ownership category)

Black___ Hispanic___ Asian American___ American Indian/Alaskan Native ____
Iberian Peninsula___
Individual(s) with a Physical Disability___
Female___

-Bidder is certified as above by State of CT Yes__ No__ -
DAS Certification Number _____</td></tr>
<tr><td>Other Locations in Ct. (If any)</td></tr>
</table>

PART II - Bidder Nondiscrimination Policies and Procedures

1. Does your company have a written Affirmative Action/Equal Employment Opportunity statement posted on company bulletin boards? Yes__ No__	7. Do all of your company contracts and purchase orders contain non-discrimination statements as required by Sections 4a-60 & 4a-60a Conn. Gen. Stat.? Yes__ No__
2. Does your company have the state-mandated sexual harassment prevention in the workplace policy posted on company bulletin boards? Yes__ No__	8. Do you, upon request, provide reasonable accommodation to employees, or applicants for employment, who have physical or mental disability? Yes__ No__
3. Do you notify all recruitment sources in writing of your company's Affirmative Action/Equal Employment Opportunity employment policy? Yes__ No__	9. Does your company have a mandatory retirement age for all employees? Yes__ No__
4. Do your company advertisements contain a written statement that you are an Affirmative Action/Equal Opportunity Employer? Yes__ No__	10. If your company has 50 or more employees, have you provided at least two (2) hours of sexual harassment training to all of your supervisors? Yes__ No__ NA__
5. Do you notify the Ct. State Employment Service of all employment openings with your company? Yes__ No__	11. If your company has apprenticeship programs, do they meet the Affirmative Action/Equal Employment Opportunity requirements of the apprenticeship standards of the Ct. Dept. of Labor? Yes__ No__ NA__
6. Does your company have a collective bargaining agreement with workers? Yes__ No__ 6a. If yes, do the collective bargaining agreements contain non-discrimination clauses covering all workers? Yes__ No__ 6b. Have you notified each union in writing of your commitments under the nondiscrimination requirements of contracts with the state of Ct? Yes__ No__	12. Does your company have a written affirmative action Plan? If no, please explain. Yes__ No__ 13. Is there a person in your company who is responsible for equal employment opportunity? Yes__ No__ If yes, give name and phone number. _____ _____ _____

Part III - Bidder Subcontracting Practices

1. Will the work of this contract include subcontractors or suppliers? Yes__ No__

   1a. If yes, please list all subcontractors and suppliers and report if they are a small contractor and/or a minority business enterprise as defined on page 1 / use additional sheet if necessary)

   1b. Will the work of this contract require additional subcontractors or suppliers other than those identified in 1a? Yes__ No__

Part IV – Bidder Employment Information Date:

JOB CATEGORY	OVERALL TOTALS	WHITE (not of Hispanic origin)		BLACK (not of Hispanic origin)		HISPANIC		ASIAN or PACIFIC ISLANDER		AMERICAN INDIAN or ALASKAN NATIVE	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Management											
Business & Financial Ops											
Computer Specialists											
Architecture/Engineering											
Office & Admin Support											
Bldg/ Grounds Cleaning/Maintenance											
Construction & Extraction											
Installation , Maintenance & Repair											
Material Moving Workers											
TOTALS ABOVE											
Total One Year Ago											
FORMAL ON THE JOB TRAINEES		(ENTER FIGURES FOR THE SAME CATEGORIES AS ARE SHOWN ABOVE)									
Apprentices											
Trainees											

PART V - Bidder Hiring and Recruitment Practices

1. Which of the following recruitment sources are used by you? (check yes or not and report percent used)				2. Check (x) any of the below listed requirements that you use as a hiring qualification		3. Describe below any other practices or actions that you take which show that you hire, train, and promote employees without discrimination?
SOURCE	YES	NO	% of applicants provided by source	(x)		
State Employment Service					Work Experience	
Private Employment Agencies					Ability To Speak Or Write English	
Schools And Colleges					Written Tests	
Newpaper Advertisements					High School Diploma	
Walk Ins					College Degree	
Present Employees					Union Membership	
Labor Organizations					Personal Recommendations	
Minority/Community Organizations					Height Or Weight	
Others Please Identify					Car Ownership	
					Arrest Record	
					Wage Garnishments	

Certification (Read this form and check your statements on it CAREFULLY before signing).
I certify that the statements made by me on this BIDDER CONTRACT COMPLIANCE MONITORING REPORT are complete and true to the best of my knowledge and belief, and are made in good faith. I understand that if I knowingly make any misstatements of facts, I am subject to be declared in non-compliance with Section 4a-60, 4a-60a, and related sections of the CONN. GEN. SAT.

Signature) (Date Signed)

(Title) (Telephone)

L. PROPOSER'S QUALIFICATION/RESPONSIBILITY STATEMENT

The Proposer shall have already completed and submitted the Questionnaire and other submission required by the University in its Invitation to Pre-Qualify, regarding the Proposer's qualifications. If changed circumstances arising since the initial submission, or other facts have occurred which would result in a material change to any of the Proposer's initial responses or submissions, the Proposer shall provide any such supplementary, or revised information at this time, along with its Proposal.

1. State, identify any such changed circumstances or other facts and provide any such supplementary or revised information as described above, identifying specifically, by number and content, each prior question, response to the Questionnaire, or information changed, supplemented or revised. (Attach a separate sheet if necessary)

2. State "NONE" if there are no changes to be made. _____

Please note that if the end date of the time period covered by the information submitted during your pre-qualification is three or more months old, please provide current financial documentation demonstrating that your present financial position has remained the same, or showing and identifying any changes in any way, in relation to the audited financial statement you submitted with your pre-qualified application on this proposal.

Dated at this day of 20
Name of Organization:
Signature:
Print Name:
Title:
Notary Statement:
Mr./Mrs./Ms. being duly sworn deposes and says that he/she
is the of and that the
(Position or Title) (Firm Name)
answers to the foregoing questions and all statements therein contained are true and correct.
Subscribed and sworn to before me this day of 20
Notary Public:
My Commission Expires: 20

M. ETHICS FORMS **-** A duly authorized representative of the company must sign these forms

- √ **These forms must be notarized and clearly show notary seal or acknowledged by a Commissioner of the Superior Court**.

- √ ALL REQUIRED forms, **must be completed, signed and returned** by the bidder/proposer as part of the bid/proposal/RFQ response package.

- √ Failure to submit ALL REQUIRED forms constitutes grounds for rejection of your bid/proposal/RFQ.

- √ If it is determined by the University of Connecticut and/or State of Connecticut that **any information requested was not referenced and submitted** with this bid/proposal/RFQ/LOI, and then such determination **will be just cause for disqualification of the bid/proposal/RFQ.**

STATE OF CONNECTICUT
GIFT AND CAMPAIGN CONTRIBUTION CERTIFICATION

Written or electronic certification to accompany a State contract with a value of $50,000 or more in a calendar or fiscal year, pursuant to C.G.S. §§ 4-250 and 4-252(c); Governor M. Jodi Rell's Executive Orders No. 1, Para. 8, and No. 7C, Para. 10; and C.G.S. §9-612(g)(2)

INSTRUCTIONS:
Complete all sections of the form. Attach additional pages, if necessary, to provide full disclosure about any lawful campaign contributions made to campaigns of candidates for statewide public office or the General Assembly, as described herein. Sign and date the form, under oath, in the presence of a Commissioner of the Superior Court or Notary Public. Submit the completed form to the awarding State agency at the time of initial contract execution and if there is a change in the information contained in the most recently filed certification, such person shall submit an updated certification either (i) not later than thirty (30) days after the effective date of such change or (ii) upon the submittal of any new bid or proposal for a contract, whichever is earlier. Such person shall also submit an accurate, updated certification not later than fourteen days after the twelve-month anniversary of the most recently filed certification or updated certification.

CHECK ONE: ☐ Initial Certification ☐ 12 Month Anniversary Update (Multi-year contracts only.)

☐ Updated Certification because of change of information contained in the most recently filed certification or twelve-month anniversary update.

GIFT CERTIFICATION:

As used in this certification, the following terms have the meaning set forth below:
1) "Contract" means that contract between the State of Connecticut (and/or one or more of it agencies o instrumentalities) and the Contractor, attached hereto, or as otherwise described by the awarding Stat agency below;
2) If this is an Initial Certification, "Execution Date" means the date the Contract is fully executed by, and becomes effective between, the parties; if this is a twelve-month anniversary update, "Execution Date" means the date this certification is signed by the Contractor;
3) "Contractor" means the person, firm or corporation named as the contactor below;
4) "Applicable Public Official or State Employee" means any public official or state employee described i C.G.S. §4-252(c)(1)(i) or (ii);
5) **"Gift"** has the same meaning given that term in C.G.S. § 4-250(1);
6) "Principals or Key Personnel" means and refers to those principals and key personnel of the Contractor, and its or their agents, as described in C.G.S. §§ 4-250(5) and 4-252(c)(1)(B) and (C).

I, the undersigned, am a Principal or Key Personnel of the person, firm or corporation authorized to execute this certification on behalf of the Contractor. I hereby certify that, no gifts were made by (A) such person, firm, corporation, (B) any principals and key personnel of the person firm or corporation who participate substantially in preparing bids, proposals or negotiating state contracts or (C) any agent of such, firm, corporation, or principals or key personnel who participates substantially in preparing bids, proposals or negotiating state contracts, to (i) any public official or state employee of the state agency or quasi-public agency soliciting bids or proposals for state contracts who participates substantially in the preparation of bid solicitations or request for proposals for state contracts or the negotiation or award of state contracts or (ii) any public official or state employee of any other state agency, who has supervisory or appointing authority over such state agency or quasi-public agency.

I further certify that no Principals or Key Personnel know of any action by the Contractor to circumvent (or which would result in the circumvention of) the above certification regarding **Gifts** by providing for any other Principals, Key Personnel, officials, or employees of the Contractor, or its or their agents, to make a **Gift** to any Applicable Public Official or State Employee. I further certify that the Contractor made the bid or proposal for the Contract without fraud or collusion with any person.

CAMPAIGN CONTRIBUTION CERTIFICATION:

I further certify that, on or after December 31, 2006, neither the Contractor nor any of its principals, as defined in C.G.S. § 9-612(g)(1), has made any **campaign contributions** to, or solicited any contributions on behalf of, any exploratory committee, candidate committee, political committee, or party committee established by, or supporting or authorized to support, any candidate for statewide public office, in violation of C.G.S. § 9-612(g)(2)(A). I further certify that **all lawful campaign contributions** that have been made on or after December 31, 2006 by the Contractor or any of its principals, as defined in C.G.S. § 9-612(g)(1), to, or solicited on behalf of, any exploratory committee, candidate committee, political committee, or party committee established by, or supporting or authorized to support any candidates for statewide public office or the General Assembly, are listed below:

Lawful Campaign Contributions to Candidates for Statewide Public Office:

Contribution Date	Name of Contributor	Recipient	Value	Description

Lawful Campaign Contributions to Candidates for the General Assembly:

Contribution Date	Name of Contributor	Recipient	Value	Description

Sworn as true to the best of my knowledge and belief, subject to the penalties of false statement.

_____ _____
Printed Contractor Name **Printed Name of Authorized Official**

_____
Signature of Authorized Official

Subscribed and acknowledged before me this _____ day of _____, 20___.

_____
Commissioner of the Superior Court (or Notary Public)

_____
My Commission Expires

OPM Ethics Form 5 **Rev. 3-28-14**

STATE OF CONNECTICUT
CONSULTING AGREEMENT AFFIDAVIT

Affidavit to accompany a bid or proposal for the purchase of goods and services with a value of $50,000 or more in a calendar or fiscal year, pursuant to Connecticut General Statutes §§ 4a-81(a) and 4a-81(b). For sole source or no bid contracts the form is submitted at time of contract execution.

INSTRUCTIONS:

If the bidder or vendor has entered into a consulting agreement, as defined by Connecticut General Statutes § 4a-81(b)(1): Complete all sections of the form. If the bidder or contractor has entered into more than one such consulting agreement, use a separate form for each agreement. Sign and date the form in the presence of a Commissioner of the Superior Court or Notary Public. **If the bidder or contractor has not entered into a consulting agreement, as defined by Connecticut General Statutes § 4a-81(b)(1):** Complete only the shaded section of the form. Sign and date the form in the presence of a Commissioner of the Superior Court or Notary Public.

Submit completed form to the awarding State agency with bid or proposal. For a sole source award, submit completed form to the awarding State agency at the time of contract execution.

This affidavit must be amended if there is any change in the information contained in the most recently filed affidavit not later than (i) thirty days after the effective date of any such change or (ii) upon the submittal of any new bid or proposal, whichever is earlier.

AFFIDAVIT: [Number of Affidavits Sworn and Subscribed On This Day: _____]

I, the undersigned, hereby swear that I am a principal or key personnel of the bidder or contractor awarded a contract, as described in Connecticut General Statutes § 4a-81(b), or that I am the individual awarded such a contract who is authorized to execute such contract. I further swear that I have not entered into any consulting agreement in connection with such contract, **except for the agreement listed below**:

_____ _____
Consultant's Name and Title Name of Firm (if applicable)

_____ _____ _____
Start Date End Date Cost

Description of Services Provided: _____

_____

Is the consultant a former State employee or former public official? ☐ YES ☐ NO

If YES: _____ _____
Name of Former State Agency Termination Date of Employment

Sworn as true to the best of my knowledge and belief, subject to the penalties of false statement.

_____ _____ _____
Printed Name of Bidder or Contractor **Signature of Principal or Key Personnel** **Date**

_____ _____
Printed Name (of above) Awarding State Agency

Sworn and subscribed before me on this _____ day of _____, 20___.

_____
Commissioner of the Superior Court or Notary Public

_____
My Commission Expires

OPM Ethics Form 6 **Rev. 10-01-11**

STATE OF CONNECTICUT

AFFIRMATION OF RECEIPT OF STATE ETHICS LAWS SUMMARY

Written or electronic affirmation to accompany a large State construction or procurement contract, having a cost of more than $500,000, pursuant to Connecticut General Statutes §§ 1-101mm and 1-101qq

INSTRUCTIONS:

Complete all sections of the form. Submit completed form to the awarding State agency or contractor, as directed below.

CHECK ONE:

☐ I am a person seeking a large State construction or procurement contract. I am submitting this affirmation to the awarding State agency with my bid or proposal. [Check this box if the contract will be awarded through a competitive process.]

☐ I am a contractor who has been awarded a large State construction or procurement contract. I am submitting this affirmation to the awarding State agency at the time of contract execution. [Check this box if the contract was a sole source award.]

☐ I am a subcontractor or consultant of a contractor who has been awarded a large State construction or procurement contract. I am submitting this affirmation to the contractor.

☐ I am a contractor who has already filed an affirmation, but I am updating such affirmation either (i) no later than thirty (30) days after the effective date of any such change or (ii) upon the submittal of any new bid or proposal, whichever is earlier.

IMPORTANT NOTE:

Within fifteen (15) days after the request of such agency, institution or quasi-public agency for such affirmation contractors shall submit the affirmations of their subcontractors and consultants to the awarding State agency. Failure to submit such affirmations in a timely manner shall be cause for termination of the large State construction or procurement contract.

AFFIRMATION:

I, the undersigned person, contractor, subcontractor, consultant, or the duly authorized representative thereof, affirm (1) receipt of the summary of State ethics laws* developed by the Office of State Ethics pursuant to Connecticut General Statutes § 1-81b and (2) that key employees of such person, contractor, subcontractor, or consultant have read and understand the summary and agree to comply with its provisions.

* The summary of State ethics laws is available on the State of Connecticut's Office of State Ethics website.

_____ _____
Signature Date

_____ _____
Printed Name Title

_____
Firm or Corporation (if applicable)

_____ _____ ____ _____
Street Address City State Zip

_____
Awarding State Agency

STATE OF CONNECTICUT

Written or electronic PDF copy of the written certification to accompany a large state contract pursuant to P.A. No. 13-162 (Prohibiting State Contracts With Entities Making Certain Investments In Iran)

Respondent Name: _____

INSTRUCTIONS:

CHECK ONE: ☐ Initial Certification.
☐ Amendment or renewal.

A. Who must complete and submit this form. Effective October 1, 2013, this form must be submitted for any large state contract, as defined in section 4-250 of the Connecticut General Statutes. This form must always be submitted with the bid or proposal, or if there was no bid process, with the resulting contract, regardless of where the principal place of business is located.

Pursuant to P.A. No. 13-162, upon submission of a bid or prior to executing a large state contract, **the certification portion of this form must be completed** by any corporation, general partnership, limited partnership, limited liability partnership, joint venture, nonprofit organization or other business organization **whose principal place of business is located outside of the United States**. United States subsidiaries of foreign corporations are exempt. For purposes of this form, a "foreign corporation" is one that is organized and incorporated outside the United States of America.

Check applicable box:

☐ Respondent's principal place of business is within the United States or Respondent is a United States subsidiary of a foreign corporation. Respondents who check this box **are not required to complete the certification portion of this form**, but must submit this form with its Invitation to Bid ("ITB"), Request for Proposal ("RFP") or contract package if there was no bid process.

☐ Respondent's principal place of business is outside the United States and it is not a United States subsidiary of a foreign corporation. **CERTIFICATION required.** Please complete the certification portion of this form and submit it with the ITB or RFP response or contract package if there was no bid process.

B. Additional definitions.

7) "Large state contract" has the same meaning as defined in section 4–250 of the Connecticut General Statutes;
8) "Respondent" means the person whose name is set forth at the beginning of this form; and
9) "State agency" and "quasi-public agency" have the same meanings as provided in section 1–79 of the Connecticut General Statutes.

C. Certification requirements.

No state agency or quasi-public agency shall enter into any large state contract, or amend or renew any such contract with any Respondent whose principal place of business is located outside the United States and is not a United States subsidiary of a foreign corporation unless the Respondent has submitted this certification.

Complete all sections of this certification and sign and date it, under oath, in the presence of a Commissioner of the Superior Court, a Notary Public or a person authorized to take an oath in another state.

CERTIFICATION:

I, the undersigned, am the official authorized to execute contracts on behalf of the Respondent. I certify that:

☐ Respondent has made no direct investments of twenty million dollars or more in the energy sector of Iran on or after October 1, 2013, as described in Section 202 of the Comprehensive Iran Sanctions, Accountability and Divestment Act of 2010.

☐ Respondent has either made direct investments of twenty million dollars or more in the energy sector of Iran on or after October 1, 2013, as described in Section 202 of the Comprehensive Iran Sanctions, Accountability and Divestment Act of 2010, or Respondent made such an investment prior to October 1, 2013 and has now increased or renewed such an investment on or after said date, or both.

Sworn as true to the best of my knowledge and belief, subject to the penalties of false statement.

_____ _____

Printed Respondent Name **Printed Name of Authorized Official**

_____

Signature of Authorized Official

Subscribed and acknowledged before me this _____ day of _____, 20___.

_____

Commissioner of the Superior Court (or Notary Public)

_____

My Commission Expires

FORM OF PROPOSAL

All pages within the Form of Proposal must be completed, signed by a duly authorized representative of the firm and returned as part of the bid/proposal/RFQ response package. NO FACSIMILE SIGNATURE PERMITTED

- √ **If the form of proposal is being submitted by a Joint Venture, each Joint Venture shall sign the Proposal, and each Joint Venture agrees to be bound by the terms and conditions thereof.**
- √ **Failure to submit ALL REQUIRED forms constitutes grounds for rejection of your bid/proposal/RFQ.**
- √ **If it is determined by the University of Connecticut and/or State of Connecticut that any information requested but not referenced and submitted with this bid/proposal; such determination will be just cause for disqualification of the bid/proposal.**

(TO BE FILLED IN AND SIGNED BY THE BIDDER)

Signed the _____ day of _____ 20____.

Firm Name: _____

Street: _____

City/State/Zip Code: _____

Telephone Number: _____

Fax Number: _____

Duly Authorized/Title: _____

(TO BE FILLED IN AND SIGNED BY JOINT VENTURE IF APPLICABLE)

Firm Name: _____

Street: _____

City/State/Zip Code: _____

Telephone Number: _____

Fax Number: _____

Duly Authorized/Title: _____

Duly Authorized/Title: _____

End of Form of Proposal

Contractor's Initials:_____

Opportunity ★ Guidance ★ Support

CONNECTICUT DEPARTMENT OF LABOR

THIS IS A PUBLIC WORKS PROJECT

Covered by the

PREVAILING WAGE LAW

CT General Statutes Section 31-53

If you have QUESTIONS regarding your wages
CALL (860) 263-6790

Section 31-55 of the CT State Statutes requires every contractor or subcontractor performing work for the state to post in a prominent place the prevailing wages as determined by the Labor Commissioner.

Section 31-53b

Sec. 31-53b. Construction safety and health course. New miner training program. Proof of completion required for mechanics, laborers and workers on public works projects. Enforcement. Regulations. Exceptions. (a) Each contract for a public works project entered into on or after July 1, 2009, by the state or any of its agents, or by any political subdivision of the state or any of its agents, described in subsection (g) of section 31-53, shall contain a provision requiring that each contractor furnish proof with the weekly certified payroll form for the first week each employee begins work on such project that any person performing the work of a mechanic, laborer or worker pursuant to the classifications of labor under section 31-53 on such public works project, pursuant to such contract, has completed a course of at least ten hours in duration in construction safety and health approved by the federal Occupational Safety and Health Administration or, has completed a new miner training program approved by the Federal Mine Safety and Health Administration in accordance with 30 CFR 48 or, in the case of telecommunications employees, has completed at least ten hours of training in accordance with 29 CFR 1910.268. (b) Any person required to complete a course or program under subsection (a) of this section who has not completed the course or program shall be subject to removal from the worksite if the person does not provide documentation of having completed such course or program by the fifteenth day after the date the person is found to be in noncompliance. The Labor Commissioner or said commissioner's designee shall enforce this section. (c) Not later than January 1, 2009, the Labor Commissioner shall adopt regulations, in accordance with the provisions of chapter 54, to implement the provisions of subsections (a) and (b) of this section. Such regulations shall require that the ten-hour construction safety and health courses required under subsection (a) of this section be conducted in accordance with federal Occupational Safety and Health Administration Training Institute standards, or in accordance with Federal Mine Safety and Health Administration Standards or in accordance with 29 CFR 1910.268, as appropriate. The Labor Commissioner shall accept as sufficient proof of compliance with the provisions of subsection (a) or (b) of this section a student course completion card issued by the federal Occupational Safety and Health Administration Training Institute, or such other proof of compliance said commissioner deems appropriate, dated no earlier than five years before the commencement date of such public works project. (d) This section shall not apply to employees of public service companies, as defined in section 16-1, or drivers of commercial motor vehicles driving the vehicle on the public works project and delivering or picking up cargo from public works projects provided they perform no labor relating to the project other than the loading and unloading of their cargo.

(P.A. 06-175, S. 1; P.A. 08-83, S. 1.)

History: P.A. 08-83 amended Subsec. (a) by making provisions applicable to public works project contracts entered into on or after July 1, 2009, replacing provision re total cost of work with reference to Sec. 31-53(g), requiring proof in certified payroll form that new mechanic, laborer or worker has completed a 10-hour or more construction safety course and adding provision re new miner training program, amended Subsec. (b) by substituting "person" for "employee" and adding "or program", amended Subsec. (c) by adding "or in

accordance with Federal Mine Safety and Health Administration Standards" and setting new deadline of January 1, 2009, deleted former Subsec. (d) re "public building", added new Subsec. (d) re exemptions for public service company employees and delivery drivers who perform no labor other than delivery and made conforming and technical changes, effective January 1, 2009.

Informational Bulletin

THE 10-HOUR OSHA CONSTRUCTION SAFETY AND HEALTH COURSE, PROGRAM OR TRAINING

(Applicable to public works contracts as described by Conn. Gen. Stat. § 31-53(g) entered into *on or after July 1, 2009*)

(1) This requirement was created by Public Act No. 08-83, which is codified in Section 31-53b of the Connecticut General Statutes;

(2) The course, program or training is required for public works contracts as described by Conn. Gen. Stat. § 31-53(g) entered into on or after July 1, 2009;

(3) It is required of private workers (not state or municipal workers) and apprentices who perform the work of a mechanic, laborer or worker pursuant to the classifications of labor under Conn. Gen. Stat. § 31-53 on a public works project as described by Conn. Gen. Stat. § 31-53(g);

(4) The ten-hour construction safety and health course, program or training pertains to the ten-hour Outreach Course conducted in accordance with federal OSHA Training Institute standards, a new mining training program approved by the Federal Mine Safety and Health Administration in accordance with 30 C.F. R. 48, or, for telecommunications workers, a ten-hour training course conducted in accordance with federal OSHA standard, 29 CFR 1910.268;

(5) The internet website for the federal OSHA Training Institute is http://www.osha.gov/fso/ote/training/edcenters/fact_sheet.html;

(6) The statutory language leaves it to the contractor and its employees to determine who pays for the cost of the ten-hour Outreach Course;

(7) Proof of course, program or training completion shall be demonstrated through the presentation of a "completion document" (card, document, certificate or other written record issued by federal OSHA or by the Federal Mine Safety and Health Administration) as defined by Conn. State Agencies Regs. § 31-53b-1(2).

(8) Any completion document with an issuance date more than 5 years prior to the commencement date of the public works project shall not constitute proof of compliance with § 31-53b;

(9) For each person who performs the duties of a mechanic, laborer or worker on a public works project, the contractor shall affix a copy of the completion document

to the certified payroll required to be submitted to the contracting agency for such project on which such worker's name first appears;

(10) Any mechanic, laborer or worker on a public works project found to be in non-compliance shall be subject to removal from the project if such employee does not provide satisfactory proof of course completion to the Labor Commissioner by the fifteenth day after the date the employee is determined to be in noncompliance;

(11) Any such employee who is determined to be in noncompliance may continue to work on a public works project for a maximum of fourteen consecutive calendar days while bringing his or her status into compliance;

(12) The statute provides the minimum standards required for the completion of a construction safety and health course, program or training by employees on public works contracts; any contractor can exceed these minimum requirements.;

(13) Regulations pertaining to § 31-53b are located at Conn. State Agencies Regs. §31-53b-1 *et seq.*, and are effective May 5, 2009. The regulations are posted on the CTDOL website;

(14) Any questions regarding this statute or the regulations may be directed to the Wage and Workplace Standards Division of the Connecticut Labor Department via the internet website of http://www.ctdol.state.ct.us/wgwkstnd/wgemenu.htm; or by telephone at (860)263-6790.

THE ABOVE INFORMATION IS PROVIDED EXCLUSIVELY AS AN EDUCATIONAL RESOURCE, AND IS NOT INTENDED AS A SUBSTITUTE FOR LEGAL INTERPRETATIONS WHICH MAY ULTMATELY ARISE CONCERNING THE CONSTRUCTION OF THE STATUTE OR THE REGULATIONS.

November 29, 2006

Notice

To All Mason Contractors and Interested Parties Regarding Construction Pursuant to Section 31-53 of the Connecticut General Statutes (Prevailing Wage)

The Connecticut Labor Department Wage and Workplace Standards Division is empowered to enforce the prevailing wage rates on projects covered by the above referenced statute.
Over the past few years the Division has withheld enforcement of the rate in effect for workers who operate a forklift on a prevailing wage rate project due to a potential jurisdictional dispute. The rate listed in the schedules and in our Occupational Bulletin (see enclosed) has been as follows:

Forklift Operator:

- Laborers (Group 4) Mason Tenders - operates forklift solely to assist a mason to a maximum height of nine feet only.

- Power Equipment Operator (Group 9) - operates forklift to assist any trade and to assist a mason to a height over nine feet.

The U.S. Labor Department conducted a survey of rates in Connecticut but it has not been published and the rate in effect remains as outlined in the above Occupational Bulletin.

Since this is a classification matter and not one of jurisdiction, effective January 1, 2007 the Connecticut Labor Department will enforce the rate on each schedule in accordance with our statutory authority.

Your cooperation in filing appropriate and accurate certified payrolls is appreciated.

STATUTE 31-55a

- SPECIAL NOTICE -

To: All State and Political Subdivisions,Their Agents, and Contractors
Connecticut General Statute 31-55a - Annual adjustments to wage rates by contractors doing state work.

Each contractor that is awarded a contract on or after October 1, 2002, for (1) the construction of a state highway or bridge that falls under the provisions of section 31-54 of the general statutes, or (2) the construction, remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public works project that falls under the provisions of section 31-53 of the general statutes shall contact the Labor Commissioner on or before July first of each year, for the duration of such contract, to ascertain the prevailing rate of wages on an hourly basis and the amount of payment or contributions paid or payable on behalf of each mechanic, laborer or worker employed upon the work contracted to be done, and shall make any necessary adjustments to such prevailing rate of wages and such payment or contributions paid or payable on behalf of each such employee, effective each July first.

- The prevailing wage rates applicable to any contract or subcontract awarded on or after October 1, 2002 are subject to annual adjustments each July 1st for the duration of any project which was originally advertised for bids on or after October 1, 2002.

- Each contractor affected by the above requirement shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.

- It is the ***contractor's*** responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's Web Site. The annual adjustments will be posted on the Department of Labor Web page: www.ctdol.state.ct.us. For those without internet access, please contact the division listed below.

- The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project. All subsequent annual adjustments will be posted on our Web Site for contractor access.

Any questions should be directed to the Contract Compliance Unit, Wage and Workplace Standards Division, Connecticut Department of Labor, 200 Folly Brook Blvd., Wethersfield, CT 06109 at (860)263-6790.

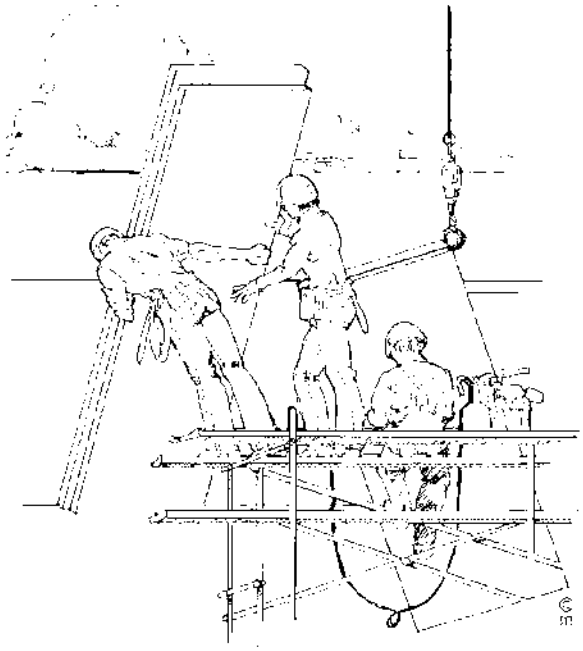
~NOTICE~

TO ALL CONTRACTING AGENCIES

Please be advised that Connecticut General Statutes Section 31-53, requires the contracting agency to certify to the Department of Labor, the total dollar amount of work to be done in connection with such public works project, regardless of whether such project consists of one or more contracts.

Please find the attached "Contracting Agency Certification Form" to be completed and returned to the Department of Labor, Wage and Workplace Standards Division, Public Contract Compliance Unit.

✎ Inquiries can be directed to (860)263-6543.



CONNECTICUT DEPARTMENT OF LABOR
WAGE AND WORKPLACE STANDARDS DIVISION
CONTRACT COMPLIANCE UNIT

CONTRACTING AGENCY CERTIFICATION FORM

I, _____, acting in my official capacity as _____,
authorized representative title

for _____, located at _____,
contracting agency address

do hereby certify that the total dollar amount of work to be done in connection with

_____, located at _____,
project name and number address

shall be $_____, which includes all work, regardless of whether such project

consists of one or more contracts.

CONTRACTOR INFORMATION

Name:_____

Address:_____
Authorized Representative:_____
Approximate Starting Date: _____

Approximate Completion Date:_____

_____ _____
Signature Date

Return To: Connecticut Department of Labor
Wage & Workplace Standards Division
Contract Compliance Unit
200 Folly Brook Blvd.
Wethersfield, CT 06109

Date Issued: _____

CONNECTICUT DEPARTMENT OF LABOR
WAGE AND WORKPLACE STANDARDS DIVISION

CONTRACTORS WAGE CERTIFICATION FORM

Construction Manager at Risk/General Contractor/Prime Contractor

I,_____of _____
Officer, Owner, Authorized Rep. Company Name

do hereby certify that the _____
Company Name

_____
Street

_____
City

and all of its subcontractors will pay all workers on the

_____
Project Name and Number

_____
Street and City

the wages as listed in the schedule of prevailing rates required for such project (a copy of which is attached hereto).

_____
Signed

Subscribed and sworn to before me this _____ day of _____,_____.

_____
Notary Public

Return to:

Connecticut Department of Labor
Wage & Workplace Standards Division
200 Folly Brook Blvd.
Wethersfield, CT 06109

Rate Schedule Issued (Date): _____

CERTIFIED PAYROLL FORM WWS - CPI

In accordance with Connecticut General Statutes, 31-53 Certified Payrolls with a statement of compliance shall be submitted monthly to the contracting agency.

Note: Once you have downloaded these forms and are ready to print them out, set the print function on your PC to the horizontal print orientation.

Note2: Please download both the Payroll Certification for Public Works Projects **and** the Certified Statement of Compliance for a complete package. The Certified Statement of Compliance appears on the same page as the Fringe Benefits Explanation page.

Announcement: The Certified Payroll Form WWS-CPI can now be completed on-line!

- Certified Payroll Form WWS-CPI (PDF, 727KB)
- Sample Completed Form (PDF, 101KB)

[New] In accordance with Section 31-53b(a) of the C.G.S. each contractor shall provide a copy of the OSHA 10 Hour Construction Safety and Health Card for each employee, to be attached to the first certified payroll on the project.

In accordance with Connecticut General Statutes, 31-53
Certified Payrolls with a statement of compliance
shall be submitted monthly to the contracting agency.

PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS

WEEKLY PAYROLL

Connecticut Department of Labor
Wage and Workplace Standards Division
200 Folly Brook Blvd.
Wethersfield, CT 06109

CONTRACTOR NAME AND ADDRESS:

SUBCONTRACTOR NAME & ADDRESS

WORKER'S COMPENSATION INSURANCE CARRIER

POLICY #

EFFECTIVE DATE:
EXPIRATION DATE:

PAYROLL NUMBER	Week-Ending Date	PROJECT NAME & ADDRESS

PERSON/WORKER, ADDRESS and SECTION	APPR RATE %	MALE/ FEMALE AND RACE*	WORK CLASSIFICATION / Trade License Type & Number - OSHA 10 Certification Number	DAY AND DATE S	M	T	W	TH	F	S	Total ST Hours / Total O/T Hours	BASE HOURLY RATE / TOTAL FRINGE BENEFIT PLAN CASH	TYPE OF FRINGE BENEFITS Per Hour 1 through 6 (see back)	GROSS PAY FOR ALL WORK PERFORMED THIS WEEK	TOTAL DEDUCTIONS FICA	FEDERAL WITH-HOLDING	STATE WITH-HOLDING	LIST OTHER	GROSS PAY FOR THIS PREVAILING RATE JOB	CHECK # AND NET PAY
				HOURS WORKED EACH DAY																
												$ Base Rate	1. $ 2. $ 3. $							
												$ Cash Fringe	4. $ 5. $ 6. $							
												$ Base Rate	1. $ 2. $ 3. $							
												$ Cash Fringe	4. $ 5. $ 6. $							
												$ Base Rate	1. $ 2. $ 3. $							
												$ Cash Fringe	4. $ 5. $ 6. $							
												$ Base Rate	1. $ 2. $ 3. $							
												$ Cash Fringe	4. $ 5. $ 6. $							

12/9/2013 *IF REQUIRED
WWS-CP1

*SEE REVERSE SIDE

PAGE NUMBER _____OF

OSHA 10 ~ATTACH CARD TO 1ST CERTIFIED PAYROLL

***FRINGE BENEFITS EXPLANATION (P):**

Bona fide benefits paid to approved plans, funds or programs, except those required by Federal or State Law (unemployment tax, worker's compensation, income taxes, etc.).

Please specify the type of benefits provided:

1) Medical or hospital care _____ 4) Disability_____

2) Pension or retirement _____ 5) Vacation, holiday_____

3) Life Insurance _____ 6) Other (please specify) _____

CERTIFIED STATEMENT OF COMPLIANCE

For the week ending date of _____,

I, _____of _____, (hereafter known as

Employer) in my capacity as _____ (title) do hereby certify and state:

Section A:

1. All persons employed on said project have been paid the full weekly wages earned by them during the week in accordance with Connecticut General Statutes, section 31-53, as amended. Further, I hereby certify and state the following:

a) The records submitted are true and accurate;

b) The rate of wages paid to each mechanic, laborer or workman and the amount of payment or contributions paid or payable on behalf of each such person to any employee welfare fund, as defined in Connecticut General Statutes, section 31-53 (h), are not less than the prevailing rate of wages and the amount of payment or contributions paid or payable on behalf of each such person to any employee welfare fund, as determined by the Labor Commissioner pursuant to subsection Connecticut General Statutes, section 31-53 (d), and said wages and benefits are not less than those which may also be required by contract;

c) The Employer has complied with all of the provisions in Connecticut General Statutes, section 31-53 (and Section 31-54 if applicable for state highway construction);

d) Each such person is covered by a worker's compensation insurance policy for the duration of his employment which proof of coverage has been provided to the contracting agency;

e) The Employer does not receive kickbacks, which means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided directly or indirectly, to any prime contractor, prime contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a prime contractor in connection with a subcontractor relating to a prime contractor; and

f) The Employer is aware that filing a certified payroll which he knows to be false is a class D felony for which the employer may be fined up to five thousand dollars, imprisoned for up to five years or both.

2. OSHA~The employer shall affix a copy of the construction safety course, program or training completion document to the certified payroll required to be submitted to the contracting agency for this project on which such persons name first appears.

_____	_____	_____
(Signature)	(Title)	Submitted on (Date)

*****THIS IS A PUBLIC DOCUMENT*****
*****DO NOT INCLUDE SOCIAL SECURITY NUMBERS*****

Weekly Payroll Certification For Public Works Projects (Continued)

PAYROLL CERTIFICATION FOR PUBLIC WORKS PROJECTS

Week-Ending Date:
Contractor or Subcontractor Business Name:

WEEKLY PAYROLL

PERSON/WORKER, ADDRESS and SECTION	APPR RATE %	MALE/ FEMALE AND RACE*	WORK CLASSIFICATION Trade License Type & Number - OSHA 10 Certification Number	DAY AND DATE S	M	T	W	TH	F	S	Total ST Hours Total O/T Hours	BASE HOURLY RATE TOTAL FRINGE BENEFIT PLAN CASH	TYPE OF FRINGE BENEFITS Per Hour 1 through 6 (see back)	GROSS PAY FOR ALL WORK PERFORMED THIS WEEK	TOTAL DEDUCTIONS FICA	FEDERAL WITH-HOLDING	STATE WITH-HOLDING	LIST OTHER	GROSS PAY FOR THIS PREVAILING RATE JOB	CHECK # AND NET PAY
				HOURS WORKED EACH DAY																
												$ Base Rate	1. $							
													2. $							
													3. $							
												$ Cash Fringe	4. $							
													5. $							
													6. $							
												$ Base Rate	1. $							
													2. $							
													3. $							
												$ Cash Fringe	4. $							
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													6. $							
												$ Base Rate	1. $							
													2. $							
													3. $							
												$ Cash Fringe	4. $							
													5. $							
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												$ Base Rate	1. $							
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												$ Cash Fringe	4. $							
													5. $							
													6. $							
												$ Base Rate	1. $							
													2. $							
													3. $							
												$ Cash Fringe	4. $							
													5. $							
													6. $							

*IF REQUIRED

12/9/2013
WWS-CP2

NOTICE: THIS PAGE MUST BE ACCOMPANIED BY A COVER PAGE (FORM # WWS-CP1)

OCCUPATIONAL CLASSIFICATION BULLETIN

The Connecticut Department of Labor has the responsibility to properly determine "job classification" on prevailing wage projects covered under C.G.S. Section 31-53.

Note: This information is intended to provide a sample of some occupational classifications for guidance purposes only. It is not an all-inclusive list of each occupation's duties. This list is being provided only to highlight some areas where a contractor may be unclear regarding the proper classification.

Below are additional clarifications of specific job duties performed for certain classifications:

- **ASBESTOS WORKERS**
  - Applies all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems.
- **ASBESTOS INSULATOR**
  - Handle, install apply, fabricate, distribute, prepare, alter, repair, dismantle, heat and frost insulation, including penetration and fire stopping work on all penetration fire stop systems.
- **BOILERMAKERS**
  - Erects hydro plants, incomplete vessels, steel stacks, storage tanks for water, fuel, etc. Builds incomplete boilers, repairs heat exchanges and steam generators.
- **BRICKLAYERS, CEMENT MASONS, CEMENT FINISHERS, MARBLE MASONS, PLASTERERS, STONE MASONS, PLASTERERS. STONE MASONS, TERRAZZO WORKERS, TILE SETTERS**
  - Lays building materials such as brick, structural tile and concrete cinder, glass, gypsum, terra cotta block. Cuts, tools and sets marble, sets stone, finishes concrete, applies decorative steel, aluminum and plastic tile, applies cements, sand, pigment and marble chips to floors, stairways, etc.
- **CARPENTERS, MILLWRIGHTS. PILEDRIVERMEN. LATHERS. RESILEINT FLOOR LAYERS, DOCK BUILDERS, DIKERS, DIVER TENDERS**
  - Constructs, erects, installs and repairs structures and fixtures of wood, plywood and wallboard. Installs, assembles, dismantles, moves industrial machinery. Drives piling into ground to provide foundations for structures such as buildings and bridges, retaining walls for earth embankments, such as cofferdams. Fastens wooden, metal or rockboard lath to walls, ceilings and partitions of buildings, acoustical tile layer, concrete form builder. Applies firestopping materials on fire resistive joint systems only. Installation of curtain/window walls only where attached to wood or metal studs. Installation

of insulated material of all types whether blown, nailed or attached in other ways to walls, ceilings and floors of buildings. Assembly and installation of modular furniture/furniture systems. Free-standing furniture is not covered. This includes free standing: student chairs, study top desks, book box desks, computer furniture, dictionary stand, atlas stand, wood shelving, two-position information access station, file cabinets, storage cabinets, tables, etc.

- **CLEANING LABORER**

  o The clean up of any construction debris and the general cleaning, including sweeping, wash down, mopping, wiping of the construction facility, washing, polishing, dusting, etc., prior to the issuance of a certificate of occupancy falls under the *Labor classification.*

- **DELIVERY PERSONNEL**

  o If delivery of supplies/building materials is to one common point and stockpiled there, prevailing wages are not required. If the delivery personnel are involved in the distribution of the material to multiple locations within the construction site then they would have to be paid prevailing wages for the type of work performed: laborer, equipment operator, electrician, ironworker, plumber, etc.

  o An example of this would be where delivery of drywall is made to a building and the delivery personnel distribute the drywall from one "stockpile" location to further sub-locations on each floor. Distribution of material around a construction site is the job of a laborer/tradesman and not a delivery personnel.

- **ELECTRICIANS**

  o Install, erect, maintenance, alteration or repair of any wire, cable, conduit, etc., which generates, transforms, transmits or uses electrical energy for light, heat, power or other purposes, including the Installation or maintenance of telecommunication, LAN wiring or computer equipment, and low voltage wiring. ***License required per Connecticut General Statutes: E-1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9.**

- **ELEVATOR CONSTRUCTORS**

  o Install, erect, maintenance and repair of all types of elevators, escalators, dumb waiters and moving walks. ***License required by Connecticut General Statutes: R-1,2,5,6.**

- **FORK LIFT OPERATOR**

  o Laborers Group 4) Mason Tenders - operates forklift solely to assist a mason to a maximum height of nine (9) feet only.

  o Power Equipment Operator Group 9 - operates forklift to assist any trade, and to assist a mason to a height over nine (9) feet.

- **GLAZIERS**

  o Glazing wood and metal sash, doors, partitions, and 2 story aluminum

storefronts. Installs glass windows, skylights, store fronts and display cases or surfaces such as building fronts, interior walls, ceilings and table tops and metal store fronts. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers which requires either a blended rate or equal composite workforce.

- **IRONWORKERS**

  o Erection, installation and placement of structural steel, precast concrete, miscellaneous iron, ornamental iron, metal curtain wall, rigging and reinforcing steel. Handling, sorting, and installation of reinforcing steel (rebar). Metal bridge rail (traffic), metal bridge handrail, and decorative security fence installation. Installation of aluminum window walls and curtain walls is the "joint" work of glaziers and ironworkers which requires either a blended rate or equal composite workforce. Insulated metal and insulated composite panels are still installed by the Ironworker.

- **INSULATOR**

  o Installing fire stopping systems/materials for "Penetration Firestop Systems": transit to cables, electrical conduits, insulated pipes, sprinkler pipe penetrations, ductwork behind radiation, electrical cable trays, fire rated pipe penetrations, natural polypropylene, HVAC ducts, plumbing bare metal, telephone and communication wires, and boiler room ceilings. Past practice using the applicable licensed trades, Plumber, Sheet Metal, Sprinkler Fitter, and Electrician, is not inconsistent with the Insulator classification and would be permitted.

- **LABORERS**

  o Acetylene burners, asphalt rakers, chain saw operators, concrete and power buggy operator, concrete saw operator, fence and guard rail erector (except metal bridge rail (traffic), metal bridge handrail, and decorative security fence installation.), hand operated concrete vibrator operator, mason tenders, pipelayers (installation of storm drainage or sewage lines on the street only), pneumatic drill operator, pneumatic gas and electric drill operator, powermen and wagon drill operator, air track operator, block paver, curb setters, blasters, concrete spreaders.

- **PAINTERS**

  o Maintenance, preparation, cleaning, blasting (water and sand, etc.), painting or application of any protective coatings of every description on all bridges and appurtenances of highways, roadways, and railroads. Painting, decorating, hardwood finishing, paper hanging, sign writing, scenic art work and drywall hanging+ for any and all types of building and residential work.

- **LEAD PAINT REMOVAL**

  o Painter’s Rate

1. Removal of lead paint from bridges.
2. Removal of lead paint as preparation of any surface to be repainted.
3. Where removal is on a Demolition project prior to reconstruction.

- Laborer's Rate
  1. Removal of lead paint from any surface NOT to be repainted.
  2. Where removal is on a *TOTAL* Demolition project only.

- **PLUMBERS AND PIPEFITTERS**
  - Installation, repair, replacement, alteration or maintenance of all plumbing, heating, cooling and piping. ***License required per Connecticut General Statutes: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2 S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4.***
- **POWER EQUIPMENT OPERATORS**
  - ates several types of power construction equipment such as compressors, pumps, hoists, derricks, cranes, shovels, tractors, scrapers or motor graders, etc. Repairs and maintains equipment. ***License required, crane operators only, per Connecticut General Statutes.**
- **ROOFERS**
  - Covers roofs with composition shingles or sheets, wood shingles, slate or asphalt and gravel to waterproof roofs, including preparation of surface. (tear-off and/or removal of any type of roofing and/or clean-up of any and all areas where a roof is to be relaid)
- **SHEETMETAL WORKERS**
  - Fabricate, assembles, installs and repairs sheetmetal products and equipment in such areas as ventilation, air-conditioning, warm air heating, restaurant equipment, architectural sheet metal work, sheetmetal roofing, and aluminum gutters. Fabrication, handling, assembling, erecting, altering, repairing, etc. of coated metal material panels and composite metal material panels when used on building exteriors and interiors as soffits, facia, louvers, partitions, wall panel siding, canopies, cornice, column covers, awnings, beam covers, cladding, sun shades, lighting troughs, spires, ornamental roofing, metal ceilings, mansards, copings, ornamental and ventilation hoods, vertical and horizontal siding panels, trim, etc. The sheet metal classification also applies to the vast variety of coated metal material panels and composite metal material panels that have evolved over the years as an alternative to conventional ferrous and non-ferrous metals like steel, iron, tin, copper, brass, bronze, aluminum, etc. Insulated metal and insulated composite panels are still installed by the Iron Worker. Fabrication, handling, assembling, erecting, altering, repairing, etc. of architectural metal roof, standing seam roof, composite metal roof, metal and composite bathroom/toilet partitions, aluminum gutters, metal

and composite lockers and shelving, kitchen equipment, and walk-in coolers.

- **SPRINKLER FITTERS**

  - Installation, alteration, maintenance and repair of fire protection sprinkler systems. ***License required per Connecticut General Statutes: F-1,2,3,4.**

- **TILE MARBLE AND TERRAZZO FINISHERS**

  - Assists and tends the tile setter, marble mason and terrazzo worker in the performance of their duties.

- **TRUCK DRIVERS**

  - **Definitions:**

    - 1) "Site of the work" (29 Code of Federal Regulations (CFR) 5.2(l)(b) is the physical place or places where the building or work called for in the contract will remain and any other site where a significant portion of the building or work is constructed, provided that such site is established specifically for the performance of the contact or project;

      - (a) Except as provided in paragraph (l) (3) of this section, job headquarters, tool yards, batch plants, borrow pits, etc. are part of the "site of the work"; provided they are dedicated exclusively, or nearly so, to the performance of the contract or project, and provided they are adjacent to "the site of work" as defined in paragraph (e)(1) of this section;

      - (b) Not included in the "site of the work" are permanent home offices, branch plant establishments, fabrication plants, tool yards etc, of a contractor or subcontractor whose location and continuance in operation are determined wholly without regard to a particular State or political subdivision contract or uncertain and indefinite periods of time involved of a few seconds or minutes duration and where the failure to count such time is due to consideration justified by industrial realities (29 CFR 785.47)

    - 2) "Engaged to wait" is waiting time that belongs to and is controlled by the employer which is an integral part of the job and is therefore compensable as hours worked. (29 CFR 785.15)

    - 3) "Waiting to be engaged" is waiting time that an employee can use effectively for their own purpose and is not compensable as hours worked. (29 CFR 785.16)

    - 4) "De Minimus" is a rule that recognizes that unsubstantial or insignificant periods of time which cannot as a practical administrative matter be precisely recorded for payroll purposes, may be disregarded. This rule applies only where there are uncertain and indefinite periods of time involved of a short duration and where the failure to count such

time is due to consideration justified by worksite realities. For example, with respect to truck drivers on prevailing wage sites, this is typically less than 15 minutes at a time.

- **Coverage of Truck Drivers on State or Political subdivision Prevailing Wage Projects**
  - Truck drivers **are covered** for payroll purposes under the following conditions:
    - Truck Drivers for time spent working on the site of the work.
    - Truck Drivers for time spent loading and/or unloading materials and supplies on the site of the work, if such time is not de minimus
    - Truck drivers transporting materials or supplies between a facility that is deemed part of the site of the work and the actual construction site.
    - Truck drivers transporting portions of the building or work between a site established specifically for the performance of the contract or project where a significant portion of such building or work is constructed and the physical places where the building or work outlined in the contract will remain.

  For example: Truck drivers delivering asphalt are covered under prevailing wage while" engaged to wait" on the site and when directly involved in the paving operation, provided the total time is not "de minimus"

  - Truck Drivers **are not** covered in the following instances:
    - Material delivery truck drivers while off "the site of the work"
    - Truck Drivers traveling between a prevailing wage job and a commercial supply facility while they are off the "site of the work"
    - Truck drivers whose time spent on the "site of the work" is de minimus, such as under 15 minutes at a time, merely to drop off materials or supplies, including asphalt.

These guidelines are similar to U.S. Labor Department policies. The application of these guidelines may be subject to review based on factual considerations on a case by case basis.

For example:

- Material men and deliverymen are not covered under

prevailing wage as long as they are not directly involved in the construction process. If, they unload the material, they would then be covered by prevailing wage for the classification they are performing work in: laborer, equipment operator, etc.

- Hauling material off site is not covered provided they are not dumping it at a location outlined above.
- Driving a truck on site and moving equipment or materials on site would be considered covered work, as this is part of the construction process.

Any questions regarding the proper classification should be directed to:

Public Contract Compliance Unit
Wage and Workplace Standards Division
Connecticut Department of Labor
200 Folly Brook Blvd, Wethersfield, CT 06109
(860) 263-6543

Rev. 07/13

Connecticut Department of Labor
Wage and Workplace Standards Division
FOOTNOTES

Please Note: If the "Benefits" listed on the schedule for the following occupations includes a letter(s) (+ a or + a+b for instance), refer to the information below.

- Benefits to be paid at the appropriate prevailing wage rate for the listed occupation.
- If the "Benefits" section for the occupation lists only a dollar amount, disregard the information below.

Bricklayers, Cement Masons, Cement Finishers, Concrete Finishers, Stone Masons
(Building Construction) and (Residential- Hartford, Middlesex, New Haven, New London and Tolland Counties)

a. Paid Holiday: Employees shall receive 4 hours for Christmas Eve holiday provided the employee works the regularly scheduled day before and after the holiday. Employers may schedule work on Christmas Eve and employees shall receive pay for actual hours worked in addition to holiday pay.

Elevator Constructors: Mechanics

a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day, plus the Friday after Thanksgiving.

b. Vacation: Employer contributes 8% of basic hourly rate for 5 years or more of service or 6% of basic hourly rate for 6 months to 5 years of service as vacation pay credit.

Glaziers

a. Paid Holidays: Labor Day and Christmas Day.

Power Equipment Operators
(Heavy and Highway Construction & Building Construction)

a. Paid Holidays: New Year's Day, Good Friday, Memorial day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day, provided the employee works 3 days during the week in which the holiday falls, if scheduled, and if scheduled, the working day before and the working day after the holiday. Holidays falling on Saturday may be observed on Saturday, or if the employer so elects, on the preceding Friday.

Ironworkers

a. Paid Holiday: Labor Day provided employee has been on the payroll for the 5 consecutive work days prior to Labor Day.

Laborers (Tunnel Construction)

a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. No employee shall be eligible for holiday pay when he fails, without cause, to work the regular work day preceding the holiday or the regular work day following the holiday.

Roofers

a. Paid Holidays: July 4th, Labor Day, and Christmas Day provided the employee is employed 15 days prior to the holiday.

Sprinkler Fitters

a. Paid Holidays: Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day, provided the employee has been in the employment of a contractor 20 working days prior to any such paid holiday.

Truck Drivers

(Heavy and Highway Construction & Building Construction)

a. Paid Holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas day, and Good Friday, provided the employee has at least 31 calendar days of service and works the last scheduled day before and the first scheduled day after the holiday, unless excused.

Minimum Rates and Classifications for Building Construction

ID# : B 20924

Connecticut Department of Labor
Wage and Workplace Standards Division

By virtue of the authority vested in the Labor Commissioner under provisions of Section 31-53 of the General Statutes of Connecticut, as amended, the following are declared to be the prevailing rates and welfare payments and will apply only where the contract is advertised for bid within 20 days of the date on which the rates are established. Any contractor or subcontractor not obligated by agreement to pay to the welfare and pension fund shall pay this amount to each employee as part of his/her hourly wages.

Project Number: 901807 Project Town: Mansfield

State#: FAP#:

Project: Main Accumulation Areas For Regulated Wastes For Uconn

CLASSIFICATION	Hourly Rate	Benefits
1a) Asbestos Worker/Insulator (Includes application of insulating materials, protective coverings, coatings, & finishes to all types of mechanical systems; application of firestopping material for wall openings & penetrations in walls, floors, ceilings	35.75	28.82
1b) Asbestos/Toxic Waste Removal Laborers: Asbestos removal and encapsulation (except its removal from mechanical systems which are not to be scrapped), toxic waste removers, blasters.**See Laborers Group 7**		
1c) Asbestos Worker/Heat and Frost Insulator	37.15	27.56

As of: **Friday, July 10, 2015**

2) Boilermaker	35.24	25.01
3a) Bricklayer, Cement Mason, Concrete Finisher (including caulking), Stone Masons	32.50	28.74 + a
3b) Tile Setter	33.75	24.21
3c) Terrazzo Mechanics and Marble Setters	31.69	22.35
3d) Tile, Marble & Terrazzo Finishers	26.26	20.69
3e) Plasterer	32.50	29.45

As of: **Friday, July 10, 2015**

Project: Main Accumulation Areas For Regulated Wastes For Uconn

------LABORERS------

4) Group 1: Laborers (common or general), acetylene burners, carpenter tenders, concrete specialists, wrecking laborers, fire watchers.	27.85	18.30
4a) Group 2: Mortar mixers, plaster tender, power buggy operators, powdermen, fireproofer/mixer/nozzleman (Person running mixer and spraying fireproof only).	28.10	18.30
4b) Group 3: Jackhammer operators/pavement breaker, mason tender (brick), mason tender (cement/concrete), forklift operators and forklift operators (masonry).	28.35	18.30
4c) **Group 4: Pipelayers (Installation of water, storm drainage or sewage lines outside of the building line with P6, P7 license) (the pipelayer rate shall apply only to one or two employees of the total crew who primary task is to actually perform the mating of pipe sections) P6 and P7 rate is $26.80.	28.85	18.30
4d) Group 5: Air track operator, sand blaster and hydraulic drills.	28.60	18.30

As of: **Friday, July 10, 2015**

4e) Group 6: Blasters, nuclear and toxic waste removal.	30.85	18.30
4f) Group 7: Asbestos/lead removal and encapsulation (except it's removal from mechanical systems which are not to be scrapped).	28.85	18.30
4g) Group 8: Bottom men on open air caisson, cylindrical work and boring crew.	28.38	18.30
4h) Group 9: Top men on open air caisson, cylindrical work and boring crew.	27.86	18.30
4i) Group 10: Traffic Control Signalman	16.00	18.30
5) Carpenter, Acoustical Ceiling Installation, Soft Floor/Carpet Laying, Metal Stud Installation, Form Work and Scaffold Building, Drywall Hanging, Modular-Furniture Systems Installers, Lathers, Piledrivers, Resilient Floor Layers.	31.45	23.54

5a) Millwrights	31.84	23.99
6) Electrical Worker (including low voltage wiring) (Trade License required: E1,2 L-5,6 C-5,6 T-1,2 L-1,2 V-1,2,7,8,9)	38.20	24.15 + 3% of gross wage
7a) Elevator Mechanic (Trade License required: R-1,2,5,6)	47.96	28.385+a+b
-----LINE CONSTRUCTION----		
Groundman	24.37	6.5%+10.04
Linemen/Cable Splicer	44.30	6.5%+17.70

As of: **Friday, July 10, 2015**

8) Glazier (Trade License required: FG-1,2)	34.58	18.55 + a
9) Ironworker, Ornamental, Reinforcing, Structural, and Precast Concrete Erection	34.47	31.09 + a
----OPERATORS----		
Group 1: Crane handling or erecting structural steel or stone, hoisting engineer 2 drums or over, front end loader (7 cubic yards or over); work boat 26 ft. and over. (Trade License Required)	37.55	23.05 + a
Group 2: Cranes (100 ton rate capacity and over); Excavator over 2 cubic yards; Piledriver ($3.00 premium when operator controls hammer); Bauer Drill/Caisson. (Trade License Required)	37.23	23.05 + a
Group 3: Excavator; Backhoe/Excavator under 2 cubic yards; Cranes (under 100 ton rated capacity), Grader/Blade; Master Mechanic; Hoisting Engineer (all types of equipment where a drum and cable are used to hoist or drag material regardless of motive power of operation), Rubber Tire Excavator (Drott-1085 or similar);Grader Operator; Bulldozer Fine Grade. (slopes, shaping, laser or GPS, etc.). (Trade License Required)	36.49	23.05 + a

Group 4: Trenching Machines; Lighter Derrick; Concrete Finishing Machine; CMI Machine or Similar; Koehring Loader (Skooper).	36.10	23.05 + a
Group 5: Specialty Railroad Equipment; Asphalt Paver; Asphalt Reclaiming Machine; Line Grinder; Concrete Pumps; Drills with Self Contained Power Units; Boring Machine; Post Hole Digger; Auger; Pounder; Well Digger; Milling Machine (over 24" Mandrell)	35.51	23.05 + a
Group 5 continued: Side Boom; Combination Hoe and Loader; Directional Driller; Pile Testing Machine.	35.51	23.05 + a
Group 6: Front End Loader (3 up to 7 cubic yards); Bulldozer (rough grade dozer).	35.20	23.05 + a
Group 7: Asphalt roller, concrete saws and cutters (ride on types), vermeer concrete cutter, Stump Grinder; Scraper; Snooper; Skidder; Milling Machine (24" and under Mandrell).	34.86	23.05 + a
Group 8: Mechanic, grease truck operator, hydroblaster; barrier mover; power stone spreader; welding; work boat under 26 ft.; transfer machine.	34.46	23.05 + a

As of: **Friday, July 10, 2015**

Group 9: Front end loader (under 3 cubic yards), skid steer loader regardless of attachments, (Bobcat or Similar): forklift, power chipper; landscape equipment (including Hydroseeder).	34.03	23.05 + a
Group 10: Vibratory hammer; ice machine; diesel and air, hammer, etc.	31.99	23.05 + a
Group 11: Conveyor, earth roller, power pavement breaker (whiphammer), robot demolition equipment.	31.99	23.05 + a
Group 12: Wellpoint operator.	31.93	23.05 + a
Group 13: Compressor battery operator.	31.35	23.05 + a
Group 14: Elevator operator; tow motor operator (solid tire no rough terrain).	30.21	23.05 + a

Group 15: Generator Operator; Compressor Operator; Pump Operator; Welding Machine Operator; Heater Operator.	29.80	23.05 + a
Group 16: Maintenance Engineer/Oiler.	29.15	23.05 + a
Group 17: Portable asphalt plant operator; portable crusher plant operator; portable concrete plant operator.	33.46	23.05 + a
Group 18: Power safety boat; vacuum truck; zim mixer; sweeper; (Minimum for any job requiring a CDL license).	31.04	23.05 + a
------PAINTERS (Including Drywall Finishing)------		
10a) Brush and Roller	31.02	18.55

10b) Taping Only/Drywall Finishing	31.77	18.55
10c) Paperhanger and Red Label	31.52	18.55
10e) Blast and Spray	34.02	18.55
11) Plumber (excluding HVAC pipe installation) (Trade License required: P-1,2,6,7,8,9 J-1,2,3,4 SP-1,2)	40.62	28.91
12) Well Digger, Pile Testing Machine	33.01	19.40 + a
13) Roofer (composition)	33.25	18.05

14) Roofer (slate & tile)	33.75	18.05
15) Sheetmetal Worker (Trade License required for HVAC and Ductwork: SM-1,SM-2,SM-3,SM-4,SM-5,SM-6)	35.74	33.22
16) Pipefitter (Including HVAC work) (Trade License required: S-1,2,3,4,5,6,7,8 B-1,2,3,4 D-1,2,3,4, G-1, G-2, G-8 & G-9)	40.62	28.91
------TRUCK DRIVERS------		
17a) 2 Axle	28.58	20.24 + a
17b) 3 Axle, 2 Axle Ready Mix	28.68	20.24 + a

17c) 3 Axle Ready Mix	28.73	20.24 + a
17d) 4 Axle, Heavy Duty Trailer up to 40 tons	28.78	20.24 + a
17e) 4 Axle Ready Mix	28.83	20.24 + a
17f) Heavy Duty Trailer (40 Tons and Over)	29.03	20.24 + a
17g) Specialized Earth Moving Equipment (Other Than Conventional Type on-the-Road Trucks and Semi-Trailers, Including Euclids)	28.83	20.24 + a
18) Sprinkler Fitter (Trade License required: F-1,2,3,4)	41.37	20.37 + a

19) Theatrical Stage Journeyman	25.76	7.34

Project: Main Accumulation Areas For Regulated Wastes For Uconn

Welders: Rate for craft to which welding is incidental.

**Note: Hazardous waste removal work receives additional $1.25 per hour for truck drivers.*

***Note: Hazardous waste premium $3.00 per hour over classified rate*

ALL Cranes: When crane operator is operating equipment that requires a fully licensed crane operator to operate he receives an extra $2.00 premium in addition to the hourly wage rate and benefit contributions:

1) Crane handling or erecting structural steel or stone; hoisting engineer (2 drums or over)

2) Cranes (100 ton rate capacity and over) Bauer Drill/Caisson

3) Cranes (under 100 ton rated capacity)

Crane with 150 ft. boom (including jib) - $1.50 extra
Crane with 200 ft. boom (including jib) - $2.50 extra
Crane with 250 ft. boom (including jib) - $5.00 extra
Crane with 300 ft. boom (including jib) - $7.00 extra
Crane with 400 ft. boom (including jib) - $10.00 extra

All classifications that indicate a percentage of the fringe benefits must be calculated at the percentage rate times the "base hourly rate".

Apprentices duly registered under the Commissioner of Labor's regulations on "Work Training Standards for Apprenticeship and Training Programs" Section 31-51-d-1 to 12, are allowed to be paid the appropriate percentage of the prevailing journeymen hourly base and the full fringe benefit rate, providing the work site ratio shall not be less than one full-time journeyperson instructing and supervising the work of each apprentice in a specific trade.

The Prevailing wage rates applicable to this project are subject to annual adjustments each July 1st for the duration of the project.

Each contractor shall pay the annual adjusted prevailing wage rate that is in effect each July 1st, as posted by the Department of Labor.

It is the contractor's responsibility to obtain the annual adjusted prevailing wage rate increases directly from the Department of Labor's website.

The annual adjustments will be posted on the Department of Labor's Web page: www.ct.gov/dol. For those without internet access, please contact the division listed below.

The Department of Labor will continue to issue the initial prevailing wage rate schedule to the Contracting Agency for the project.

All subsequent annual adjustments will be posted on our Web Site for contractor access.

Contracting Agencies are under no obligation pursuant to State labor law to pay any increase due to the annual adjustment provision.

***As of:* Friday, July 10, 2015**

Project: Main Accumulation Areas For Regulated Wastes For Uconn

Effective October 1, 2005 - Public Act 05-50: any person performing the work of any mechanic, laborer, or worker shall be paid prevailing wage

All Person who perform work ON SITE must be paid prevailing wage for the appropriate mechanic, laborer, or worker classification.

All certified payrolls must list the hours worked and wages paid to All Persons who perform work ON SITE regardless of their ownership i.e.: (Owners, Corporate Officers, LLC Members, Independent Contractors, et. al)

Reporting and payment of wages is required regardless of any contractual relationship alleged to exist between the contractor and such person.

~~Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR 5.5 (a) (1) (ii)).

Please direct any questions which you may have pertaining to classification of work and payment of prevailing wages to the Wage and Workplace Standards Division, telephone (860)263-6790.

As of: **Friday, July 10, 2015**

AIA® Document A101™ – 2007

Standard Form of Agreement Between Owner and Contractor *where the basis of payment is a Stipulated Sum*

The following document is the AIA 101 – Standard Form of Agreement Between Owner and Contractor as modified by the University of Connecticut.
Modification Date: May 28, 2014

AGREEMENT made as of the day of in the year
(In words, indicate day, month and year)

BETWEEN the Owner:
(Name, address and other information)

and the Contractor:
(Name, address and other information)

for the following Project:
(Name, location and description)

The Architect:
(Name, address and other information)

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

AIA Document A201™–2007, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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AIA Document A101™ – 2007. Copyright © 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1967, 1974, 1977, 1987, 1991, 1997 and 2007 by The American Institute of Architects. **All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This document was produced by AIA software at 12:04:47 on 06/02/2014 under Order No.7819085441_1 which expires on 05/23/2015, and is not for resale.
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(1098007144)

TABLE OF ARTICLES

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2 THE WORK OF THIS CONTRACT

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8 MISCELLANEOUS PROVISIONS

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ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, as amended, the AIA A201-2007 General Conditions, as amended, Drawings, Specifications, Bid Clarifications and Addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others. The Contractor shall furnish and install all materials, labor and equipment required to provide ******* as set forth in the Contract Documents enumerated in Article 9.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.
(Paragraphs deleted)
Date of Commencement shall be fixed in the Notice to Proceed.

§ 3.2 The Contract Time shall be measured from the date of commencement.

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than ( ) days from the date of commencement, or as follows:
(Paragraph deleted)

(Row deleted)

, subject to adjustments of this Contract Time as provided in the Contract Documents.

(Paragraph deleted)
Liquidated Damages of _____ and 00/100 Dollars ($_____) per calendar day shall be assessed as provided in Paragraph 9.11 of the AIA A201-2007 General Conditions, as amended.

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User Notes: (1098007144)

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents, and are hereby accepted by the Owner. The Contract Sum is the amount set forth in Section 4.1 and includes the amounts for the following alternates, if any, accepted by the Owner.

Alternate prices which reflect the work of the bid package under which this bid proposal was submitted shall remain valid for the life of the project , unless otherwise noted in the Contract Documents and include all costs for a complete installation. All pricing is inclusive of all costs of wages, applicable taxes, benefits, applicable insurance, overhead and profit. Alternate prices are good for both adds and deducts.

§ 4.3 Unit prices, if any are as follows:
All rates are inclusive of all costs of wages, applicable taxes, benefits, applicable insurance, overhead and profit. The rates provided will be negotiated and included as part of a subcontract. The Unit Prices herein shall remain valid for the life of the project and include all costs for a complete installation. Unit prices are good for both adds and deducts.

Item	Units and Limitations	Price Per Unit ($ 0.00)

§ 4.4 Allowances included in the Contract Sum, if any:
(Identify allowance and state exclusions, if any, from the allowance price.)

Item	Price

ARTICLE 5 PAYMENTS

§ 5.1 PROGRESS PAYMENTS

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month.

§ 5.1.3 The Owner shall make payments to the Contractor on each Application of Payment within 45 days of the Owner Representative's receipt of a properly submitted, correct and accepted Application, in accordance with the provisions of the AIA A201-2007 General Conditions, Article 9, as amended. The "Owner Representative" shall be as defined in AIA A201-2007 Paragraph 2.1.1.1.

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

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§ **5.1.6** Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

.1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of Ten Percent (10%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™–2007, General Conditions of the Contract for Construction;

.2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of Ten Percent (10%);

.3 In addition, if the State Commission on Human Rights and Opportunities ("CHRO") authorizes the award or execution of this contract in advance of CHRO's approval of the Affirmative Action Plan required to be submitted by the Contractor pursuant to Connecticut General Statutes Section 46a-68d, the Owner will withhold an additional two percent (2%) of the total contract price per month from any payment made to such Contractor, until such time as the Contractor has received approval from CHRO of the Affirmative Action Plan. Moreover, if CHRO determines through its complaint procedure and the hearing process provided in Connecticut General Statutes Section 46a-56(c) that a contractor or subcontractor is not complying with anti-discrimination statutes or contract provisions required under Connecticut General Statutes Section 4a-60 or 4a-60(a) or the provisions of Connecticut General Statutes Section 46a-68c to 46a-68f, inclusive, and if so ordered by the presiding officer after such hearing and upon a finding of noncompliance, the University shall retain two percent (2%) of the total contract price per month on the contract with the Contractor.

.4 Subtract the aggregate of previous payments made by the Owner; and

.5 Subtract amounts, if any, for which the Owner Representative has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2007.

§ **5.1.7** The progress payment amount determined in accordance with Section 5.1.6 shall be further modified under the following circumstances:

.1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Owner Representative shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and
(Section 9.8.5 of AIA Document A201–2007 requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.)

.2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of AIA Document A201–2007.

§ **5.1.8** Reduction or limitation of retainage, if any, shall be as follows:
(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Sections 5.1.6.1 and 5.1.6.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

N/A

§ **5.1.9** Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 FINAL PAYMENT

§ **5.2.1** Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 12.2.2 of AIA Document A201–2007, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

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§ **5.2.2** The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, subject to the provisions of the AIA A201-2007 General Conditions, Article 9, as amended.

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 INITIAL DECISION MAKER

The University Master Planner and Chief Architect for Planning Architectural & Engineering Services for the Owner and in the case of a project for the UCONN Health ("UCH"), its Associate Vice President for Facilities Development & Operations will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A201–2007, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(Paragraphs deleted)

§ 6.2 BINDING DISPUTE RESOLUTION

(Paragraphs deleted)
NOT USED.

ARTICLE 7 TERMINATION OR SUSPENSION

§ **7.1** The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2007.

§ **7.2** The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ **8.1** Where reference is made in this Agreement to a provision of AIA Document A201–2007 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ **8.2**
(Paragraphs deleted)
NOT USED.

§ **8.3**
(Paragraphs deleted)
NOT USED.

§ **8.4**
(Paragraphs deleted)
NOT USED.

(Paragraph deleted)
§ **8.5**The Contractor's representative shall not be changed without ten days written notice to the Owner.

§ **8.6** Other provisions:
The Contractor is hereby specifically cautioned that unless specifically authorized, in writing, by the University's Interim Executive Vice President for Administration and Chief Financial Officer, or in the case of UCH its Chief Administrative Officer, on a case by case basis, the Contractor shall have no right to use, and shall not use, in any manner, the name of the University of Connecticut, its officials or employees, or the Seal of the University:
(a) in any advertising, publicity, promotion, nor;
(b) to express or to imply any endorsement of Contractor's work product or services.

§8.7 ETHICS AND COMPLIANCE

In accordance with the University's compliance program, the University has in place an anonymous ethics and compliance reporting hotline service – 1-888-685-2637. Any person who is aware of unethical practices, fraud, violation of state laws or regulations or other concerns relating to University policies and procedures can report such matters anonymously. Such persons may also directly contact the University's compliance office at: Office of Audit, Compliance, and Ethics, 9 Walters Avenue, Unit 5084, Storrs, CT 06269-5084; Phone 860-486-4526; Fax 860-486-4527. As a provider of goods and/or services to the University, you are hereby required to notify your

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employees, as well as any subcontractors, who are involved in the implementation of this contract, of this reporting mechanism.

§ 8.8 JOINT VENTURE

§ 8.8.1 If the Contractor is a joint venture, each joint venture partner shall be jointly, severally and individually responsible to the Owner for the performance of any and all obligations of the Contractor encompassed by this contract or as required by applicable law, and each joint venture partner shall be jointly, severally and individually liable to the Owner for any failures to perform such obligations in accordance with the contract or applicable law. In its dealings with the Owner, each joint venture partner shall have full authority to act in behalf of and bind the joint venture and any other joint venture partner. Each joint venture partner shall be considered to be the agent of the joint venture and of any other joint venture partner.

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A101–2007, Standard Form of Agreement Between Owner and Contractor.

§ 9.1.2 The General Conditions are AIA Document A201–2007, General Conditions of the Contract for Construction, as amended and attached hereto.

§ 9.1.3 NOT USED.

(Table deleted)

§ 9.1.4 The Specifications are those contained in the Project Manual dated _____ and are as follows:

Table of Contents – Exhibit A

(Table deleted)

§ 9.1.5 The Drawings are dated _____ and are as follows:

List of Drawings – Exhibit B

(Table deleted)

§ 9.1.6 The Bid Clarifications or Addenda, Exhibit C, if any, are as follows:

Number	Date	Pages

Portions of Bid Clarifications or Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 9.

§ 9.1.7 Additional documents, if any, forming part of the Contract Documents are as follows:

The Invitation to Bid dated _____
Notice and Instructions to Bidders
Contractor's Proposal Form dated _____
(Paragraph deleted)
Contractor's Schedule of Labor Rates approved by the Owner attached as Exhibit D
Contractor's Critical Path Method ("CPM") Schedule approved by the Owner attached as Exhibit E
Project Manual dated _____
Owner's Contractor Environmental, Health & Safety Manual
Payment and Performance Bonds (attached hereto)

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201–2007.

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This Agreement is entered into as of the day and year first written above and is executed in at least three originals, of which one is to be delivered to the Contractor, one to the Architect for use in the administration of the Contract, and the remainder to the Owner.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
Interim Executive VP for Administration & CFO	
Duly Authorized: CGS §§ 10a-109d; 10a-109n	
(Printed name and title)	*(Printed name and title)*
Date:_____	Date:_____

(Paragraphs deleted)

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AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

The following document is the AIA A201 – General Conditions of the Contract for Construction as modified by the University of Connecticut and is for any project which is included within the University of Connecticut On-Call Trade Contractor Program.

Modification Date: July 30, 2014
for the following PROJECT:
(Name and location or address)

THE OWNER:
(Name and address)

THE CONTRACTOR:
(Name and address)

THE ARCHITECT:
(Name and address)

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents for each individual project consist of the Contract for On-Call Trade Contractor Services for _____ executed by the Owner on _____; the AIAA101-207 Agreement, as amended, this AIA A201-2007 Conditions of the Contract (General Conditions, as amended), Drawings, Specifications, Bid Clarifications and/or Addenda as issued for that individual project, the Project Manual, including the Invitation to bid, Notice and Instructions to Bidders, Contractor's Form of Proposal, as accepted by the University, all Exhibits within the Proposal, State of Connecticut Department of Labor prevailing Wage Rates, Labor Rates, and Insurance Certificates, Performance and Payment Bonds, as issued for that individual project, other documents listed in this Contract and Modifications issued after execution of this Contract, all of which form the Contract, and are as fully a part of the Contract as if attached to this Contract or repeated herein. An enumeration of the Contract Documents, other than a Modification, appears in Article 9 of the AIA A101-2007. The provisions of the AIA A101, as amended, and of the AIA A201, as amended, apply to each individual project, except to the extent specifically modified in the Contract Documents for the individual project. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. In the event of any conflict between provisions of the Contract for On-Call Trade Contractor Services for _____ and the AIA A101 Agreement, the AIA A201 General Conditions, as modified by the Owner and Division One of the Specifications, issued for the individual project, on the one hand, and provisions of the technical specifications and plans prepared by the Architect, on the other hand, the provisions of the former group of documents shall take precedence.

§ 1.1.1.1 Whenever the words, "directed", "required", "ordered", "designated", prescribed", or words of like import are used, it shall be understood that the direction", "requirement", "order", "designation", or "prescription" of the Owner Representative is intended and similarly the words "approved", "acceptable", satisfactory", or words of like import shall mean, "approved by", or "acceptable to", or "satisfactory to" the Owner Representative unless otherwise expressly state. The "Owner Representative" shall be as defined in the AIA A201-2007 Section 2.1.1.1.

§ 1.1.1.2 Where "as shown", "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the Contract Documents accompanying this Contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place" that is, "furnished and installed".

§ 1.1.1.3 All personal pronouns used in this Contract, whether used in the masculine, feminine, or neuter gender, shall include all other genders; and the singular shall include the plural and vise versa. Title of Articles and Sections are for convenience only, and neither limit or amplify the provisions of this Contract in itself. The use herein of the word "including", when following any general statement, term, or matter, shall not be construed to limit such statement, term, or matter to the specific items or matters set forth immediately following such word or to similar items or matters, whether or not non-limiting language (such words as "without limitation", or "but not limited to", or words of similar import) is used with reference thereto, but rather shall be deemed to refer to all other items or matters that could reasonably fall within the broadest possible scope of such general statement, term or matter.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project,

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whether on or off the site of the Project, and including all labor, materials, equipment and services provided or to be provided by subcontractors, sub-subcontractors, material suppliers or any other entity for whom the Contractor is responsible under or pursuant to the Contract Documents.

§ 1.1.4 THE PROJECT
The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS
The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS
The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

(Paragraphs deleted)
§ 1.1.7 THE PROJECT MANUAL
The Project Manual is a volume assembled for the Work, which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

§ 1.1.8 INSTRUMENTS OF SERVICE
Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.9 INITIAL DECISION MAKER
The Initial Decision Maker is the person identified in the AIA A101-2007 Contract Section 6.1to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Contract under Section 14.2.2.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS
§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 In the event of inconsistencies within or between parts of the Contract Documents or between the Contract documents and applicable standards, codes, and ordinances, the Contractor shall: 1) provide the better quality or greater quantity of work, or 2) comply with the more stringent requirement; either or both in accordance with the Owner Representative's interpretation. The terms and conditions of this Section 1.2.1 however, shall not relieve the Contractor of any of the obligations set forth in Sections 3.2 and 3.7.

§ 1.2.1.1.1 Before ordering any materials or doing any Work, the Contractor and each Subcontractor shall verify measurements at the project site and shall be responsible for the correctness of such measurements. Any difference which may be found shall be submitted to the Architect for resolution before proceeding with the Work.

§ 1.2.1.1.2 If a minor change in the Work is found necessary due to actual field conditions, the Contractor shall submit detailed drawings of such departure for approval by the Architect before making the change.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

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§ 1.2.4 In performing its obligations under this contract, the Contractor shall comply with all applicable statutes, laws, ordinances, regulations, codes, rules or orders of, or issued by any governmental body having jurisdiction over the Work, location of the Work, or the Contract.

§ 1.2.5 If any item, material, product or equipment is found to be specified in more than one Division Section or Article of the Specifications, the Contractor shall be responsible for determining which subcontractor or supplier shall provide the item.

§ 1.2.5.1 When applied to materials and equipment, the words "furnish", "install", and "provide" shall mean the following:

The word "provide" shall mean to furnish, pay for, deliver, install, adjust, clean and otherwise make materials and equipment fit for their intended use, as specified in Section 3.5 of the General Conditions.

The word "furnish" shall mean to secure, pay for, deliver to site, unload, uncrate and store materials.

The word "install" shall mean to place in position, incorporate in the work, adjust, clean, make fit for use, and perform all services specified in General Conditions Section 3.5 except those included under the definition of the word "furnish" above.

The phrase "furnish and install" shall be equivalent to the word "provide".

§ 1.2.5.2 The phrase "match existing" shall mean the following:

Where Contract Documents call for exact matching, match existing work exactly in quality and appearance.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 EXECUTION OF CONTRACT

Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

(Paragraphs deleted)

§ 1.6 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.6.1 For the purposes of this Contract only, the Drawings, Specifications and other documents, including those in electronic form, prepared by the Architect and the Architect's consultants are Instruments of Service through which the Work to be executed by the Contractor is described. The Contractor may retain one record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect or the Architect's consultants, and unless otherwise indicated the Architect and the Architect's consultants shall be deemed the authors. The Owner will retain all common law, statutory and other reserved rights, including copyrights unless the Contract between the Owner and Architect provides otherwise. All copies of Instruments of Service, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

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§ 1.6.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this authorization shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' rights.

§ 1.7 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Contract or the Contract Documents.

§ 1.8 PROVISIONS REQUIRED BY LAW DEEMED INSERTED

§ 1.8.1 Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Contract and is referred to throughout the Contract Documents as if singular in number. Except as otherwise provided in Section 4.2.1, the Architect does not have any authority to act on behalf of the Owner. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.1.1 A staff member of the Owner shall be designated as the "Owner Representative". All contact and communication with the Owner shall be through the Owner Representative, or his or her designee. The Owner, on certain projects, may also retain the services of an outside Construction Administrator, who may be authorized to exercise certain contractual powers of the Owner Representative and/or the Architect. Should this occur, the Contractor will be advised in writing, as appropriate, of the scope and nature of this Construction Administrator's role pursuant to these Contract Documents.

§ 2.1.2 NOT USED.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 NOT USED.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall exercise proper precautions relating to the safe performance of the Work. Contractor shall review all such information and notify the Owner of any inaccuracies within twenty (20) days of its receipt.

§ 2.2.3.1 Data concerning site, size, access to site, staging and storing, present obstructions on or near the site, conditions of existing adjacent structures, locations and depths of sewers, conduits or pipes, gas lines, position of sidewalks, curbs and pavements, and other data concerning site conditions, has been obtained from sources Owner believes reliable. Accuracy of such data, however, is not guaranteed and is furnished solely for accommodation of Contractor. Use of such data is made at Contractor's sole risk and expense.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control

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and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 The Contractor shall purchase such copies of Drawings and Project Manuals as are reasonably necessary for execution of the Work.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3. This right shall be in addition to and not in restriction or derogation of the Owner's rights under Article 14 hereof.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, after such seven (7) day period give the Contractor a second written notice to correct such deficiencies within a three (3) day period. If the Contractor within such three-day period after receipt of such second notice fails to commence and continue to correct any deficiencies, the Owner may, without prejudice to other remedies, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

§2.5 EXTENT OF OWNER RIGHTS

§2.5.1 The rights stated in Article 2 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner (1) granted in the Contract Documents, (2) at law or (3) in equity.

§2.5.2 In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences or procedures for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Contract and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative. The Contractor shall not replace the Contractor's representative without the prior written consent of the Owner.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.1.4 The Contractor represents and warrants the following to the Owner (in addition to the other representations and warranties contained in the Contract Documents) as an inducement to the Owner to execute the Contract Documents, which representations and warranties shall survived the execution and delivery of the Contract Documents and the final completion of the Work;

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(a) That it is financially solvent, able to pay its debts as they mature and possesses sufficient working capital to complete the Work and perform its obligations under the Contract Documents;
(b) That it, through its Subcontractors or otherwise, is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform its obligations hereunder and has sufficient experience and competence to do so;
(c) That it is authorized to do business in the State where the Project is located and properly licensed by all necessary governmental and public and quasi-public authorities having jurisdiction over it and over the Work and the site of the Project;
(d) That its execution of the Contract Documents and its performance thereof have been duly authorized by all necessary corporate action; and
(e) That its duly authorized representative has visited the site of the Work, familiarized himself with the local conditions under which the Work is to be performed and correlated his observations with the requirements of the Contract Documents.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor and all Subcontractor tiers have visited the site, become familiar with all existing conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 The Contractor and all Subcontractors shall visit the Project site and become acquainted with all existing conditions and conduct all tests, examinations or inspections including, but not necessarily limited to any subsurface investigations they deem necessary or as required by law, at their sole expense, to satisfy themselves as to existing conditions on the site, including sub-surface conditions. No such tests, examinations or inspections shall be conducted without the Owner's prior written approval and the Owner shall approve of any engineer or consultant engaged to perform such test, examination or inspection.

§ 3.2.3 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect and Owner Representative any errors, inconsistencies or omissions discovered or which should have been discovered by or made known to the Contractor as a request for information in such form as the Architect and Owner Representative may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents. After reporting to the Architect any error, inconsistency, or omission which the Contractor may discover in the Contract Documents, the Contractor is not to proceed with any work so affected without the Architect's written response and or clarifications and, if required, Owner approval of Contract adjustments.

§ 3.2.4 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect and Owner Representative any nonconformity discovered, or which should have been discovered, by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.5 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities unless the Contractor recognized, or should have recognized,

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such error, inconsistency, omission or difference and knowingly failed to report it to the Architect and Owner Representative immediately.

§ 3.2.6 No compensation will be allowed by reason of any difficulties which the Contractor could have discovered or reasonably anticipated, prior to execution of the Contract by visiting the project site and observing existing conditions and/or comparing these to the Contract Documents at the time of shop drawings and/or submittals.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. The Contractor shall schedule and perform the Work so as not to interfere with any other related work being performed by the Owner in or about the Project site. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for any damages, losses, costs and expenses resulting from the acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 The Contractor shall send its qualified representative to periodic progress meetings held at such time and at such place as Architect or the Owner shall designate in accordance with the Contract Documents.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.2.1 In connection with any requests for substitutions, the Contractor:

.1 represents that the Contractor and Subcontractor or any applicable tier have personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;

.2 represents that the Contractor and proposed manufacturer will provide the same or superior warranty coverage for the substitution that the Contractor would for that specified;

.3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent;

.4 shall coordinate the installation of the accepted substitution, making such changes as may be required for the Work to be complete in all respects;

.5 shall make requests for substitutions within fifteen (15) days after Contract award or at the preconstruction meeting; and

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.6 shall reimburse and compensate the Owner for any costs incurred in connection with, and/or the value of, any services performed by the Architect and/or the Owner Representative associated with addressing the request for substitution.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.3.1 The Contractor shall neither permit nor suffer the use of offensive language on or about the Work embraced in this Contract.

§ 3.4.3.2 The Contractor shall neither permit nor suffer lewd conduct on or about the Work embraced in this Contract.

§ 3.4.3.3 All of Owner's buildings are smoke-free buildings. Additionally, the Contractor shall not permit outdoor smoking, where it creates a hazard, nor the introduction or use of drugs, spirituous or intoxicating liquors, on or about the Owner's property.

§ 3.4.3.4 The Contractor shall be fully responsible to the Owner for the acts of his Subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts of persons directly employed by him.

§ 3.4.3.5 The Contractor shall familiarize himself and act in compliance with the current "President's Policy on Harassment" including its provisions prohibiting sexual harassment.

§ 3.4.3.6 The Contractor is hereby specifically cautioned that unless specifically authorized in writing by the Owner's Interim Executive Vice President for Administration and Chief Financial Officer or in the case of a University of Connecticut Health Center project, the Chief Administrative Officer, on a case by case basis, the Contractor shall have no right to use and shall not use, in any manner, the name of the Owner, its officials or employees, or the Seal of the Owner: (a) in any advertising, publicity, promotion; nor (b) to express or to imply any endorsement of Contractor's work product or services.

§ 3.4.4 Directions, specifications and recommendations by manufacturers for installation, handling, storing, adjustment, and operation of their materials or equipment shall be complied with, but the Contractor shall nonetheless have the responsibility of determining whether such directions, specifications, and recommendations may safely and suitably be employed in the Work, and of notifying the Architect in advance in writing of any deviation or modification necessary for installation safety or proper operation of the item.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Owner is a tax-exempt institution. The Contractor shall be familiar with the current regulations of the Department of Revenue Service. The tax on materials or supplies exempted by such regulations shall not be included as part of the Contract Sum, or any Application for Payment, or request for Change Order or other compensation. A Sales Tax Certificate is available from the Owner's Purchasing Department upon written request.

§ 3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper

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execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

(Paragraph deleted)
§ 3.7.4 If any governmental body having jurisdiction over the Work requires licenses or registrations for the performance of the Work, or any part thereof, the Contractor shall hold such valid licenses or registrations as may be required by law to prosecute the Work to completion. If any part of the Work for which such a license or registration is required to be performed by Subcontractors of any tier, the Contractor shall ensure that any such Subcontractor holds such valid licenses or registrations as may be required by law to prosecute said Work to completion.

§ 3.7.5 CONCEALED OR UNKNOWN CONDITIONS. See Section 15.1.8.
§ 3.7.6 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES
§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances, except when installation is specified as part of the allowance in Division 1 Specifications; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2, except when installation is specified as part of the allowance in the General Requirements (Division 1 of the Specifications).

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT AND PROJECT MANAGER
§ 3.9.1 The Contractor shall employ a competent full time superintendent(s) and necessary assistants who shall be in attendance at the Project site during performance of the Work for the duration of the entire Project. The superintendent shall be satisfactory to the Owner and the Contractor shall not replace the superintendent without the prior written consent of the Owner. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

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§ 3.9.2 If not already identified as part of the Owner's pre-qualification process, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner's Representative and Architect the name, qualifications and references of the proposed superintendent(s).

§ 3.9.3 The superintendent(s) shall be satisfactory to the Owner and the Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. If for any reason the superintendent(s) is unsatisfactory, upon request of Owner, other qualified representatives shall be substituted. The Contractor shall not change the superintendent without the Owner's written consent, which shall not unreasonably be withheld or delayed.

§ 3.9.4 The Contractor shall employ a competent project manager and necessary assistants who shall be in attendance at the Project site during performance of the Work for the duration of the entire Project. The project manager shall be satisfactory to the Owner and the Contractor shall not replace the project manager without the prior written consent of the Owner. The project manager shall represent the Contractor, and communications given to the project manager shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

§ 3.9.5 If not already identified as part of the Owner's pre-qualification process, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name, qualifications and references of the proposed project manager.

§ 3.9.6 The project manager shall be satisfactory to the Owner and the Contractor shall not employ a proposed project manager to whom the Owner or Architect has made reasonable and timely objection. If for any reason the project manager is unsatisfactory, upon request of Owner, other qualified representatives shall be substituted. The Contractor shall not replace the project manager without the prior written consent of the Owner.

§ 3.9.7 Additional key personnel may be required for this project. The Contractor shall provide additional personnel as required to ensure proper project coordination.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, within ten (10) days of the date reflected on the Letter of Intent to Award, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall be in such format, and contain such information as the Owner may request or outlined in Division 1 of the Specifications. The schedule shall not exceed time limits current under the Contract Documents, shall, with the prior review and approval of the Owner and Architect, be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for simultaneous review and approval by the Owner and Architect. The Owner and Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Bid Clarifications and/or Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

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§ 3.11.1.1 In addition, the Contractor shall indicate on the drawings, as best as possible, all new and existing pipe and conduit runs which are concealed in the floor slabs, walls, ceilings, etc. The Contractor shall indicate on the drawing the electrical distribution panel and circuit number supplying each item installed or reconnected, with diagrammatic lines showing sequence of connections. All changes shall be identified and circled on the Architect's and Engineer's drawings at the time they occur for each such field change.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect or Engineer without action. Such action will not be grounds for time extension to the Contract.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect and the Owner Representative in writing of such deviation at the time of submittal and (1) the Owner Representative has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of

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the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.12.11 See Specifications for additional information on Shop Drawings.

§ 3.13 USE OF SITE

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 Nothing contained in the Contract Documents shall be interpreted as giving the Contractor exclusive use of the premises where the Work is to be performed.

§ 3.13.3 The Work in this Contract should not interfere with normal, continuous and safe operation of the buildings and site. If interference appears possible because of new connections to existing work or other reasons, the Work involved must be done at a time and in a manner approved by the Owner Representative as a part of the Contract.

§ 3.13.4 The Contractor shall comply with the following procedures when working in occupied areas including classrooms, hallways, and office spaces:

§ 3.13.4.1 Notification: The Contractor shall notify the Owner Representative and the Building Safety Committee Representative two (2) days prior to commencing work in occupied office, classroom and other areas. This notification shall include detailed description of proposed work.

§ 3.13.4.2 Overhead Work: There shall be no overhead work, (e.g. demolition, HVAC ductwork, and/or electrical) performed directly over occupied spaces.

§ 3.13.5 The Contractor shall produce a site mobilization plan for the Owner Representative's review and approval before beginning operations on site. This document shall be updated and submitted monthly. No deviations will be allowed without the prior approval of the Owner.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

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§ 3.14.3 Written permission shall be obtained from the Architect/Engineer before cutting beams, arches, lintels or other structural members.

§ 3.14.4 See Specifications for additional information on Cutting and Patching.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials and shall clean and/or remove all stains, spots, marks, blemishes, foreign matter and dirt from surfaces of the Work and from other surfaces not a part of the Work but where such conditions resulted from the Contractor's operations from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect. In the event of legal action arising out of such infringement for which the Contractor is responsible and which action has the effect of stopping the Work, the Owner may require the Contractor to substitute other products of like kind as will make it possible to pursue and complete the Work. Costs and expenses caused thereby shall be borne by the Contractor.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall defend, indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent causedby the willful, wanton or negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18. Nothing in this Section shall be construed as obligating the Contractor to indemnify or hold harmless any of the parties indemnified hereunder against liability for damage arising out of bodily injury to persons or damage to property caused by or resulting from the sole negligence of any such indemnified party, or such party's agents or employees.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

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§3.18.3 The Contractor further agrees to obtain and maintain at it expense such general liability insurance coverage as will insure the provisions of this Section and other contractual indemnity obligations assumed by the Contractor in this Contract.

§ 3.18.4 The Contractor shall defend, indemnify and hold harmless the Owner, the Architect, and the Architect's consultants and their agents and employees from and against all claims, damages, losses, including, but not limited to, attorneys fees, arising out of or resulting from any type of pollution and/or environmental impairment into or upon the land, the atmosphere, or any course or body of water that is above or below ground, which is caused by any negligent or willful or wanton act or omission of the Contractor, subcontractors, or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable. The Contractor shall further indemnify and hold harmless the Owner, the Architect, and the Architect's consultants, and the agents and employees of any of them, as set out above for any acts that are outside of the contract specifications, and without the supervision or direction of the Owner, its Architects and Engineers; additionally this same indemnification shall apply to the misuse or malfunction of any equipment rented, owned, or leased by the Contractor, subcontractor, or anyone directly or indirectly employed by any of them or anyone for whose acts they may be liable. Nothing in this Section shall be construed as obligating the Contractor to indemnify or hold harmless any of the parties indemnified hereunder against liability for damage arising out of bodily injury to persons or damage to property caused by or resulting from the sole negligence of any such indemnified party, or such party's agents or employees.

The Owner assumes no responsibility or liability from loss or damage to the Contractor's equipment, materials, or supplies.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Contract and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate For Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.2.1 Where it is stated in the Contract Documents that the Contractor shall pay for or reimburse the Owner for services of the Architect, such payment shall be at a rate of two and one half (2.5) times the Architect's Direct Personnel Expense plus any expenses incurred in providing such services. Direct Personnel Expense is defined as the direct salaries of the architect's personnel engaged on the Project and the portion of the cost of their mandatory and customary contributions and benefits related thereto, such as employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions and similar contribution and benefits.

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§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION
Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Owner Representative has authority to reject Work that does not conform to the Contract Documents. Whenever the Owner Representative considers it necessary or advisable for implementation of the intent of the Contract Documents, the Owner Representative will have authority to require additional inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. The Architect shall advise and assist the Owner Representative in performing any of the functions set forth in this Section.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Owner Representative or the Architect will prepare Change Orders and Construction Change Directives and may authorize minor changes in the Work as provided in Section 7.4..

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10. The undertaking of any inspections by the Architect is not to be construed as supervision of actual construction, nor to make the Architect responsible for providing a safe place for the performance of work by the Contractor of the Contractor's employees, or those of suppliers of subcontractors for access, visits, work, travel, or occupancy by any person.

§ 4.2.10 NOT USED.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If no

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agreement is made concerning the time within which interpretations required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretations until fifteen (15) days after written request is made for them.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The decisions of the Owner Representative, with the advice and consultation of the Architect on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable from the date of the Letter of Intent to Award, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within fourteen (14) days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14 day period shall constitute notice of no reasonable objection. The Contractor shall submit the list of the subcontractors along with their CT registration number and FEIN or social security number if no FEIN number is available, within ten (10) days of the Letter of Intent to Award.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.2.1 The Contractor shall not contract with a person or entity who appears on the State of Connecticut Debarment List, the Federal Davis Bacon Act Debarment List, both of which are available through:

http://www.ctdol.state.ct.us/

or the Federal List of Excluded Parties Listing System available through http://epls.arnet.gov/

or who is party to a legal dispute with the State of Connecticut.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work and is not ineligible to be contracted with in accordance with Section 5.2.2.1, the Contract Sum and/or Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time

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shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity (including those who are to furnish materials or equipment fabricated to a special design) previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.2.5 As set forth more fully in the Notice and Instructions to Proposers, if the value of the masonry, electrical, mechanical (other than HVAC) and HVAC work each exceeds $25,000, the Contractor may be required to list the names and prices of Subcontractors for masonry, electrical, mechanical other than HVAC, and HVAC work, as well as other Subcontractors or as may be required by the Bid Documents. Substitution of a Subcontractor for one named in the Bid Document, or substitution of a Subcontractor for any designated sub trade work bid to be performed by the Contractor's own forces, shall not be permitted, except for good cause. The term "good cause" includes but is not limited to a Subcontractor's or where appropriate, Contractor's: (1) death or physical disability, if the listed Subcontractor is an individual; (2) dissolution, if a corporation or partnership; (3) bankruptcy; (4) inability to furnish any performance and payment bonds shown on the Proposal Form; (5) inability to obtain, or loss of, a license necessary for the performance of a particular category of work; (6) failure or inability to comply with a requirement of law applicable to Contractors, Subcontractors, or construction, alteration, or repair projects; and (7) failure to perform its agreement to execute a Subcontract, as set forth in the Bid Documents.

§ 5.3 SUBCONTRACTUAL RELATIONS

§ 5.3.1 By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.2 Any Subcontract must be in the form as provided by the Owner in accordance with Section 4b-96 of the Connecticut General Statutes. Supplements or other forms of Subcontracts are permitted as long as all the basic elements of the Connecticut General Statutes Section 4b-96 form are covered. In the event of any conflict or inconsistency between the Connecticut General Statutes Section 4b-96 Subcontract form as provided by the Owner and the Contractor's standard Subcontract form, the provisions of the Connecticut General Statutes Section 4b-96 Subcontract form shall prevail. Any standard Subcontract form used will be attached as a supplement to the Connecticut General Statutes Section 4b-96 Subcontract form as provided by the Owner.

Within five days after being notified of an award of a general contract by the University or, in the case of an approval of a substitute Subcontractor by the Owner, within five days after being notified of such approval, the Contractor shall present to each listed and approved Subcontractor, or approved Substitute Subcontractor, which will be performing masonry, electrical, mechanical other than HVAC, or HVAC work, or which will be performing other subcontract work which the Owner has designated in the Bid Documents as applicable to the following requirements:

1. A Subcontract in the form as described above.
2. A notice of the time limit under this section for executing a Subcontract.

If such Subcontractor fails within five days, Saturdays, Sundays and legal holidays excluded after presentation of a Subcontract by the Contractor to execute a Subcontract in the form hereinafter set forth, the Contractor shall propose

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another Subcontractor for the Owner's consideration and approval. When seeking approval for a substitute Subcontractor, the Contractor shall provide the University with all documents showing (A) the Contractor's proper presentation of a Subcontract to the listed Subcontractor and (B) communications to or from such Subcontractor after such presentation. The Owner shall adjust the Contract Price to reflect the difference between the amount of the price of the new Subcontractor and the amount of the price of the prior Subcontractor if the new Subcontractor's price is lower and may adjust such Contract Price if the new Subcontractor's price is higher. The Contractor shall, with respect to each such Subcontractor or approved substitute Subcontractor, file with the Owner a copy of each executed subcontract within ten days, Saturdays, Sundays and legal holidays excluded, of presentation of a Subcontract to such Subcontractor.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract. Contractor agrees to execute any and all other documents reasonably required to effect the assignment.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than thirty (30) days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

§ 5.5 The Contractor shall promptly advise the Owner in writing of any claim or demand by a Subcontractor claiming that any amount is due to such Subcontractor or claiming any default by the Contractor in any of its obligations to such Subcontractor.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules and construction requirements. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement between the Owner and Contractor. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

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§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable. If any part of a Contractor's work depends on proper and timely execution or relies upon the interphasing or coordinating of the work of any other separate Contractor, or the Owner, the Contractor shall allow for this interrelationship in the planning and performance of his work, without interference to any other contractor.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Owner Representative will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. All changes to the Work shall be approved by the Owner Representative. Except as permitted in Section 7.3, a change in the Contract Sum or the Contract Time shall be accomplished only by Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that the Owner has been unjustly enriched by any alterations or additions to the Work, whether or not there is, in fact, any unjust enrichment shall be the basis for any claim for an increase in any amounts due under the Contract Documents or a change in any time period provided for the Contract Documents..

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Owner or Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

.1 The change in the Work;

.2 The amount of the adjustment, if any, in the Contract Sum; and

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.3 The extent of the adjustment, if any, in the Contract Time.

There shall be no extension in the Contract time unless the Contractor can effectively demonstrate that the Work delayed is on the critical path of the Project Schedule in accordance with Section 8.3.

The signature of the Architect signifies that he has reviewed the change proposed, with accompanied breakdowns and subcontractors change proposals for appropriate quantities and unit costs and recommends the change. However, if the Contractor and the Owner Representative have signed the change order, the Architect's signature is not necessary in order for the Change Order to constitute a modification to the Contract which binds the Owner and the Contractor.

§ 7.2.2 CHANGE ORDER COST COMPONENTS

The contractor's proposal for a change in the Work shall be itemized completely, submitted in a detailed format acceptable to the Owner and shall include the following itemized cost components, as appropriate:

§ 7.2.2.1 Engineered Equipment and Materials:

Engineered Equipment shall be defined as equipment specified by the contract from a single manufacturer. **Material** (bulk materials) shall be defined as permanent construction materials that become part of the completed installation Engineered Equipment and Material costs shall be considered all-inclusive of the purchase cost of the equipment including all freight costs, purchasing services, expediting, and inspections and shall be substantiated by manufacturer quotes subject to review and approval by the Owner's representative, with the advice of the Architect.

§ 7.2.2.2 Direct Field Labor Hours:

Direct labor work hours for change orders shall be itemized indicating the estimated direct labor to be expended in the actual installation of equipment and materials that will become a permanent part of the finished project. The quantity of hours shall be based upon the contractor's estimate to complete the work based upon actual field conditions subject to review and approval by the Owner's representative, with the advice of the Architect.

§ 7.2.2.3 Direct Field Labor Costs:

Direct field labor costs are defined as cost of the direct labor estimated in the actual installation of equipment and materials that will become a permanent part of the finished project. Direct field labor may include hourly labor classifications for foremen, journeymen, apprentices, laborers, etc. Direct field labor costs may include contractor's direct labor payroll costs including social security, unemployment (federal and state), workers' compensation insurance, fringe benefits, and any other identified costs directly related to direct labor subject to review and approval by the Owner's representative, with the advice of the Architect.

The contractor's direct labor rates as outlined above are to be substantiated by a detailed direct labor cost breakdown with associated back-up support in a form acceptable to the Owner.

If the project is subject to prevailing wage rates, no wage above the prevailing rate shall be allowed unless such rate is substantiated by documentation of actual wages paid in the proposed amount or subject to labor rates submitted and accepted by the Owner as part of the contract documents.

§ 7.2.2.4 Construction Equipment and Tool Rental:

Contractor owned or rented equipment and major tools costs are allowed as part of the cost of a Change Order if it is demonstrated to the Owners satisfaction that such costs are valid and related to the change in work. Major tools shall be defined as non-hand held tools. Pricing rates for equipment and major tools shall be acceptable if agreed to by the Owner. In such cases, equipment costs shall be submitted for review and approval by the Owner, with the advice of the Architect. Changes that require specialized equipment not already on site shall have costs shown separately and shall include justification.

§ 7.2.2.5 Field Overheads (Indirects):

Field overhead (indirect) labor shall include field (onsite) supervision (superintendent, general foremen, field engineers)

Field overhead (Indirects) are allowed as part of a cost of a Change Order if it is demonstrated to the Owners satisfaction that such costs are valid and related to the change in work. In such cases additional costs of supervision

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and directly attributable to the change based on supporting data additional shall be submitted for review and approval by the Owner, with the advice of the Architect. The hourly rate for such personnel shall be based upon rates submitted to and approved by the Owner with the advice of the Architect. Changes that require specialized personnel or additional staff shall have costs shown separately and shall include justification.

Field Facilities shall include the following classifications, as applicable:

1. Temporary offices (office furniture, copiers, computers, printers, other office equipment and supplies)
2. Temporary material storage (storage vans and containers, warehouse rental)
3. Utilities (electricity, phones, data lines, restroom facilities)

Field Facilities costs are not allowed as part of the costs of a Change Order except in the event that a change involving an adjustment in contract time is submitted and approved in accordance with Section 8.3 or for changes that do not impact the critical path, it is demonstrated to the Owners satisfaction that such incremental costs are valid and related to the change in work. In such cases, Field Facilities costs shall be submitted for review and approval by the Owner, with the advice of the Architect.

§ 7.2.2.6 As noted in Section 3.6, the Owner is a tax exempt institution. The tax on materials or supplies exempted by the current regulations of the Department of Revenue Services shall not be included as a cost component of any Change Order or Change Order request/proposal.

§ 7.2.2.7 Subcontractors:
Subcontractors shall adhere to the same contract requirements and shall utilize change order pricing methodology that is consistent with the general contractor's contractual agreement with the owner. Include detailed Subcontractor cost proposals as backup to all subcontractor pricing.

§ 7.2.2.8 General and Administrative Overhead (Home Office) Costs and Profit (Overhead and Profit):
Overhead and Profit shall be applied as a percentage to the total cost of the change and shall include:

1. All home office expenses;
2. Safety related items, including safety equipment, safety administration, and all related costs associated with the contractor's safety program;
3. Small tools, which are defined as construction tools with a value of up to $500;
4. Consumable materials, which are normally used in the execution of the work and as may be further defined in the general conditions section of the specifications;
5. Indirect costs as related to field administrative personnel (project manager, field safety supervisor, planners, estimators, office manager, secretarial services, document control);
6. Indirect costs as related to support staff ;
7. Commercial General, Automobile, Umbrella, Aircraft and Contractor's Pollution Liability Insurance as described in Section 11.1.2;
8. Parking;
9. Safety;
10. Commissioning Requirements;
11. Such other items as are commonly considered part of home office overhead;
12. Company vehicles, gas, d mileage and travel time;
13. Union-related contributions, fees, expenses and costs;
14. Any training; and
15. Licenses.

§ 7.2.2.9 The determination of overhead and profit allowance for a contract change shall be based on the total direct cost of the work including material, labor, and equipment cost, as appropriate, utilizing the Contractor/Subcontractor Combined Overhead and Profit Markup Table as follows:

Contractor/Subcontractor Combined Overhead and Profit Markup Table:	
Contractor markup on self performed work	15%
Contractor markup on subcontractor work.	5%

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Subcontractor markup on self performed work.	15%
Subcontractor markup on first tier sub-subcontractor work.	5%
Sub-subcontractor markup on self performed work.	10%
Subcontractor markup on Sub-subcontractor subtier work	0%
Sub-subcontractor markup on subtier work.	0%

§ 7.2.2.10 Upon computing of the direct costs and applying the Section 7.2.2.9 mark ups to the direct costs on a compounded basis, the aggregate allowance for overhead and profit on any contract change shall not exceed twenty percent (20%).

§ 7.2.2.11 Overtime, when specifically authorized by the Owner and not as an Extraordinary Measure (as defined in Section 8.2.3.2), shall be paid for by the Owner on the basis of premium payment only, plus the cost of insurance and taxes based on the premium payment period.

§ 7.2.2.12 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Owner Representative. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.2.2.13 If the Contractor does not expeditiously proceed with the work in dispute, the Owner may, in its sole discretion, cause the work to be performed by other forces, and may issue a Change Order deducting the actual cost of the work to the Owner from the Contract Sum.

§ 7.2.2.14 Bond Costs: Actual additional bonding costs associated with the value of the Change Order will be compensable only when supported by written documentation by the bonding company that the Change Order requires an increase to the original Performance, Payment, Labor or Material Bond. Such Bond Costs will be adjusted as a final Change Order to the Contractor with no additional fee or mark-up.

§ 7.2.3 The Contractor shall submit cost proposals only on "Change Order Proposal Request Form" provided in Division 1of the Specifications or on a form and in a format acceptable to the Owner. In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials, unit prices, and Subcontracts. Subcontract proposals included in any work shall also be itemized.

§ 7.2.4 Alternates awarded by Change Order after Contract execution are not subject to Contractor , Subcontractor or Subcontractor tiers overhead and profit mark-up.

§ 7.2.5 Agreement upon and execution of any Change Order shall constitute a final settlement of all matters relating to the change in the Work which is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum and the construction schedule. In the event a Change Order increases the Contract Sum, Contractor shall include the Work covered by such Change Orders in Application for Payment as if such Work were originally part of the Contract Documents.

§ 7.2.6 Any percentage referred to hereafter for General Conditions, and/or Overhead and Profit included in the adjustment to the Contract Sum shall be applied to the costs of performing the work attributable to the change as stated in 7.3.7.1 through 7.3.7.6. No markup shall be allowed for premiums on bonds and insurance.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Owner Representative or Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly. The signature of the Architect

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signifies that he has reviewed and recommends the change. However, if the Owner Representative has signed the Change Directive the Architect's signature is not necessary in order for the Change Directive to be valid

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for a proposed adjustment to the Contract Sum and/or Contract Time, the adjustment shall be based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. The Contractor must proceed promptly regardless if the directive is signed by the Contractor.

§ 7.3.7 If the contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method for adjustment in the Contract Sum and/or Contract Time shall be determined at the sole discretion of the Owner Representative, on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit in accordance with Section 7.2. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Owner Representative may prescribe, an itemized accounting together with appropriate supporting data. Any increase to Contract time will be limited to only changes that have been demonstrated through a critical path analysis in conformance with Section 8.3 and Division 1 of the Contract Documents to extend the Project end date. Unless otherwise provided in the Contract Documents, costs of performing the Work attributable to the changes for the purposes of this Section 7.3.7 shall be limited to the following as defined in Section 7.2:

- **.1** Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- **.2** Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- **.3** Rental costs of machinery and equipment, exclusive of hand tools and any hand-held equipment, whether rented from the Contractor or others;
- **.4** Costs of premiums for all bonds, permit fees, and sales, use or similar taxes related to the Work; and
- **.5** Additional costs of field overhead personnel directly attributable to the change based on supporting data.

§ 7.3.8 If the Contractor does not expeditiously proceed with the work in dispute, the Owner may, in its sole discretion, cause the work to be performed by other forces, and may issue a Change Order deducting the actual cost of the work to the Owner from the Contract Sum.

§ 7.3.9 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Owner Representative. When both

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additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 NOT USED.

§ 7.3.10 When the Owner and Contractor agree concerning the adjustments in the Contract Sum and/or Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order, Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect, subject to approval of the Owner Representative, has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Notice to Proceed.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Contract the Contractor confirms that the Contract Time is a reasonable period for performing the Work and that the Contractor is capable of properly completing the Work within the Contract Time.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.2.3.1 The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The accepted construction schedule shall be updated to reflect actual conditions (sometimes referred to as progress reports) as set forth in Section 3.10.1 of AIA Document A201 or if requested by the Owner. In the event any progress report indicates any delays or potential delays, the Contractor shall advise the Owner of its plan to recover the schedule, providing the Owner with a recovery schedule, and shall further take all steps necessary to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report or recovery schedule constitute an adjustment in the Contract Time or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

§ 8.2.3.2 In the event the Owner determines that the performance of the Work has not progressed or reached the level of completion required by the approved construction schedule for reasons within the responsibility of the Contractor, the Owner shall have the right to order the Contractor to take any and all corrective measures necessary to expedite the progress of construction, including, without limitation, (1) working additional shifts or overtime, (2) supplying additional manpower, equipment, and facilities and (3) other similar measure (hereinafter referred to collectively as "Extraordinary Measures"). Such Extraordinary Measure shall continue until the progress of the Work complies with the stage of completion required by the approved construction schedule. The Owner's right to

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require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule.

§ 8.2.3.3 The Contractor shall not be entitled to any adjustment in the Contract Price in connection with Extraordinary Measures required by the Owner, if the Owner determines that the conditions creating the need for such Extraordinary Measures were within the responsibility of the Contractor.

§ 8.2.3.4 The Owner may exercise the rights furnished the Owner under or pursuant to this Section as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with any approved construction schedule or completion date established in accordance with the Contract.

§ 8.2.4 The Contractor and the Owner agree that the times specified for the performance of the Contract shall include not only the work of the original Contract but any additional work ordered by the Owner which, in the opinion of the Owner Representative, can be performed concurrently with the original work specified and therefore do not warrant the granting of an extension of time.

§ 8.2.5 Except in the event of emergency, no substantial field operations shall be performed outside of regular working hours without the prior approval of the Architect and the Owner. The Contractor shall not be entitled to additional compensation for work performed outside of regular working hours.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, or unavoidable casualties beyond the Contractor's control, then the Contract Time may be extended by Change Order for such reasonable time periods as demonstrated through a Critical Path Analysis in conformance with Division 1 of the Contract Documents and accepted by the Owner Representative.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.2.1 Claims of delay and requests for extension of time shall set forth in detail the circumstances of such claim, the dates upon which claimed delay began and ended, and the number of days' extension of time requested. The Contractor shall provide supporting documentation as the Architect and Owner may require, including a revised Construction Schedule indicating the affect of the circumstances which form the basis for the claim.

§ 8.3.2.2 The contractor shall not be entitled to an extension of time for each and every one of a number of causes which have a concurrent and interrelated effect on the progress of the Work.

§ 8.3.2.3 Claims for extension of time arising out of authorized changes in the Work shall be made in writing prior to or concurrent with the submission of the Contractor's proposal for such change. No extension of time arising out of changes in the Work will be granted after the date upon which the Contractor is authorized to proceed with such change unless specific provision for an extension of time has been incorporated in the authorization.

§ 8.3.2.4 Any additional cost to the contractor arising from such change shall be included in the amended Contract Sum set forth in such Change Order. No claim for damages for delay, arising from such change in the Work, shall be recognized or be deemed valid.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Contract and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

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§ 9.2 SCHEDULE OF VALUES

§ 9.2.1 Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Owner Representative may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.2.1.1 Submission of the Schedule of Values shall be made within five (5) days for projects under One Million Dollars ($1,000,000.00) and for all others within thirty (30) days of the Contract execution.

§ 9.2.1.2 The Schedule of Values shall be submitted (typewritten) on an AIA Document G702 form and should be broken down into a minimum of sixteen (16) divisions based on the Construction Specifications Institute (CSI) Guidelines and subdivided further by Materials and Labor.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 By the twenty-fifth of each month, the Contractor shall submit to the Owner Representative and the Architect a Draft Application for Payment for Work in the form of an AIA Document G702, Application and Certification for Payment, supported by AIA Document G703, Continuation Sheet. The latest edition of each document must be used.

The Owner Representative and the Architect will within ten (10) days after receipt of the Contractor's Draft Application for Payment notify the Contractor in writing of all necessary revisions.

The Contractor shall make all revisions to the Application for Payment as required by the Owner Representative.

The Contractor shall then submit to the Owner Representative and the Architect an Application for Payment for Work in the form of a notarized AIA Document G702, Application for Payment, supported by AIA Document G703, Continuation Sheet, free of any handwritten, marks, notes, annotations, etc. and an Affidavit of Payment and Release of Claims form (either partial release or final release as appropriate) in a form as provided by the Owner.

By submission of the Affidavit and the Application for Payment the Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown therein is now due.

§ 9.3.1.1 Each payment requisition submitted by the Contractor shall include a statement showing the status of all pending construction change orders, other pending change directives and approved changes to the original contract or subcontract. Such statement shall identify the pending construction change orders and other pending change directives, and shall include the date such change orders and directives were initiated, the costs associated with their performance and a description of any work completed. As used in this subsection, "pending for construction change order" or "other pending change directive", means an authorized directive for extra work that has been issued to a contractor or a subcontractor.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 Such Application for Payment shall include a deduction of ten (10%) percent of the estimated amount of the application to be retained by the Owner until the completion of the entire Contract in an acceptable manner. The Contractor shall be prohibited from withholding more than ten (10%) percent retainage from any payment which is otherwise due to any Subcontractor.

§ 9.3.1.3 .1 In addition, if the State Commission on Human Rights and Opportunities ("CHRO") authorizes the award or execution of this contract in advance of CHRO's approval of the Affirmative Action Plan required to be submitted by the Contractor pursuant to Connecticut General Statutes Section 46a-68d, the Owner will withhold an additional two percent (2%) of the total contract price per month from any payment made to such Contractor, until

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such time as the Contractor has received approval from CHRO of the Affirmative Action Plan. Moreover, if CHRO determines through its complaint procedure and the hearing process provided in Connecticut General Statutes Section 46a-56(c) that a contractor or subcontractor is not complying with anti-discrimination statutes or contract provisions required under Connecticut General Statutes Section 4a-60 or 4a-60(a) or the provisions of Connecticut General Statutes Section 46a-68c to 46a-68f, inclusive, and if so ordered by the presiding officer after such hearing and upon a finding of noncompliance, the University shall retain two percent (2%) of the total contract price per month on the contract with the Contractor.

§ 9.3.1.4 Whenever the Owner has designated a separate section for a class of work the Contractor shall, when applicable, state as part of its application for partial payment that it considers the work required to be done under any such separate section to be fully completed in accordance with the terms of the Contract. The Owner shall thereupon conduct an inspection of the work in such class, and if it finds that such work has been fully completed in accordance with the terms of the Contract, it shall issue a statement certifying that such work is accepted as fully completed, and shall pay the Contractor in full for such work.

§ 9.3.2 Unless otherwise specifically approved, the Owner will pay only for material and equipment delivered and incorporated in the Work. If approved in advance by the Owner, payment may be similarly made for material and equipment suitably stored on site or off site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.2.1 Payment for stored material either on site or off site will require Owner's prior approval. Approval will be dependent upon demonstration of hardship due to extended time duration between required purchase and actual field installation or the critical nature of the commodity in relationship to the critical path of the construction schedule. Additionally, the Contractor must provide secured storage, insurance coverage for the material during storage, transfer of ownership of the material to the Owner and indemnify the Owner from any delay, cost associated with or resulting from, the loss or damage of such material during such storage. Payment for such material will be paid for at 80% of invoice verified cost. No stored payment will be considered for raw materials. Those items requiring fabrication must be complete so that identification and appropriate documentation can be obtained to insure such items are part of the work identified in this Contract.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.3.4 If payment for stored products is approved, Contractor shall furnish with Application for Payment a vendor invoice establishing value of material and equipment stored along with a statement of amount to be paid to vendor.

§ 9.3.4.1 Such stored items are subject to prior approval for storage and to inspection by Architect and Owner before payment is recommended.

§ 9.3.4.2 Contractor shall give Owner Certificates of Insurance in accordance with Contract Documents for the full value of the items stored. Insurance to be maintained until items are incorporated in the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the

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best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect following consultation with the Owner Representative may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. The Architect following consultation with the Owner Representative may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** after prior notice, defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims unless full bond coverage, insurance or security acceptable to the Owner is provided by or demonstrated by the Contractor, or unless the Contractor demonstrates to the Owner that the claims do not have a reasonable basis in fact;
- **.3** failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment in accordance with the provisions of this Contract;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** injury to persons or damage to the Work or property of the Owner, other Contractors, or others caused by the act of neglect of the Contractor or any of his Subcontractors;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance of the Contract Sum would not be adequate to cover actual or liquidated damages for the anticipated delay unless the Contractor demonstrates to the satisfaction of the Owner that it or others for whom it is responsible are not responsible for such delay;
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents;
- **.8** failure to submit Construction Schedules as outlined in Division 1 of the Specifications in the time prescribed;
- **.9** failure to submit all documents necessary for compliance with CHRO requirements;
- **.10** failure to submit all copies of all certified payrolls;
- **.11** failure to provide copies of subcontractors contracts per statute; or
- **.12** failure to submit any other documentation requested by the Owner necessary for compliance with the requirements of any regulatory agency.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld. The Owner shall not be deemed in default by reason of withholding payment while any of the above grounds remain uncured, nor shall any interest accrue or be payable with respect to any payments so withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

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§ 9.5.4 The Owner shall have the right to apply any such amounts so withheld in such manner, as the Owner may deem proper to satisfy such claims or to secure such protection. Such application of such amounts shall be payments to the Contractor.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has certified the Application for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, or shall so notify the Contractor of the Owner's intent to withhold payment to the extent reasonably necessary to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions of its Subcontractors due to the causes set forth in Section 9.5.1.

§ 9.6.2 For every Contract with the Owner for the construction, alteration or repair of any building or work;

- **.1** The Contractor within thirty (30) days after payment to the Contractor by the Owner, shall be required to pay any amounts due any Subcontractor, whether for labor performed or materials furnished, when the labor or materials have been included in a requisition submitted by the Contractor and paid by the Owner;
- **.2** The Contractor shall include in each of its subcontracts a provision requiring each Subcontractor to pay any amounts due any of its Subcontractors, whether for labor performed or materials furnished, within thirty (30) days after each Subcontractor receives a payment from the Contractor which encompasses labor or materials furnished by such Subcontractor.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven (7) days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Pursuant to Connecticut General Statutes Sections 10a-109a through 10a-109y:

- **.1** No payments shall be made by the Owner on account of this Contract for this project until the bills or estimates presented for such payments shall have been duly certified to be correct by the Owner;
- **.2** The obligations of the Owner or the State of Connecticut to make payments to the Contractor for services, labor, or materials provided on this project are limited to those amounts set forth in the Contract Documents and any agreed upon changes or amendments thereto. Neither the Owner nor the State of Connecticut shall or may be liable to make payments in excess of such amount.

§ 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven (7) days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven (7) days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven (7) additional days' written notice to the Owner and Architect be entitled to the applicable statutory interest.. Said provision does not apply where the Owner has submitted to the Contractor its intention to withhold payment in accordance with Section 9.6.1 or where the Architect has submitted to the Contractor its intention to withhold certification in accordance with Section 9.5.1.

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§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize without impact or interruptions the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. The Certificate of Substantial Completion shall become valid upon the written approval thereof by the Owner Representative. Upon such acceptance and written consent of Contractor's surety, if any, and a written statement from CHRO releasing the Owner from any obligation to withhold amounts retained under Section 9.3.1.3.1, the Owner shall make payment of retainage applying to such Work or designated portion thereof. At the sole discretion of the University, reductions in retainage may be allowed before the Contractor reaches Substantial Completion. Such reductions shall not be allowed without written consent from the Contractor's surety. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.8.6 Certifications. The Contractor at completion of construction shall provide to the Owner a "Certificate of Substantial Compliance" bearing original signatures of an officer of the company stating: "This is to CERTIFY that in my professional opinion the complete structure/renovations described above is in substantial compliance with the approved construction documents on file with the University of Connecticut. Minor deviations and special stipulations are noted below (if any)".

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

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§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least thirty 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner, (6) all documents necessary for compliance with CHRO requirements and as required to obtain the written statement of release from CHRO referenced in Section 9.8.5, (7) copies of all certified payrolls, (8) certifies that all material installed does not contain asbestos, (9) the Certificate of Substantial Compliance referenced in Section 9.8.6, and (10) any other documentation requested by the Owner necessary for compliance with the requirements of any regulatory agency. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such claim. If such claim remains unsatisfied after payments are made to the Contractor, the Contractor shall promptly pay to the Owner all money that the Owner may be compelled to pay in discharging such claim, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor, the written approval of the Owner Representative and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

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§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

§ 9.11 LIQUIDATED DAMAGES

§ 9.11.1 Time is of the essence to the Contract Documents and all obligations there under. The Contractor acknowledges and agrees that if the Contractor fails to achieve Substantial Completion, or causes any delay to the Substantial Completion of any portion of the Work within the Contract Time, as may be extended by the Owner, the

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Owner will sustain extensive damages and serious loss as a result of such failure. The exact amount of such damages will be difficult to ascertain. Therefore, the Owner and the Contractor agree as follows:

.1 If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time and as otherwise required by the Contract Documents, the Owner shall be entitled to retain or recover from the Contractor, as liquidated damages and not as a penalty, the amount per calendar day specified in §3.3 of the AIA A101-2007 for every calendar day that the Contractor is in default, commencing upon the first day following the expiration of the Contract Time and continuing until the actual date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable pre-estimate of damages the Owner will incur as a result of delayed completion of the Work.

.2 The Owner shall be entitled to recover as actual damages the Owner's costs, expenses and damages it incurs in connection with the completion of the Work in the event that the Contractor fails to complete the Work, and/or the Contractor's surety fails to perform the Work pursuant to any Performance Bond. The Owner shall be entitled to recover as actual damages any payments it makes to any subcontractor or materials supplier that the Contractor's surety fails to pay pursuant to any Payment Bond.

.3 The Owner may deduct liquidated damages described in Clause 9.11.1.1 from any unpaid amounts then or thereafter due the Contractor under this Contract. Any liquidated damages not so deducted from any unpaid amounts due the Contractor shall be payable to the Owner, together with interest from the date of the demand at the legal rate.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

§ 10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract. Prior to and as a condition of mobilization on site, the Contractor shall submit a Safety Plan to Owner. To the extent the Owner provides safety manuals or other information, any such manuals and information shall be deemed minimum requirements for the Contractor's fulfillment of its safety obligations. Safety fines may be assessed based on Owner's safety plan and or Occupational Safety and Health Administration ("OSHA") .

§10.1.1.1 In accordance with C.G.S. Section 31-53b, the Contractor is required to submit proof that each employee has completed a course of at least ten hours in duration in construction safety and health approved by the federal OSHA.

§10.1.1.2 The Contractor shall remove all snow and ice as may be required for the proper protection and/or prosecution of the Contractor's work. The Contractor shall coordinate and cooperate with the Owner for such activities.

§ 10.1.2 Contractors Safety Program: The Contractor hereby acknowledges that the job site safety will be of utmost importance. Contractor shall be responsible for initiating, maintaining and supervising safety and anti-substance abuse precautions and programs in connection with the Work. Contractor shall provide all protection to prevent injury to all persons involved in any way in the Work and all other persons, including, without limitation, the employees, agents, guests, visitors, invitees and licensees of the Owner who may visit or be affected thereby. These precautions shall include, but in no event be limited to: (1) those set forth in the most current provisions of the Owner's Contractor Environmental Health and Safety Manual, which is incorporated by reference as a Contract Document; (2) the posting of danger signs and personal notification to all affected persons of the existence of a hazard of whatever nature; (3) the furnishing and maintaining of necessary traffic control barricades and flagman services; (4) the use, or storage, removal and disposal of required explosives or other hazardous materials only under the supervision of qualified personnel and after first obtaining permission of all applicable governmental authorities; (5) and the maintenance of adequate quantities of both hose and operable fire extinguishers at the job site. The Contractor shall set forth in writing its own safety and anti-substance abuse precautions and programs in connection with the Work and if requested by the Owner submit the same to the Owner or its designee for review. The Owner may but shall not be obligated to make suggestions and recommendations to the Contractor with respect thereto.

.1 **Compliance of Work, Equipment and Procedures with all Laws**: All Work, whether performed by the Contractor and its Subcontractors of any tier, or anyone directly or indirectly employed by any

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of them, and all equipment, appliances, machinery, materials, tools and like items incorporated or used in the Work, shall be in compliance with and conform to: (a) all applicable laws, ordinances, rules, regulations and orders of any public, quasi-public or other governmental bodies relating to the safety of persons and their protection against injury, specifically including, but in no event limited to the Federal Occupations Safety and Health Act of 1970, as amended and all rules and regulations now or hereafter in effect pursuant to said Act and the OSHA Act of the State of Connecticut, as amended and all rules and regulations now or hereafter in effect pursuant to said Act; and (b) all rules, regulations and requirements of the Owner and its insurance carriers relating thereto, including without limitation the O. In the event of conflicting provisions the more stringent shall govern. The Owner reserves the right to assess fines and penalties to the Contractor for violations of the Owner's Contractor Environmental Health and Safety Manual as may be more specifically referred to in the Manual and may deduct such fines and penalties from any payments due the Contractor under the Contract.

.2 **Contractors Designation of Safety Program Administrator**: The Contractor shall designate a qualified member of its organization at the job site in accordance with the requirements of the Owner's Contractor Environmental Health and Safety Manual whose duties shall include enforcement of the Contractor's Safety Program to assure compliance with Article 10 and to prevent accidents. This position may be required to be a full time position dedicated to this Project. This person's name, qualifications and the estimated number of man-hours of effort per week performing this function shall be submitted to the Owner in writing. His or her identity, qualifications and level of effort must be satisfactory to the Owner who shall have the sole discretion to approve or reject same. Any reduction to this schedule must be submitted to the Owner for approval. The Contractor shall further cause each of its Subcontractors of any tier to designate a qualified safety representative to assist the Contractor's Representative in the performance of its duties as described above and the names of such representative shall be given to the Owner.

.3 **Suspension of Contractor's Work**: If in the opinion of the Owner or its designee the Contractor shall fail to provide a safe area for the performance of the Work or any portion thereof the Owner or its designee shall have the right but not the obligation to suspend Work in the unsafe area. Contractor shall be liable for all costs incurred of any nature (including without limitation overtime pay, liquidated damages or other costs resulting from delays) resulting from the suspension.

.4 **Right of Owner to have Contractor Send Worker Home**: The Contractor shall provide to each worker on the job site the proper safety equipment for the duties being performed by that worker and will not permit any worker on the job site who fails or refuses to use the same. The Owner shall have the right but not the obligation to order the Contractor to cause any worker to be sent home for the day or to otherwise temporarily or permanently remove him or her from the job site for his or her failure to comply with safe practices or anti-substance abuse policies. Contractor shall promptly comply with such orders from the Owner and shall be liable for any and all costs of whatsoever nature, including attorney's fees paid or incurred by the Owner.

§ 10.1.3 Protection of Work and Property; Responsibility for Loss: The Contractor shall, throughout its performance of the Work, maintain adequate and continuous protection of all property of the Owner and third parties and of the Work and temporary facilities against loss or damage from whatever cause arising out of the performance of the Work and shall comply with the requirements of the Owner and its insurance carriers and with all applicable laws, codes, rules and regulations with respect to the prevention of loss or damage to property as a result of fire or other hazards.

§ 10.1.4 Emergencies: In any emergency affecting the safety of persons or property, or in the event of a claimed violation of any federal or state safety or health law or regulation arising out of or in any way connected with the Work or its performance, the Contractor shall act immediately to prevent threatened damage injury or loss or to remedy said violation whichever is applicable, failing which the Owner or its Designee may immediately take whatever action it deems necessary including, but not limited to, suspending the Work.

The Owner may offset any and all cost or expenses of whatever nature including attorneys' fees paid or incurred by the Owner in taking such action against any sums then or thereafter due to the Contractor. The Contractor shall defend indemnify and hold the Owner, and its officers, agents, employees, harmless against any and all costs, expenses or liability in accordance with Section 3.1.8. If the Contractor shall be entitled to any additional compensation or extension of time claimed on account of emergency work not due to the fault or neglect of the

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Contractor or its Subcontractors or Sub-subcontractors, it shall be handled as a request for a Change Order as provided in Section 7.2 of this Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

The Contractor shall provide and pay for whatever security measures the Contractor deems necessary to protect the Contractor's work until acceptance by the Owner through issuance of a Certificate of Substantial Completion.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 At a minimum, the Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities. Additionally, the Contractor shall maintain all passageways, guard fences, lights and other facilities for protection.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor, at a minimum, shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

.1 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary, the Contractor shall give the Owner advance written notice of at least five (5) days prior to bringing to the site or utilizing such explosives, materials, equipment or methods..

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 and indemnify and save the Owner harmless for all damage or injury to referenced persons and property caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable in whole or in part to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

.1 The Contractor shall repair or replace any such damage at no additional cost to the Owner. Such repair or replacement shall be completed within one week of the damage or as directed by the Owner Representative. If the Contractor fails or refuses to repair the damage promptly, the Owner may have the necessary Work performed and charge the cost to the Contractor.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger the safety of persons or property or cause damage or create an unsafe condition.

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(Paragraphs deleted)
§ 10.2.8 All materials furnished and all work installed shall comply with the rules and recommendations of the National Board of Fire Underwriters; with all applicable State and local codes, laws, ordinances, rules and regulations; with all requirements of local utility companies and with the recommendations of the Insurance Rating Organization having jurisdiction.

§ 10.2.9 All apparatus, equipment and construction such as ladders, scaffolds, chutes, etc. shall comply with the recommendations of the manual of Accident Prevention in Construction published by the Associated General Contractors of America.

§ 10.3 HAZARDOUS MATERIALS
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.1.1 Upon request, the Owner, through the Office of Environmental Health and Safety, will provide the Contractor with a written copy of the Hazard Communication Program and chemical inventory for work areas in which they will be working. The Owner, upon request, will make available to the Contractor an opportunity to review the Material Safety Data Sheets ("MSDS") on file for areas where hazardous chemicals are used and stored for work areas they will be working in.

§ 10.3.1.2 Per OSHA's Hazard Communication Standard, Contractors are expected to inform and provide the Owner any MSDSs of materials to be used in their work at the University of Connecticut. Contractors shall provide a chemical inventory and information on the location of chemical use and storage. The Contractor shall be responsible for the removal of all unused portions of chemicals and their waste products from the Project Site. A copy of the Hazard Communication Policy is available for review by the Contractor or prospective Proposers of the Contract at the Office of Capital Project & Contract Administration or at:

http://www.ehs.uconn.edu/Occupational/occuhazard.php

or http://ors.uchc.edu

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Upon written request, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up which may have occurred, but must be demonstrated as impacting the critical path of the schedule.

§ 10.3.3 NOT USED.

§ 10.3.4 In no event, however, shall the Owner have any responsibility for any substance or material that is brought to the Project site by the Contractor, any Subcontractor, any materialman or supplier or any entity for whom any of them is responsible. The Contractor agrees not to use any fills or other materials to be incorporated into the Work, which are hazardous, toxic or comprised of any items that are hazardous or toxic. In the event it is determined materials that are hazardous, toxic or comprised of items that are hazardous or toxic have been used as

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fills or incorporated into the Work, the Contractor, at its sole expense, shall be responsible for immediate removal, proper disposal, and replacement of materials of the Work and surrounding areas so affected.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 Contractor shall verify that all material/equipment installed in any portion of the Work shall be asbestos free. The Owner may perform sampling to verify all suspect material/equipment is asbestos free. If any material/equipment is found to contain asbestos, the Contractor shall pay for the lawful and proper removal and disposal of product(s), and re-install acceptable material/equipment all at its sole expense. Contractor shall visually and in writing provide to Owner or its representative proof that products or equipment to be used are non-asbestos containing, asbestos free, do not contain asbestos, or similar via manufacture statement on product itself or accompanying information.

10.3.6.1 For purposes of this requirement, materials include, but are not limited to, the following:

.1 **Surfacing Treatments**
Fireproofing Acoustical Plaster
Finish Plasters, Skim Coats of Joint Compound, Fibrous Type Paint Applications

.2 **Thermal System Insulation**
Equipment Insulation
Boiler, Breeching, Boiler Rope, Duct or Tank Insulation, Cement or Mortar used for boilers and refractory brick
Piping and fitting insulations including but not limited to Wrapped Paper, Aircell, Millboard, Rope, Cork, Preformed Plaster, Job Molded Plaster and coverings over fibrous glass insulation

.3 **Roofing and Siding Miscellaneous Materials**
Insulation Board Vapor Barriers
Coatings Felts
Flashing Shingles
Cementitious Board (Transite) Galbestos
Non-Metallic or Non-Wood roof Decking

.4 **Other Miscellaneous Materials**
Cove Base Floor Leveling Compound
Ceiling Tile Vermiculite Insulation
Vibration Isolators Laboratory Tables and Hoods

§ 10.3.7 Most buildings at the University of Connecticut have some Asbestos Containing Materials (ACM) used as building products. Any known ACM has been identified on the Plans and Specifications of this Contract.

§ 10.3.8 Every effort has been made to identify ACM; however, there may be additional ACM present in the area of work. This suspected ACM may become apparent especially during the demolition phases of contracts.

§ 10.3.9 The Contractor shall make every attempt to accomplish work in such a manner as to not disturb ACM or suspected ACM. If the Work cannot be accomplished without disturbing ACM or suspected ACM, or if ACM abatement is specifically incorporated as part of this contract, the Contractor must have the applicable training, licenses, or any other qualifications necessary to perform such work safely and in accordance with Federal, State and Local regulations.

§ 10.3.10 The Contractor shall bring to the immediate attention of the Owner Representative the location of suspected ACM that will be disturbed by work required under this Contract. No work shall be attempted that could result in a release of ACM to the environment.

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§ 10.3.11 Asbestos surveys for most buildings of the Owner which are part of this Contract are available for Contractor's review in the Architectural and Engineering Services building or for UCHC projects at the Facilities Development & Operations office..

§10.3.12 Exposure levels for lead in the construction industry are regulated by 29 CFR 1926.62. Construction activities disturbing surfaces containing lead-based paint (LBP) which are likely to be employed, such as sanding, grinding, welding, cutting and burning, have been known to expose workers to levels of lead in excess of the Permissible Exposure Limit (PEL). Contractor shall conduct demolition and removal work specified in the Contract Documents in conformance with these regulations. In addition, construction debris/waste may be classified as hazardous waste. Disposal of hazardous waste material shall be in accordance with 40 CFR Parts 260 through 271 and Connecticut Hazardous Waste Management Regulations Section 22a-209-1; 22a-209-8(c)-11; and 22a-449(c)-100 through 110.

§ 10.3.13 Where a child under the age of six resides, the work shall also be in accordance with Connecticut Regulations Section 19a-111-1 through 11.

§ 10.3.14 **If this is a renovation project**, testing for lead-based paint has been conducted at selected facilities of the Owner. Results of LBP testing are for information purposes only. Under no circumstance shall this information be the sole means used by the Contractor for determining the extent of LBP. The Contractor shall be responsible for verification of all field conditions affecting performance of the Work.

§ 10.3.15 Except for UCHC projects, lead based paint testing results are available at the Architectural and Engineering Services building. Contractors proposing on this project are requested to visit this office and review lead testing documents.

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

10.5 LOCKOUT/TAGOUT PROCEDURES REQUIRED BY OSHA

§ 10.5.1 OSHA regulations 29 CFR 1910.147 (The Control of Hazardous Energy) requires employers to develop procedures for the lockout or tag out of machines or equipment. The purpose is to prevent injuries by ensuring that hazardous forms of energy are isolated (locked or tagged out) before employees perform any servicing or maintenance activities, which could result in the unexpected energization, start-up or release of stored energy. This includes electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other energy sources.

§ 10.5.2 The Owner has a written Lockout/Tag out Policy, as required under 29 CFR 1910.147. The policy is available for review by the Contractor or prospective Proposers of this Contract upon request.

§ 10.5.3 Prior to commencing any work under this Contract that will or may involve exposure to potentially hazardous energy; the Contractor shall notify the Owner Representative of the lockout/tag out procedures to be used. Lockout/tag out procedures shall be exchanged between the Contractor and the Owner Representative at the Pre-Construction Conference.

§ 10.5.4 All work carried out under this Contract that will or may involve exposure to potentially hazardous energy shall be carried out in accordance with all applicable Federal, State and local rules and regulations, including OSHA regulation 29 CFR 1910.147 (The Control of Hazardous Energy) and 1926.417 (Locking and Tagging of Circuits).

10.6 SOLVENT BASED PRODUCTS

§ 10.6.1 The use of solvent-based products, including paints and adhesives within occupied areas of buildings shall not be allowed as part of this project, unless specifically directed in other provisions of the Contract Documents. The use of solvent-based products in non-occupied areas shall be carried out using adequate ventilation that prevents migration of vapors into occupied areas. If solvent-based products are to be used in occupied areas, then work shall only be accomplished on nights or weekends and with prior approval with the Owner Representative; continuous ventilation should be provided as required to mitigate odors on building occupants using adequate ventilation. The

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Contractor's representative shall notify the Owner Representative, the Department of Environmental Health and Safety and the Building Safety Committee Representative two (2) days prior to the intended date of such work.

10.7 CONFINED SPACE ENTRY

§ 10.7.1 Certain areas at the University of Connecticut such as manholes, tanks, vessels, trenches, ducts, etc. meet the OSHA definition of a confined space (pursuant to 29 CFR 1910.146) in that they: 1) are large enough and so configured that an employee can bodily enter and perform assigned work; 2) have limited or restricted means for entry or exit; and 3) are not designated for continuous employee occupancy.

§ 10.7.2 According to this OSHA regulation, employers are required to implement a confined space entry permit program if its employees will enter confined spaces which have one or more of the following characteristics: 1) contain or have the potential to contain a hazardous atmosphere, 2) contain a material that has the potential for engulfing and entrant, 3) have an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or by a floor which slopes downward and tapers to a smaller cross-section, or 4) contain any other recognized safety or health hazard. Such a space is considered to be a permit-required confined space.

§ 10.7.3 The Owner has a written confined space entry policy, which implements a permit program. The policy is available for review by the Contractor or prospective Proposers of this Contract at the Architectural and Engineering Services building.

§ 10.7.4 Prior to commencing work that may require entry into a confined space; the Contractor shall consult with the Owner Representative and the Environmental Health and Safety Department to become apprised of the locations, the nature of the hazards, and safe entry procedures of known permit-required confined spaces.

§ 10.7.5 The contractor shall coordinate entry operations with the Owner through the Owner Representative when both Owner and Contractor personnel will be working in or near permit spaces.

§ 10.7.6 Any work carried out under this Contract that will require entry into a confined space shall be carried out in accordance with all applicable Federal, State, and Local rules and regulations, including OSHA regulations 29 CFR 1910.146 (Permit required confined spaces), 1926.21(b) (6) (Safety Training and Education – Employer responsibility (confined spaces)), 1926.352(g) (Fire prevention in enclosed spaces) and 1926.353(b) (Welding, cutting and heating in confined spaces).

10.8 EXCAVATION AND TRENCHING

§ 10.8.1 The Owner has a written Excavation and Trenching Policy, which can be found in the Owner's Contractor Environmental Health and Safety Manual.

§ 10.8.2 Any work carried out under this Contract that will require excavation or trenching shall be carried out in accordance with all applicable Federal, State and Local rules and regulations, including OSHA regulation 29 CFR 1926 Subpart P (Excavations).

§ 10.8.3 At a minimum, the Contractor shall comply with established Owner's Contractor Environmental Health and Safety Manual, which have been previously provided to bidders and/or are available for review upon request. These policies are hereby incorporated by reference herein, including but not limited to: Policies on Lockout/Tagout; Confine Space Entry; Code of Conduct; Sexual Harassment; Racism and Acts of Intolerance; Smoking.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall demonstrate and provide evidence of insurance in an industry accepted certificate of insurance and maintain with a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;

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.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 Claims for damages insured by usual personal injury liability coverage;

.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;

.7 Claims for bodily injury or property damage arising out of completed operations; and

.8 Claims involving contractual liability applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

.1 **Worker's Compensation Insurance**: Worker's Compensation Insurance in Statutory Limits of the Worker's Compensation Laws of the State of Connecticut, and other extensions, with Coverage B – Employer's Liability of not less than limits of $1,000,000 – Each Accident, $1,000,000 – Policy Limit and $1,000,000 – Each Employee. Coverage under the Broad Form All State extension shall also be included.

.2 **Commercial General Liability Insurance**: $1,000,000 combined single limit per occurrence for bodily injury, personal injury and property damage. Coverage shall include Premises and Operations, Independent Contractors, Products and Completed Operations, Contractual Liability and Broad Form Property Damage coverage. If a general aggregate is used, the general aggregate limit shall apply separately to the project or the general aggregate limit shall be twice the occurrence limit. The coverage shall contain no special limitations on the scope of protection afforded to the State. Said policy shall also state that it is primary insurance, and that the Owner, the State of Connecticut, the Contractor, and such other persons or interests as the Owner may designate as additional insured in connection with the performance of the Work, including hazards of operations (including explosion, collapse and underground coverage), elevators, independent contractors, employees as additional insured, completed operations for a period of three (3) years after final completion of the Work.

.3 **Automobile Liability Insurance**: Automobile Liability Insurance covering all owned, non-owned and hired automobiles, trucks and trailers of the respective parties required to provide and maintain this insurance. Such insurance shall provide coverage not less than that of the Standard Comprehensive Automobile Liability policy in limits not less than, as respects Contractor and all tiers of Subcontractors, $1,000,000 Combined Single Limit each occurrence for Bodily Injury and Property Damage.

.4 **Umbrella Liability Insurance:** Umbrella liability (following form) in the amount of $5,000,000 per Occurrence.

.5 **Aircraft Liability**: If aircraft of any kind is used by the Contractor, any tier of Subcontractor or by anyone else on their behalf, the Contractor or Subcontractor shall maintain or cause the operator of the aircraft to maintain aircraft public liability insurance insuring passengers and the general public against personal injury, bodily injury or property damage arising from aircraft owned, used, operated or hired in connection with the Work by the Contractor, Subcontractor or anyone else in limits of $50,000,000 Combined Single Limit for any one occurrence, each aircraft.

.6 **Contractor's Pollution Liability**: If the work of this project includes the abatement, removal, cleanup or handling of any asbestos, PCB's, lead based paint, or other pollutants or hazardous materials, then the Contractor shall also provide evidence that Pollution Liability Insurance, including completed operations and Contractual Liability coverage of not less than limits of $5,000,000 has been procured and is in force on the project. However, if the Contractor demonstrates that coverage

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for claims arising out of the abatement, removal, cleanup or other handling of asbestos, PCB's, lead based paint, or other pollutants or hazardous materials is covered by the Contractor's general liability insurance, a separate Contractor's Pollution Liability Policy will not be required.

.7 Builder's Risk: If the Project is for new construction, rather than for renovations to an existing structure or facilities, the Contractor shall purchase and maintain Builder's Risk Insurance, ISO CP 30 10 00 special form, in the amount of the initial contract amount plus values of subsequent modifications or change orders on a replacement cost basis. The Builder's Risk coverage shall be written on a Special Covered Cause of Loss form and shall include theft, vandalism, malicious mischief, collapse, temporary buildings, transit, debris removal, increased cost of construction, architect fees and expenses, soft costs, flood and earthquake. Builder's Risk shall include portions of work located away from site but intended for use at the site. Contractor shall obtain consent of the insurance company and delete any provisions with regard to restrictions within any occupancy clause. Equipment break down coverage shall be included and shall cover insured equipment during installation and testing.

.8 It is agreed that the Owner, the State of Connecticut, their officers, officials, agents, employees, boards and commissions shall be additional named insureds under the coverages described in Clauses 11.1.2.2; 11.1.2.3; 11.1.2.4; 11.1.2.5; 11.1.2.6; 11.1.2.7 and that said coverage(s) is provided for all operations, uses, occupations, acts and activities of the insureds under the Contract Documents and under any amendments, modifications, extensions or renewals of said Contracts regardless of whether liability is attributable to the named insureds or a combination of the named insureds and the additional named insureds.

.9 If the Contractor is a joint venture, the joint venture and each individual partner of the joint venture must be designated in each policy as named insureds.

.10 A Certificate of Insurance shall clearly indicate the Project name, Project number or some easily identifiable reference to the relationship to the Owner.

.11 Each liability policy shall contain a Cross Liability Endorsement.

.12 Coverage, written on an occurrence basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.

.13 All insurance secured by Contractor or Subcontractors pursuant to the Owner's requirements under the provisions of this Section 11.1.2 shall be in policies subject to the Owner's approval, as to form, content, limits of liability, cost and issuing companies. Such companies shall have and maintain an A.M. Best rating of not less than A-(VII), or otherwise acceptable to Owner.

.14 If the Contractor maintains insurance against physical loss or damage to Contractor's construction equipment and tools, such insurance shall include an insurer's waiver of rights of subrogation in favor of Owner.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled, terminated or materially changed, altered or allowed to expire until at least thirty (30) days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief and shall identify on their faces the project name and contract number to which they apply. The Certificate(s) of Insurance must also provide clear evidence that the Contractor's Insurance Policies contain at least the minimum limits of coverage and special provisions prescribed in Article 11.

§ 11.1.4 Form Certificates acceptable by the Owner shall be Accord 25(2001/08) together with Endorsement CG 20 37 07 04.

§ 11.1.5 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's Consultants as additional insureds for claims caused in

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whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 OWNER'S LIABILITY INSURANCE
NOT USED.

§ 11.3 PROPERTY INSURANCE
§ 11.3.1 Property insurance on an all-risk basis, including coverage for the perils of earthquakes and floods, has been purchased by the Owner. Insurance required by Section 11.3 is not intended to cover machinery, tools and equipment of the Contractor which is used in the performance of the Work, but is not incorporated into the permanent improvements, nor any materials and equipment paid for by the Owner and stored off-site, for which the Contractor shall procure property insurance satisfactory to the Owner. The Contractor shall, at is own expense, provide coverage for its machinery, tools and equipment subject to these provisions.
§ 11.3.1.1 NOT USED.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then procure and maintain insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the Owner's property insurance requires deductibles, the Contractor shall pay costs not covered because of such deductibles.

§ 11.3.1.4 NOT USED.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE
The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE
NOT USED.

§ 11.3.4 NOT USED.

§ 11.3.5 NOT USED.

§ 11.3.6 NOT USED.

§ 11.3.7 WAIVERS OF SUBROGATION
The Owner and Contractor waive all rights of subrogation against (1) each other and any of their subcontractors of all tiers, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors of all tiers, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3, the boiler and machinery insurance maintained by the Owner or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as

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appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Contract between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five (5) days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Contract. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND; PAYMENT BOND AND GUARANTY/CASHBOND

§ 11.4.1 The Contractor shall furnish to the Owner and deliver at the time of contract signing Performance and Payment Bonds pursuant to the requirements of Connecticut General Statutes Section 49-41 et seq. and the requirements of this Section 11.4. In all cases where the Contract Sum exceeds $100,000, the Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Each such Bond shall be in compliance with the form which has been adopted by the Owner as its required form of payment or performance bond and shall be provided by a Surety company licensed to do business in the State of Connecticut and that is acceptable to the Owner, and is named in the current list of "Surety Companies Acceptable on Federal Bonds" as published in the "Treasury Department Circular 570". The Surety company's underwriting limitation, as further set forth in "Treasury Department Circular 570", must not be less than the full amount required by the bond itself. The amount of each bond shall be equal to One Hundred Percent (100%) of the Contract Sum. The Payment and Performance Bonds shall name as "Obligee" the University of Connecticut.

§ 11.4.1.1 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.4.1.2 Each surety bond and surety contract between the Contractor named as a principal on the bond and the surety that issued the bond shall contain the following language: "In the event that the surety assumes the contract or obtains a bid or bids for completion of the contract, the surety shall ensure that the contractor chosen to complete the contract is prequalified pursuant to section 4a-100 of the Connecticut General Statutes in the requisite classification and has the aggregate work capacity rating and single project limit necessary to complete the contract.

§ 11.4.2 If the Contractor or any of its subcontractors is a non-resident contractor, the Contractor and/or subcontractor shall comply with the requirements of Connecticut General Statutes Section 12-430(7) ("the statute"), to the extent applicable. If the Contractor is a verified contractor as defined in the statute, the Contractor shall provide to the Owner written verification of that status from the State Commissioner of Revenue Services. If the

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Contractor is a unverified contractor as defined in the statute, the Contractor shall provide to the Owner proof that the Contractor has posted with the Commissioner of Revenue Services a surety bond in an amount equal to five percent (5%) of the contract price and which is otherwise in compliance with the requirements of the statute.

§ 11.4.3 If the Contractor proposes a Subcontractor default coverage program, the Contractor must demonstrate a cost savings of no less than 18% as compared to the actual Subcontractor traditional bond cost, including a reasonable percentage for changes as agreed upon by the Owner.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Owner Representative with the advice of the Architect has not specifically requested to examine prior to its being covered, the Owner Representative with the advice of the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Owner Representative with the advice of the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing, inspections, uncovering and replacement, and compensation for the Architect's and Owner Representative services made necessary thereby, shall be at the Contractor's expense.

If prior to the date of Substantial Completion, the Contractor, a Subcontractor or anyone from whom either is responsible uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment, or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly at Contractor's sole expense after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4 or may exercise any other commercially reasonable remedies to compensate Owner for any expenses losses or damage caused by such nonconforming work.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

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§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made at an appropriate time as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities having jurisdiction. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be

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present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's and Owner Representative services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST
NOT USED.

§ 13.7 TIME LIMITS ON CLAIMS
NOT USED.

§ 13.8 NON-DISCRIMINATION, AFFIRMATIVE ACTION, GOVERNOR'S EXECUTIVE ORDERS, AND OTHER MISCELLANEOUS PROVISIONS
§ 13.8.1 NONDISCRIMINATION. References in this section to "Contract" shall mean this Contract and references to "Contractor" shall mean the Contractor.

(a) For purposes of this Section, the following terms are defined as follows: (i) "Commission" means the Commission on Human Rights and Opportunities; (ii) "Contract" and "contract" include any extension or modification of the Contract or contract; (iii) "Contractor" and "contractor" include any successors or assigns of the Contractor or contractor; (iv) "Gender identity or expression" means a person's gender-related identity, appearance or behavior, whether or not that gender-related identity, appearance or behavior is different from that traditionally associated with the person's physiology or assigned sex at birth, which gender-related identity can be shown by providing evidence including, but not limited to, medical history, care or treatment of the gender-related identity, consistent and uniform assertion of the gender-related identity or any other evidence that the gender-related identity is sincerely held, part of a person's core identity or not being asserted for an improper purpose; (v) "good faith" means that degree of diligence which a reasonable person would exercise in the performance of legal duties and obligations; (vi) "good faith efforts" shall include, but not be limited to, those reasonable initial efforts necessary to comply with statutory or regulatory requirements and additional or substituted efforts when it is determined that such initial efforts will not be sufficient to comply with such requirements; (vii) "marital status" means being single, married as recognized by the State of Connecticut, widowed, separated or divorced; (viii) "mental disability" means one or more mental disorders, as defined in the most recent edition of the American Psychiatric Association's "Diagnostic and Statistical Manual of Mental Disorders", or a record of or regarding a person as having one or more such disorders; (ix) "minority business enterprise" means any small contractor or supplier of materials fifty-one percent or more of the capital stock, if any, or assets of which is owned by a person or persons: (1) who are active in the daily affairs of the enterprise, (2) who have the power to direct the management and policies of the enterprise, and (3) who are members of a minority, as such term is defined in subsection (a) of Connecticut General Statutes § 32-9n; and (x) "public works contract" means any agreement between any individual, firm or corporation and the

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State or any political subdivision of the State other than a municipality for construction, rehabilitation, conversion, extension, demolition or repair of a public building, highway or other changes or improvements in real property, or which is financed in whole or in part by the State, including, but not limited to, matching expenditures, grants, loans, insurance or guarantees.

For purposes of this Section, the terms "Contract" and "contract" do not include a contract where each contractor is (1) a political subdivision of the state, including, but not limited to, a municipality, (2) a quasi-public agency, as defined in Conn. Gen. Stat. Section 1-120, (3) any other state, including but not limited to any federally recognized Indian tribal governments, as defined in Conn. Gen. Stat. Section 1-267, (4) the federal government, (5) a foreign government, or (6) an agency of a subdivision, agency, state or government described in the immediately preceding enumerated items (1), (2), (3), (4) or (5).

(b) (1) The Contractor agrees and warrants that in the performance of the Contract such Contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, mental retardation, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by such Contractor that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the State of Connecticut; and the Contractor further agrees to take affirmative action to insure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to their race, color, religious creed, age, marital status, national origin, ancestry, sex, gender identity or expression, mental retardation, mental disability or physical disability, including, but not limited to, blindness, unless it is shown by the Contractor that such disability prevents performance of the work involved; (2) the Contractor agrees, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, to state that it is an "affirmative action-equal opportunity employer" in accordance with regulations adopted by the Commission; (3) the Contractor agrees to provide each labor union or representative of workers with which the Contractor has a collective bargaining Agreement or other contract or understanding and each vendor with which the Contractor has a contract or understanding, a notice to be provided by the Commission, advising the labor union or workers' representative of the Contractor's commitments under this section and to post copies of the notice in conspicuous places available to employees and applicants for employment; (4) the Contractor agrees to comply with each provision of this Section and Connecticut General Statutes §§ 46a-68e and 46a-68f and with each regulation or relevant order issued by said Commission pursuant to Connecticut General Statutes §§ 46a-56, 46a-68e and 46a-68f; and (5) the Contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the Commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Contractor as relate to the provisions of this Section and Connecticut General Statutes § 46a-56. If the contract is a public works contract, the Contractor agrees and warrants that he will make good faith efforts to employ minority business enterprises as subcontractors and suppliers of materials on such public works projects.

(c) Determination of the Contractor's good faith efforts shall include, but shall not be limited to, the following factors: The Contractor's employment and subcontracting policies, patterns and practices; affirmative advertising, recruitment and training; technical assistance activities and such other reasonable activities or efforts as the Commission may prescribe that are designed to ensure the participation of minority business enterprises in public works projects.

(d) The Contractor shall develop and maintain adequate documentation, in a manner prescribed by the Commission, of its good faith efforts.

(e) The Contractor shall include the provisions of subsection (b) of this Section in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the State and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the Commission. The Contractor shall take such action with respect to any such subcontract or purchase order as the Commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with Connecticut General Statutes §46a-56; provided if such Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Commission, the Contractor may request the State of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the State and the State may so enter.

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(f) The Contractor agrees to comply with the regulations referred to in this Section as they exist on the date of this Contract and as they may be adopted or amended from time to time during the term of this Contract and any amendments thereto.

(g) (1) The Contractor agrees and warrants that in the performance of the Contract such Contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of sexual orientation, in any manner prohibited by the laws of the United States or the State of Connecticut, and that employees are treated when employed without regard to their sexual orientation; (2) the Contractor agrees to provide each labor union or representative of workers with which such Contractor has a collective bargaining Agreement or other contract or understanding and each vendor with which such Contractor has a contract or understanding, a notice to be provided by the Commission on Human Rights and Opportunities advising the labor union or workers' representative of the Contractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment; (3) the Contractor agrees to comply with each provision of this section and with each regulation or relevant order issued by said Commission pursuant to Connecticut General Statutes § 46a-56; and (4) the Contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the Commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the Contractor which relate to the provisions of this Section and Connecticut General Statutes § 46a-56.

(h) The Contractor shall include the provisions of the foregoing paragraph in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the State and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the Commission. The Contractor shall take such action with respect to any such subcontract or purchase order as the Commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with Connecticut General Statutes § 46a-56; provided, if such Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Commission, the Contractor may request the State of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the State and the State may so enter.

§ 13.8.2 This Contract is subject to the provisions of **Executive Order No. 3 of Governor Thomas J. Meskill promulgated June 16, 1971**, concerning labor employment practices, **Executive Order No. Seventeen of Governor Thomas J. Meskill**, promulgated February 15, 1973, concerning the listing of openings and **Executive Order No. Sixteen of Governor John G. Rowland**, promulgated August 4, 1999, concerning violence in the workplace, all of which are incorporated into and are made a party of this Contract as if they had been fully set forth herein. At the Contractor's request, the Owner shall provide a copy of these orders to the Contractor. The Contract may also be subject to **Executive Order No. 7C of Governor M. Jodi Rell**, promulgated July 13, 2006, concerning contracting reforms and **Executive Order No. 14 of Governor M. Jodi Rell**, promulgated April 17, 2006, concerning procurement of cleaning products and services, in accordance with their respective terms and conditions.

§13.8.3 ETHICS AND COMPLIANCE

In accordance with the Owner's compliance program, the Owner has in place an anonymous ethics and compliance reporting hotline service – 1-888-685-2637. Any person who is aware of unethical practices, fraud, violation of state laws or regulations or other concerns relating to Owner policies and procedures can report such matters anonymously. Such persons may also directly contact the Owner's compliance office at: Office of Audit, Compliance, and Ethics, 9 Walters Avenue, Unit 5084, Storrs, CT 06269-5084; Phone 860-486-4526; Fax 860-486-4527. As a provider of goods and/or services to the Owner, you are hereby required to notify your employees, as well as any subcontractors, who are involved in the implementation of this contract, of this reporting mechanism.

§13.8.4 CAMPAIGN CONTRIBUTION RESTRICTIONS

For all State contracts as defined in P.A. 10-1 having a value in a calendar year of $50,000 or more or a combination or series of such agreements or contracts having a value of $100,000 or more, the authorized signatory to this Contract expressly acknowledges receipt of the State Elections Enforcement Commission's notice advising state contractors of state campaign contribution and solicitation prohibitions, and will inform its principals of the contents of the notice (SEEC Form 11) below:

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SEEC FORM 11
CONNECTICUT STATE ELECTIONS ENFORCEMENT COMMISSION
Rev. 1/11

NOTICE TO EXECUTIVE BRANCH STATE CONTRACTORS AND PROSPECTIVE STATE CONTRACTORS OF CAMPAIGN CONTRIBUTION AND SOLICITATION LIMITATIONS

This notice is provided under the authority of Connecticut General Statutes §9-612(g)(2), as amended by P.A. 10-1, and is for the purpose of informing state contractors and prospective state contractors of the following law (italicized words are defined on the reverse side of this page).

CAMPAIGN CONTRIBUTION AND SOLICITATION LIMITATIONS

No *state contractor, prospective state contractor, principal of a state contractor or principal of a prospective state contractor*, with regard to a *state contract* or *state contract solicitation* with or from a state agency in the executive branch or a quasi-public agency or a holder, or principal of a holder of a valid prequalification certificate, shall make a contribution to (i) an exploratory committee or candidate committee established by a candidate for nomination or election to the office of Governor, Lieutenant Governor, Attorney General, State Comptroller, Secretary of the State or State Treasurer, (ii) a political committee authorized to make contributions or expenditures to or for the benefit of such candidates, or (iii) a party committee (which includes town committees).

In addition, no holder or principal of a holder of a valid prequalification certificate, shall make a contribution to (i) an exploratory committee or candidate committee established by a candidate for nomination or election to the office of State senator or State representative, (ii) a political committee authorized to make contributions or expenditures to or for the benefit of such candidates, or (iii) a party committee.

On and after January 1, 2011, no state contractor, prospective state contractor, principal of a state contractor or principal of a prospective state contractor, with regard to a state contract or state contract solicitation with or from a state agency in the executive branch or a
quasi-public agency or a holder, or principal of a holder of a valid prequalification certificate, shall **knowingly** *solicit* contributions from the state contractor's or prospective state contractor's employees or from a *subcontractor* or *principals of the subcontractor* on behalf of (i)
an exploratory committee or candidate committee established by a candidate for nomination or election to the office of Governor,
Lieutenant Governor, Attorney General, State Comptroller, Secretary of the State or State Treasurer, (ii) a political committee authorized to make contributions or expenditures to or for the benefit of such candidates, or (iii) a party committee.

DUTY TO INFORM

State contractors and prospective state contractors are required to inform their principals of the above prohibitions, as applicable, and the possible penalties and other consequences of any violation thereof.

PENALTIES FOR VIOLATIONS

Contributions or solicitations of contributions made in violation of the above prohibitions may result in the following civil and criminal penalties:

Civil penalties—Up to $2,000 or twice the amount of the prohibited contribution, whichever is greater, against a principal or a contractor. Any state contractor or prospective state contractor which fails to make reasonable efforts to comply with the provisions requiring notice to its principals of these prohibitions and the possible consequences of their violations may also be subject to civil penalties of up to $2,000 or twice the amount of the prohibited contributions made by their principals.

Criminal penalties—Any knowing and willful violation of the prohibition is a Class D felony, which may subject the violator to imprisonment of not more than 5 years, or not more than $5,000 in fines, or both.

CONTRACT CONSEQUENCES

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In the case of a state contractor, contributions made or solicited in violation of the above prohibitions may resulting the contract being voided.

In the case of a prospective state contractor, contributions made or solicited in violation of the above prohibitions shall result in the contract described in the state contract solicitation not being awarded to the prospective state contractor, unless the State Elections Enforcement Commission determines that mitigating circumstances exist concerning such violation.

The State shall not award any other state contract to anyone found in violation of the above prohibitions for a period of one year after the election for which such contribution is made or solicited, unless the State Elections Enforcement Commission determines that mitigating circumstances exist concerning such violation.

Additional information may be found on the website of the State Elections Enforcement Commission, www.ct.gov/seec. Click on the link to "Lobbyist/Contractor Limitations."

DEFINITIONS

"State contractor" means a person, business entity or nonprofit organization that enters into a state contract. Such person, business entity or nonprofit organization shall be deemed to be a state contractor until December thirty-first of the year in which such contract terminates. "State contractor" does not include a municipality or any other political subdivision of the state, including any entities or associations duly created by the municipality or political subdivision exclusively amongst themselves to further any purpose authorized by statute or charter, or an employee in the executive or legislative branch of state government or a quasi-public agency, whether in the classified or unclassified service and full or part-time, and only in such person's capacity as a state or quasi-public agency employee.

"Prospective state contractor" means a person, business entity or nonprofit organization that (i) submits a response to a state contract solicitation by the state, a state agency or a quasi-public agency, or a proposal in response to a request for proposals by the state, a state agency or a quasi-public agency, until the contract has been entered into, or (ii) holds a valid prequalification certificate issued by the Commissioner of Administrative Services under section 4a-100. "Prospective state contractor" does not include a municipality or any other political subdivision of the state, including any entities or associations duly created by the municipality or political subdivision exclusively amongst themselves to further any purpose authorized by statute or charter, or an employee in the executive or legislative branch of state government or a quasi-public agency, whether in the classified or unclassified service and full or part-time, and only in such person's capacity as a state or quasi-public agency employee.

"Principal of a state contractor or prospective state contractor" means (i) any individual who is a member of the board of directors of, or has an ownership interest of five per cent or more in, a state contractor or prospective state contractor, which is a business entity, except for an individual who is a member of the board of directors of a nonprofit organization, (ii) an individual who is employed by a state contractor or prospective state contractor, which is a business entity, as president, treasurer or executive vice president, (iii) an individual who is the chief executive officer of a state contractor or prospective state contractor, which is not a business entity, or if a state contractor or prospective state contractor has no such officer, then the officer who duly possesses comparable powers and duties, (iv) an officer or an employee of any state contractor or prospective state contractor who has *managerial or discretionary responsibilities with respect to a state contract,* (v) the spouse or a *dependent child* who is eighteen years of age or older of an individual described in this subparagraph, or (vi) a political committee established or controlled by an individual described in this subparagraph or the business entity or nonprofit organization that is the state contractor or prospective state contractor.

"State contract" means an agreement or contract with the state or any state agency or any quasi-public agency, let through a procurement process or otherwise, having a value of fifty thousand dollars or more, or a combination or series of such agreements or contracts having a value of one hundred thousand dollars or more in a calendar year, for (i) the rendition of services, (ii) the furnishing of any goods, material, supplies, equipment or any items of any kind, (iii) the construction, alteration or repair of any public building or public work, (iv) the acquisition, sale or lease of any land or building, (v) a licensing arrangement, or (vi) a grant, loan or loan guarantee. "State contract" does not include any agreement or contract with the state, any state agency or any quasi-public agency that is exclusively federally funded, an education loan, a loan to an individual for other than commercial purposes or any agreement or contract between the state or any state agency and the United States Department of the Navy or the United States Department of Defense.

"State contract solicitation" means a request by a state agency or quasi-public agency, in whatever form issued, including, but not limited to, an invitation to bid, request for proposals, request for information or request for quotes, inviting bids, quotes or other types of submittals, through a competitive procurement process or another process authorized by law waiving competitive procurement.

"Managerial or discretionary responsibilities with respect to a state contract" means having direct, extensive and substantive responsibilities with respect to the negotiation of the state contract and not peripheral, clerical or ministerial responsibilities.

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"Dependent child" means a child residing in an individual's household who may legally be claimed as a dependent on the federal income tax of such individual.

"Solicit" means (A) requesting that a contribution be made, (B) participating in any fund-raising activities for a candidate committee, exploratory
committee, political committee or party committee, including, but not limited to, forwarding tickets to potential contributors, receiving contributions for transmission to any such committee or bundling contributions, (C) serving as chairperson, treasurer or deputy treasurer of any such committee, or (D) establishing a political committee for the sole purpose of soliciting or receiving contributions for any committee. Solicit does not include: (i) making a contribution that is otherwise permitted by Chapter 155 of the Connecticut General Statutes; (ii) informing any person of a position taken by a candidate for public office or a public official, (iii) notifying the person of any activities of, or contact information for, any candidate for public office; or (iv) serving as a member in any party committee or as an officer of such committee that is not otherwise prohibited in this section.

"Subcontractor" means any person, business entity or nonprofit organization that contracts to perform part or all of the obligations of a state contractor's state contract. Such person, business entity or nonprofit organization shall be deemed to be a subcontractor until December thirty first of the year in which the subcontract terminates. "Subcontractor" does not include (i) a municipality or any other political subdivision of the state, including any entities or associations duly created by the municipality or political subdivision exclusively amongst themselves to further any purpose authorized by statute or charter, or (ii) an employee in the executive or legislative branch of state government or a quasi-public agency, whether in the classified or unclassified service and full or part-time, and only in such person's capacity as a state or quasi-public agency employee.

"Principal of a subcontractor" means (i) any individual who is a member of the board of directors of, or has an ownership interest of five per cent or more in, a subcontractor, which is a business entity, except for an individual who is a member of the board of directors of a nonprofit organization, (ii) an individual who is employed by a subcontractor, which is a business entity, as president, treasurer or executive vice president, (iii) an individual who is the chief executive officer of a subcontractor, which is not a business entity, or if a subcontractor has no such officer, then the officer who duly possesses comparable powers and duties, (iv) an officer or an employee of any subcontractor who has managerial or discretionary responsibilities with respect to a subcontract with a state contractor, (v) the spouse or a dependent child who is eighteen years of age or older of an individual described in this subparagraph, or (vi) a political committee established or controlled by an individual described in this subparagraph or the business entity or nonprofit organization that is the subcontractor.

§ 13.8.5 WHISTLEBLOWING:

This Contract is subject to the provisions of § 4-61dd of the Connecticut General Statutes. In accordance with this statute, if an officer, employee or appointing authority of the Contractor takes or threatens to take any personnel action against any employee of the Contractor in retaliation for such employee's disclosure of information to any employee of the Contracting state or quasi-public agency or the Auditors of Public Accounts or the Attorney General under the provisions of subsection (a) of such statute, the Contractor shall be liable for a civil penalty of not more than five thousand dollars for each offense, up to a maximum of twenty per cent of the value of this Contract. Each violation shall be a separate and distinct offense and in the case of a continuing violation, each calendar day's continuance of the violation shall be deemed to be a separate and distinct offense. The Ownermay request that the Attorney General bring a civil action in the Superior Court for the Judicial District of Hartford to seek imposition and recovery of such civil penalty. In accordance with subsection (f) of such statute, each large state Contractor, as defined in the statute, shall post a notice of the provisions of the statute relating to large state Contractors in a conspicuous place which is readily available for viewing by the employees of the Contractor.

§ 13.8.6 COMPLIANCE WITH OWNER POLICIES AND GUIDELINES

At a minimum, the Contractor shall comply with established Owner policies and guidelines, which have been previously provided to bidders and/or are available for review upon request. These policies are hereby incorporated by reference herein, including but not limited to: Policies on Lockout/Tagout; Confined Space Entry as referenced in the Contractor's Environmental Health and Safety Manual; Code of Conduct; Sexual Harassment; Racism and Acts of Intolerance; Smoking.

§ 13.9 PREFERENCE IN EMPLOYMENT

§ 13.9.1 In the employment of labor to perform the work specified herein, preference shall be given to citizens of the United States, who are, and continuously for three months prior to the date hereof have been residents of the labor market areas, as established by the Labor Commissioner in which said work is to be done; and if no such qualified persons are available, then to citizens who have continuously resided in the county in which the work is to be performed for at least three months prior to the date hereof and then to citizens of the State who have continuously resided in the State at least three months prior to the date hereof. In no event shall said provisions be

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deemed to abrogate or supersede in any manner any provision regarding residence requirements contained in a Collective Bargaining Agreement to which the Contractor is a party.

§ 13.10 MINIMUM WAGE RATES

§ 13.10.1 If this project involves new construction of a building or other structure or improvement and the total cost of all Work to be performed by Contractors and Subcontractors is $400,000 or more or if the project involves remodeling, refurbishing, rehabilitation, alteration or repair of a building or other structure or improvement and such total cost is $100,000 or more then:

.1 The wages paid on an hourly basis to any mechanic, laborer or workman employed upon the work herein contracted to be done and the amount of payment or contribution paid or payable on behalf of each such employee to any employee welfare fund as defined in Subsection (i) of Section 31-53 of the Connecticut General Statutes shall be at a rate equal to the rate customary or prevailing for the same work in the same trade or occupation in the town in which such project is being constructed. Any Contractor who is not obligated by agreement to make payment or contribution on behalf of such employees to any such employee welfare fund shall pay to each employee as part of his wages the amount of payment or contribution for his classification on each payday.

§ 13.10.2 The State of Connecticut Labor Department Wage Schedule where required shall be provided with these documents typically with the Bidding Documents, or will be incorporated in the Contract Documents as an Addendum. The Contractor agrees to accept the current prevailing wage scale as well as any annual adjustment to the prevailing wage scale as provided by the Connecticut Department of Labor. Wage Rates will be posted each July 1st on the Department of Labor's website: www.ctdol.state.ct.us. Such prevailing wage adjustment will not be considered a basis for an annual contract amendment. The schedule is deemed to reflect customary or prevailing wages for this project and is hereby incorporated and made a part of the Contract Documents. Wage Rates shall be paid pursuant to Sections 31-53 and 31-54 of the Connecticut General Statutes and any regulations issued there under.

§ 13.11 HOURS OF LABOR PERMITTED

§ 13.11.1 Pursuant to Section 31-57 of the Connecticut General Statutes, no person shall be employed to work or be permitted to work more than eight hours in any day or more than forty hours in any week on any work provided for in the Contract. The operation of such limitation of hours of work may be suspended during an emergency upon the approval of the Owner Representative.

§ 13.12 EXAMINING AND COPYING CONTRACTOR'S RECORDS

§ 13.12.1 The Contractor shall permit the Owner or its duly authorized representative to examine and copy books and records of the Contractor relative to charges for extra work, alleged breaches of contract, settlement of claims, or any other matter involving the Contractor's demand for added compensation from the Owner. The Contractor shall also permit such examination and copying of his records as the Owner may deem necessary, excepting papers and records preceding the execution of the Contract that are not a matter of record with the Owner, in order to determine that the Contractor has complied with all laws and regulations pertaining to the Contract, such as but not limited to Labor Compliance, Affirmative Action Program and Equal Employment Opportunity.

§ 13.12.2 The Contractor further agrees that he shall keep all records relating to this Contract until the expiration of six (6) years after final payment under this Contract is made, or six (6) months after settlement of any disputes whichever may be later.

§ 13.12.3 The Contractor further agrees that he and his Subcontractors shall permit the Owner, at its own expense, by its duly authorized representatives, to inspect and audit all their data, records and files pertaining to this Contract.

§ 13.13 SYSTEM LAYOUT DRAWING

§ 13.13.1 System layouts indicated on the on the drawings are generally diagrammatic and locations and arrangements of items are approximate. Exact routing of conduit, wiring, location of fixtures, outlets, panels, piping, valves and all other equipment shall be governed by the structural conditions and obstructions. The entire layout shall be followed as closely as possible and the right is reserved by the Owner to reasonably change the locations to accommodate any conditions which may arise during the progress of the work without additional compensation to the Contractors.

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§ 13.14 GUARANTY OF PERFORMANCE

§ 13.14.1 If the Contractor has submitted the financial statement of a parent or other affiliated entity in its Proposers Qualification Statement, or if pre-qualified, its application for pre-qualification and has also indicated in that submission that such parent or affiliate will guarantee the performance of the Contract, then the parent or affiliate shall execute, simultaneously, with the Contractor's execution of the Contract, a Guaranty in a form provided by and acceptable to the Owner.

§13.15 JOINT VENTURE

§ 13.15.1 If the Contractor is a joint venture, each joint venture partner shall be jointly, severally and individually responsible to the Owner for the performance of any and all obligations of the Contractor encompassed by this contract or as required by applicable law, and each joint venture partner shall be jointly, severally and individually liable to the Owner for any failures to perform such obligations in accordance with the contract or applicable law. In its dealings with the Owner, each joint venture partner shall have full authority to act in behalf of and bind the joint venture and any other joint venture partner. Each joint venture partner shall be considered to be the agent of the joint venture and of any other joint venture partner.

§13.16 WORKER GEOGRAPHIC DISTRIBUTION

§13.16.1 If the Project is a Covered Project (as defined hereinafter), the Contractor shall comply with the provisions of this Section 13.16.

§13.16.2 The Contractor shall submit to the Owner a plan for encouraging the hiring of Workers (as defined hereinafter) with Residence (as defined hereinafter) in the State of Connecticut.

§13.16.3 Following the close of each Quarter (as defined hereinafter), the Contractor shall submit a Worker Geographic Distribution Report (as defined hereinafter) to the Owner in a form satisfactory to the Owner. The "Worker Geographic Distribution Report" is a report that shall provide the following information for each Worker paid, during the most recently closed Quarter, for work on the Project:

- **.1** The numbers of hours of Project work for which such Worker was paid during such Quarter.
- **.2** The Wages (as defined hereinafter) paid to such Worker during such Quarter.
- **.3** The Residence of such Worker as of the close of such Quarter.

§13.16.4 The Worker Geographic Distribution Report shall not contain any personally identifiable information about a Worker.

§13.16.5 The following terms shall have the meaning assigned below for the purposes of this Section 13.16.

- **.1** "Covered Project" is a project that is both subject to Section 31-53(a) of the Connecticut General Statutes and for which the total cost of all work to be performed by all contractors and subcontractors is $1,000,000 or greater.
- **.2** "Quarter" means a calendar quarter of each calendar year.
- **.3** "Residence" is the state and town in which a Worker resides, as reflected in the payroll records of such Worker's employer.
- **.4** "Subcontractor" is any subcontractor or sub-subcontractor of the Contractor, which subcontractor or sub-subcontractor employs Workers on the Project.
- **.5** "Wages" are the wages that are subject to Section 31-53(a) of the Connecticut General Statutes (including any amounts paid to an employee welfare fund).
- **.6** "Worker" is an employee of the Contractor or a Subcontractor (as defined hereinabove), which employee is working on the Project and whose wages for such work is subject to Section 31-53(a) of the Connecticut General Statutes.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of sixty (60) consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

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.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped; or
.2 An act of government, such as a declaration of national emergency that requires all Work to be stopped.
.3 Not Used.
.4 Not Used.

§ 14.1.2 Not Used.

§ 14.1.3 If one of the reasons described in Section 14.1.1 exists, the Contractor may, upon seven (7) days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery.

§ 14.1.4 If the Work is stopped for a period of sixty (60) consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven (7) additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may, without prejudice to or waiving any other right or remedy of the Owner, terminate the Contract if the Contractor

.1 refuses or fails to supply enough properly skilled workers or proper materials;
.2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
.3 disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;
.4 otherwise is guilty of substantial breach of a provision of the Contract Documents;
.5 Fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with all requirements of the Contract Documents;
.6 Refuses or fails to prosecute the Work or any separable part, with the diligence that will insure its completion within the time specified in this Contract including any duly authorized extension, or fails to compete the Work within said period; or
.7 Fails to comply with laws, rules, regulations, or directives regarding job site safety; or to comply with the provisions of the Owner's Contractor Environmental Health and Safety Manual , or orders or directives regarding safety issued by the Owner pursuant to the Contract.

§ 14.2.2 When any of the above reasons exist, the Owner, with advice of the Architect and upon certification by the Initial Decision Maker, determines that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven (7) days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
.2 Accept assignment of subcontracts pursuant to Section 5.4;
.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work; and
.4 Terminate the Contractor's right to proceed with a separate part of the Work if the Owner so elects.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be retained by the Owner. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case

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may be, shall be certified by the Architect and Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause and without prejudice to or waiving any other right or remedy of the Owner, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, without prejudice or waiving any other right or remedy of the Owner, terminate the Contract in whole or in part for the Owner's convenience and without cause. Termination by the Owner under this Section shall be by a Notice of Termination delivered to the Contractor specifying the extent of termination and the effective date.

§ 14.4.2 Upon receipt of a Notice of Termination for convenience, the Contractor shall immediately, in accordance with instructions from the Owner, proceed with performance of the following duties regardless of delay in determining or adjusting amounts due under this Section:

- **.1** Cease operations as specified in the notice;
- **.2** Place no further orders and enter into no further Subcontracts for materials, labor, services or facilities except as necessary to complete continued portions of the Contract;
- **.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.
- **.4** Proceed to complete the performance of Work not terminated;
- **.5** Take actions that may be necessary or that the Owner may direct for the protection and preservation of the terminated Work.

§ 14.4.3 Upon such termination, the Contractor shall recover as its sole remedy, payment for Work properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely purchased or fabricated off the Project site, delivered and stored in accordance with the Owner's instructions plus demobilization costs. The Contractor hereby waives and forfeits all other claims for payment and damages, including without limitation, anticipated profits.

§14.4.4 The Owner shall be credited for (1) payments previously made to the Contractor for the terminated portion of the Work; (2) claims which the Owner has against the Contractor under the Contract and (3) the value of the materials, supplies, equipment or other items that are to be disposed of by the Contractor that are part of the Contract Sum.

§14.4.5 The payment to the Contractor pursuant to this Section may not exceed the total Contract Price as reduced by:

- **.1** The amount of payments previously made
- **.2** The Contract price of work not terminated.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension or time, and/or other relief with respect to the terms of the Contract.

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The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

Claims by the Contractor must be initiated by written notice to the Owner Representative as described in Section 1.1.1.1 and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by the Contractor must be initiated within twenty-one (21) days after occurrence of the event giving rise to such Claim or within fourteen (14) days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims may also be reserved by the Contractor in writing within the time limits set forth in this Section 15.1.2. If a Claim is reserved, the Resolution of Claims and Disputes procedures described in Article 15 shall not commence until a written notice from the Contractor is received by the Owner Representative. No such claim shall be valid unless so made. Any notice of Claim or reservation of Claim must clearly identify the alleged cause and the nature of the Claim and include data and information then available to the claimant that will facilitate prompt verification and evaluation of the Claim.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

§ 15.1.4.1 If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§15.1.4.2 If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) Owner's suspension or (7) other reasonable grounds, Claim shall be made in accordance with the provisions of this Article 15.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. No such claim shall be valid unless made in accordance with the provisions of this Article 15. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

NOT USED.

§ 15.1.7 Injury or Damage to Person or Property. If the Contractor suffers injury or damage to person or property because of an act or omission of the Owner Representative, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding twenty-one (21) days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 15.1.8 Claims for Concealed or Unknown Conditions: If, upon or subsequent to the Contractor's and its Subcontractors' site visits and performance of the tests, examinations and inspections required by Section 3.2.2, the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor will promptly provide notice to the

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Owner and the Architect before conditions are disturbed and in no event later than 5 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different in the respects noted above and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. Any claim by the Contractor in opposition to such determination must be made within 21 days after the Architect has given notice of the recommendation. The Owner Representative will have the final authority to accept or reject the Architect's recommendations, which decision by the Owner Representative shall be subject to further proceedings pursuant to Article 15.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims by the Contractor, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the AIA 101-2007 Section 6.1 of the Contract. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, regardless of (1) whether such matters relate to execution and progress of the Work, or (2) the extent to which the Work has been completed. The decision by the Initial Decision Maker in response to a Claim shall not be a condition precedent to arbitration or litigation in the event (1) the position of Initial Decision Maker is vacant, (2) the Contractor has not provided evidence or (3) the Initial Decision Maker has failed to take action required under Section 15.2.2 within thirty (30) days after the Claim is made.

§ 15.2.2 The Initial Decision Maker will review Claims by the Contractor and within thirty (30) days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims of the Contractor, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim of the Contractor or to furnish additional supporting data, such party shall respond, within ten (10) days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.4.1 If a Claim of the Contractor has not been resolved after consideration of the foregoing, the Initial Decision Maker will render a written decision on the claim, including any change in the Contract Sum or Contract Time or both, which decision shall be final and binding but subject to meeting and mediation pursuant to Section 15.3 of this document and arbitration or litigation pursuant to Connecticut General Statutes Section 4-61 and Section 15.4 of this Contract to the extent applicable.

§ 15.2.5 NOT USED.

§ 15.2.6 NOT USED.

§ 15.2.6.1 NOT USED.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

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§ **15.2.8** NOT USED.

§ 15.3 MEDIATION

§ **15.3.1** Claims of the Contractor except those waived as provided for in Section 9.10.5 shall be submitted to the meeting and mediation process described in the Sections which follow, prior to and as a precondition to the Contractor pursuing any other available remedy. Claims by the Owner, at the option of the Owner, may be submitted to such meeting process and/or mediation process, and, in such event, Contractor shall be required to submit to and participate in such a meeting and/or mediation. The meeting shall be between the parties and attended by individuals with decision-making authority regarding the dispute, to attempt in good faith to negotiate a resolution of the dispute.

§ **15.3.2** The meeting referenced in Section 15.3.1 shall be held promptly, but not less than fourteen (14) calendar days after a party's request for the meeting. The Contractor shall not submit any claim to mediation in accordance with the provisions of Sections 15.3.1 through 15.3.6 until fourteen (14) calendar days after the date of the meeting.

§ **15.3.3** In connection with any such mediation, a request for mediation shall be made in writing, delivered to the other party to the Contract. The request may be made concurrently with the filing of applicable binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of sixty (60) calendar days from the date of filing, unless stayed for a different period of time by agreement of the parties or as modified by court order.

§ **15.3.4** The parties will jointly appoint a mutually acceptable mediator, seeking assistance in such regard from a mutually agreed upon dispute resolution entity if they have been unable to agree upon such appointment within twenty (20) calendar days from the submittal of the request for mediation. If the parties are unable to agree on the dispute resolution entity, the mediation shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of this Contract.

§ **15.3.5** The parties agree to participate in good faith in the mediation and negotiations related thereto for a period of sixty (60) calendar days from the date of submittal, or until the parties reach impasse as evidenced by a letter from a party to the mediator, whichever first occurs. If the parties are not successful in resolving the dispute through mediation, then the parties may pursue other legal remedies available to them.

§ **15.3.6** Should the Owner request, the Contractor agrees to participate as a party in any mediation proceeding between the Owner and the Architect or other Consultant for the Project in which construction deficiencies, contract breaches, or other alleged wrongful acts by the Contractor are alleged.

§ 15.4 ARBITRATION OR LITIGATION OF CLAIMS

§ **15.4.1** NOT USED.

§ **15.4.1.1** NOT USED.

§ **15.4.2** NOT USED.

§ **15.4.3** NOT USED.

§ **15.4.4** Should the Owner have a claim against the Contractor, the parties agree that the Owner, whether or not it elects to proceed with the meeting process or mediation described in Section 15.3, shall have the option of either prosecuting the claim against the Contractor in an appropriate court of general jurisdiction, or by arbitrating the claim by filing a demand for arbitration pursuant to the rules of a dispute resolution entity agreed upon by the parties, except that if the parties cannot agree upon a dispute resolution entity, the rules of the American Arbitration Association shall apply.

§ **15.4.5** Should the Contractor have a claim against the Owner which has not been resolved by mediation or any other procedure set forth in this Contract, the Contractor's rights to assert its claim against the Owner shall be subject to the provisions of Connecticut General Statutes Section 4-61.

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§ 15.4.6 CONSOLIDATION OR JOINDER

§ 15.4.6.1 Should either the Contractor institute an arbitration to the extent authorized by Section 4-61 of the Connecticut General Statutes or the Owner institute an arbitration as set forth herein, the Contractor agrees that any such arbitration may be consolidated, at the Owner's discretion, with any arbitration proceeding involving the Owner and the Architect or other Consultant for the Project in which construction or design deficiencies, breaches of contract, or any other alleged wrongful acts by the Contractor or Architect are alleged.

§ 15.4.6.2 NOT USED.

§ 15.4.6.3 NOT USED.

ARTICLE 16 CODE OF CONDUCT

§ 16.1 CODE OF CONDUCT

§ 16.1.1 In furtherance of its longstanding commitment to fundamental human rights, to the dignity of all people, and to the environment, the Owner has developed the Code of Conduct for University of Connecticut Vendors (the "Vendor Code of Conduct"). The Contractor hereby acknowledges receipt of the Vendor Code of Conduct. A copy of the Vendor Code of Conduct is available at http://csr.uconn.edu/. The Vendor Code of Conduct is hereby incorporated herein by reference to the extent the Contractor is required to comply with the same pursuant to this section.

The Contractor agrees to comply with the "Principal Expectations" described in the Vendor Code of Conduct. The Contractor further agrees to comply with the "Preferential Standards" described in the Vendor Code of Conduct, to the extent a commitment to so comply, or a representation of compliance, was provided by the Contractor to the Owner in writing. Any such commitment or representation is hereby incorporated herein by reference. The Contractor agrees to provide the Owner with such evidence of Contractor's compliance with this section as the Owner reasonably requests and to, at the request of the Owner, provide a comprehensive, annual summary report of the Contractor's corporate social and environmental practices.

ARTICLE 17 BACKGROUND CHECKS

§ 17.1 The Contractor warrants that it will not assign any employee, independent contractor or agent to perform services under this Contract unless that employee, independent contractor or agent has satisfactorily completed a background check and is deemed suitable by the Contractor for performing such services on a college campus attended and inhabited by students. The background check must minimally include criminal arrest information for the past seven years, a check of the national and state sex offender registries and a social security number verification. All fees associated with the background checks shall be the responsibility of the Contractor. The Contractor shall immediately remove any employee, independent contractor or agents performing services under this Contract on campus if it becomes known to the Contractor that such person may be a danger to the health or safety of the campus community, or at the request of the University based on a concern of community or individual safety.

§ 17.2 Without limiting the obligations of the Contractor under § 3.18 of this Contract, the Contractor shall defend, indemnify and hold harmless the state of Connecticut, the University of Connecticut and all of their employees, agents and/or assigns for any claims, suits or proceedings resulting from a breach of the foregoing warranty and/or that are caused in whole or in part by the actions or omissions of the Contractor, its employees, or other persons that the Contractor causes to be on the campus.

ARTICLE 18 UNIVERSITY POLICIES

The Contractor shall, at no additional cost to the University, comply with all policies and procedures of the University. In the event the University establishes new policies or procedures following execution of the contract, or makes modifications to policies or procedures in existence at the time of contract execution, the Contractor shall comply with such new or modified policies or procedures upon written notice.

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ARTICLE 19 SOVEREIGN IMMUNITY

§ 19.1 The parties acknowledge and agree that nothing in this Contract shall be construed as a waiver by the State of Connecticut or the Owner of any rights or defenses of sovereign immunity, which it may have had, now has, or will have with respect to all matters arising out of this Contract. To the extent that this provision conflicts with any other provision hereunder, this provision shall govern.

This document acknowledging agreement to the General Conditions contained herein is entered into as of _____, 2014 and is executed in at least three originals, of which one is to be delivered to the Contractor, one to the Architect for use in the administration of the Contract, and the remainder to the Owner.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
Interim Executive VP for Administration & CFO	
Duly Authorized: CGS §§ 10a-104 and 10a-108	
(Printed name and title)	*(Printed name and title)*
Date:_____	Date:_____

APPROVED AS TO FORM:

_____
Assistant/Associate Attorney General

Date Signed: _____

(Paragraphs deleted)

Init.

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STATE OF CONNECTICUT

UNIVERSITY OF CONNECTICUT

Storrs, Connecticut

UCONN

MAIN ACCUMULATION AREA
MAA
for Regulated Wastes

Project No. 901807

April 6, 2015

100% Construction Documents

Tai Soo Kim Partners, LLC
146 Wyllys Street, Suite 1-203
Hartford, Connecticut 06106

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S101	FOUNDATION DETAILS

MECHANICAL

H001	MECHANICAL SCHEDULE
H101	MECHANICAL PLAN
H102	ROOF MECHANICAL PLAN

FIRE PROTECTION

FP101	FIRE PROTECTION PLAN

PLUMBING

P001	PLUMBING DETAILS
P101	PLUMBING PLAN

ELECTRICAL

E001	ELECTRICAL LEGENDS
E002	ELECTRICAL SCHEDULES
E101	POWER PLAN
E102	LIGHTING PLAN
E103	POWER PLAN ROOF EQUIPMENT

TELECOMMUNICATION

T101	TELECOMMUNICATION

FIRE ALARM

FA101	FIRE ALARM

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SECTION 003132

GEOTECHNICAL DATA

PART 1 - GENERAL

1.01 SUMMARY

A. General:

1. This section includes the Geotechnical Report for the Proposed Main Accumulation Area for the University of Connecticut, Prepared by GZA GeoEnvironmental, Inc., Dated February 17, 2015.

2. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all sections within DIVISION 01- GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

3. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

GZA
GeoEnvironmental, Inc.

Engineers and Scientists

February 17, 2015 (revised from February 26, 2014)
File No. 05.0045269.01

Tai Soo Kim Partners, Inc.
One Hartford Square West
146 Wyllys Street
Hartford, Connecticut 06106

Attention: Mr. T. Whitcomb Iglehart
Principal

Reference: Revised Geotechnical Report
Proposed Main Accumulation Area
University of Connecticut
Storrs, Connecticut

655 Winding Brook Drive, Suite 402
Glastonbury, CT 06033
860-286-8900 (phone)
860-652-8590 (fax)
www.gza.com

Dear Mr. Iglehart:

GZA GeoEnvironmental, Inc. (GZA) is pleased to provide our revised geotechnical report for the subject project in accordance with our January 24, 2014 Agreement and January 13, 2015 Contract Addendum with Tai Soo Kim Partners, Inc. Report Limitations and the terms and conditions of our contracts are attached in Appendix A.

Since our original report was issued on February 26, 2014, the proposed building location has been repositioned on the site and a sanitary sewer alignment identified. This revised report includes additional borings drilled for the proposed sanitary sewer and two additional borings were drilled in the proposed footprint to supplement the previous borings. In addition to providing the boring logs, recommendations have been provided for the sewer alignment and our foundation recommendations for the building updated with the new subsurface information.

Changes to the recommendations include the addition of perimeter foundation drains and pavement edge drains in the area of the loading dock and retaining wall.

PROJECT LOCATION AND EXISTING CONDITIONS

The site location is shown on the attached Figure 1, Locus Plan. The site is in a portion of the Tech Park "Parcel G" along the C-Lot driveway with coordinates of about N41.8133° W72.2653°. The site is bounded to the north by the C-Lot driveway, to the east by tennis courts, to the south by the Celeron Trail and to the west by an overhead utility corridor and easement.

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The proposed project area is about 0.75-acres and is undeveloped and moderately wooded. Occasional boulders were observed at the ground surface and the topographic high located on the southeastern area of the site is a bedrock outcrop.

Existing ground surface elevations shown on the topographic plan[1] range from a low of about El. 592 feet at the northwestern area to a high (on the bedrock outcrop) of about El. 616 feet at the southeastern area of the site. Existing grades are relatively flat in the central portion of the site where the building is located. The southern areas grade downwards at an approximate 5 horizontal to 1 vertical (5H:1V) slope towards the gravel walking path. The ground surface along the western edge of the site grades down to the existing C-Lot driveway at an approximate 3.5H:1V slope. All elevations presented in this report are in units of feet and referenced to project datum.

The northeastern side of the site is at the base of a 3H:1V slope which is about 10 feet-high and supports the tennis courts above. We assume this slope is the fill portion of a cut and fill to create the tennis court area. A stormwater detention pond is located to the south of the tennis courts. The existing stormwater detention pond grades and construction details have not been provided.

PROPOSED DEVELOPMENT

It is our understanding the proposed building will include a radiation lab, a chemical waste characterization lab, waste sorting and storage area, and truck loading dock. The proposed building footprint will be approximately 8,650 square feet and the building may be either one or two levels above grade with a slab-on-grade and no basement. The proposed building has a finish floor at El. 605 feet; El. 603 feet in the loading dock area. Existing grades within the proposed building footprint range from approximately El. 604 feet to the west and El. 608.5 feet to the south.

Two subsurface infiltration/detention systems (Infiltration Trench A and Infiltration Trench B) are proposed within the parking and driveway areas. Trench A is located to the north of the proposed building with an area of approximately 735 square feet and bottom at about El. 598.9 feet. Trench B is located to the south of the proposed building with an area of approximately 1700 square feet and bottom at El. 593.7 feet.

Approximately 12,500 square feet of paved areas are proposed within the parking and drive areas located to the north and south of the proposed building. An approximate 65-foot-long and up to 7-foot-high retaining wall is proposed near the southern corner of the proposed building footprint near the truck loading dock to provide grade separation and support the loading dock drive.

A utility corridor is proposed north of the proposed building footprint. The utilities enter the site from the existing C-Lot Driveway and are oriented in a northwest to southeast direction and connect the eastern corner of the proposed building. Proposed utilities include electric, water, gas and telephone. Additionally, a new sanitary sewer line leaves the eastern corner of

[1] Electronic File entitled: "82TS401to TSKP021814.dwg", by Loureiro Engineering Associates, Inc.

the proposed building and connects to an existing sanitary manhole located southeast of the existing tennis courts. The invert at the proposed building is El. 597 feet and the invert at the existing sanitary manhole is El. 587 feet.

OBJECTIVE AND SCOPE OF SERVICES

The objective of our services was to provide geotechnical design and related construction recommendations for the proposed building, parking lots and driveways, utilities and related site improvements. To accomplish this objective, the following work scope was completed:

- Planned, managed, and observed four days of test boring explorations;
- Performed engineering analyses as required relative to the proposed development; and
- Prepared this geotechnical report.

SUBSURFACE EXPLORATIONS

Ten test borings (GZ-1 to GZ-7, GZ-1A, GZ-2A, GZ-5A-OW) were drilled by Seaboard Drilling of East Longmeadow, Massachusetts on February 4 and 10, 2014 to investigate the site-wide subsurface conditions. Eight test borings (GZ-101 to GZ-106, GZ-102A and GZ-105A) were drilled by Seaboard Drilling on January 26 and 29, 2015 for the proposed relocated building and sanitary sewer line. Borings GZ-1 to GZ-7, GZ-1A, GZ-2A and GZ-5A-OW were located in the field by GZA using GPS methods and the as-drilled locations and elevations were surveyed by Loureiro Engineering Associates, Inc. (Loureiro). The as-drilled locations of borings GZ-101 to GZ-106, GZ-102A and GZ-105A were approximately determined by tape measurement from the proposed building corners and sanitary sewer manholes which were surveyed and marked with stakes by Loureiro.

The ground surface elevations at the boring locations were interpolated from topographic information shown on project plans. The elevations and boring locations should be considered accurate only to the degree implied by the methods used. The boring locations are shown on Figure 2 and the logs are included in Appendix B. A summary of the explorations and subsurface conditions encountered are presented on Table 1.

A GZA engineer observed the explorations, classified the subsurface materials, and prepared exploration logs. The soils were classified according to the modified Burmister classification system. Details of the modified Burmister classification system are attached with the logs in Appendix B.

Split spoon soil samples were obtained at 5-foot intervals or less in accordance with ASTM D1586, the Standard Penetration Test (SPT). The SPT consists of advancing a 1-3/8 inch inside diameter standard split spoon sampler at least 18 inches with a 140-pound hammer dropping from a height of 30 inches. The SPT value, referred to as the “N” value, is the number of blows per foot of penetration required to drive the sampler from 6 to 18 inches of penetration, and is a commonly used indicator of soil density and consistency.

The test borings were advanced to depths ranging from about 4.5 to 22 feet below the ground surface. If drilling refusal was encountered at depths less than approximately 9 to 10 feet, an offset test boring was attempted near the original boring location. This offset test boring was given an "A" designation (i.e. GZ-1A).

NX size (2.1-inch diameter) rock core samples were obtained from GZ-6 to confirm the presence of bedrock and to assess the type and quality of bedrock at the site.

A 2-inch diameter groundwater observation well was installed in GZ-5A OW and was screened from 2 to 12 feet below grade.

LABORATORY TESTING

Three (3) soil samples collected from the borings were tested for grain size distribution to confirm field classification and to provide information on the engineering properties of the site soils. Laboratory test results are presented in Appendix C.

GEOLOGY AND GENERALIZED SUBSURFACE CONDITIONS

The published surficial geology map[2] indicates that naturally-deposited soils in the vicinity of the site are expected to be comprised of sand and gravel overlying glacial till. The sand and gravel is described as ranging from well to poorly sorted and may be layered. Glacial till is described as a dense heterogeneous, well graded and poorly-draining mix of sand, silt, gravel, cobbles, and boulders.

In general, subsurface strata encountered were consistent with the published geology and included:

- 1 to 8 inches of topsoil or forest mat; over
- 2 to 4.4 feet of subsoil; over
- 5.5 to 10.5 feet of sand and gravel (when fully penetrated); over
- Glacial till; or
- Gneiss bedrock.

The subsurface conditions encountered in the borings are described below. Refer to the exploration logs in Appendix B for more detailed descriptions. A summary of explorations and subsurface conditions encountered is presented on Table 1.

Topsoil/Forest Mat

Topsoil/forest mat was encountered in all of the borings and ranged from 1 to 8 inches thick. The topsoil/forest mat generally consisted of brown, fine sand with up to 50 percent silt, and up to 10 percent organic matter.

[2] "Surficial Materials Map of Connecticut", by Stone, J.R., Schafer, J.P., London, E.H., and Thompson, W.B., dated 1992, Scale 1:125000.

Subsoil

Subsoil was encountered in all of the borings below the topsoil/forest mat. The thickness of the subsoil ranged from 1.9 to 4.4 feet, with an average thickness of 2.9 feet. The subsoil generally consisted of brown to orange brown, fine to medium sand with up to 50 percent silt, up to 10 percent gravel and up to 10 percent roots. SPT N-values indicate that the density of the subsoil encountered was loose.

Sand and Gravel

Sand and gravel was encountered in all of the explorations and was fully penetrated by borings GZ-1A, GZ-4, GZ-6, GZ-101, GZ-102A and GZ-104. When fully penetrated, the thickness of the sand and gravel ranged from 5.5 to 10.5 feet, with an average thickness of 7.3 feet. The sand and gravel generally consisted of light brown, fine to coarse sand, with up to 35 percent silt and up to 20 percent gravel. Based on observations during drilling and shallow auger refusals, cobbles and/or boulders are likely to be present in the sand and gravel stratum. SPT N-values indicate that the density of the sand and gravel encountered ranged from medium dense to very dense.

Glacial Till

Glacial till was encountered below the sand and gravel in test borings GZ-1A, GZ-4, GZ-101, GZ-102A and GZ-104 along the northwestern edge of the site. The borings did not fully penetrate the glacial till. The glacial till generally consisted of gray-brown, fine to coarse sand with up to 50 percent clayey silt, and up to 20 percent gravel. SPT N-values indicate that the density of the glacial till encountered ranged from medium dense to very dense.

Bedrock

Drilling refusal was encountered in the majority of the borings except for GZ-1A, GZ-4, GZ-101, and GZ-102A. Drilling refusal is defined as the inability to advance the auger flights downward under the full down pressure of the drill rig and typically indicates either the presence of bedrock or boulders. Off-set test borings were performed at locations GZ-1, GZ-2, GZ-5, GZ-103 and GZ-105 to further evaluate drilling refusals at these locations. Offset boring drilling refusal depths varied which indicates the presence of cobbles and boulders in the sand and gravel strata.

A bedrock outcrop was observed in the southeastern area of the site. The presence of bedrock was confirmed by rock coring at boring GZ-6 which is near the site topographic high point (bedrock outcrop). The top of bedrock at GZ-6 was encountered 8.9 feet below the ground surface, corresponding to El. 604 feet. The bedrock core collected generally consisted of gray, hard, slightly to highly weathered, moderately fractured, fine to coarse grained Gneiss. Photographs of the rock cores are presented in Appendix D.

The Rock Quality Designation (RQD) is defined as the sum of the lengths of pieces of core that are greater than 4 inches in length divided by the length of the core run, and is

an indicator of the intactness of the bedrock. The Rock Quality Designation (RQD) of the rock cores collected was 0 percent for the 3-foot-long initial core run and 33 percent for the 2-foot-long second core run. The RQD and core drilling times per linear foot are indicated on the test boring logs.

The refusal depths and elevations are presented on Table 1. Large boulders could also exist above those elevations indicated in the table because of their random distribution. Based on the results of the drilling program, the bedrock surface elevations should be assumed to vary significantly in short horizontal distances.

Groundwater

Groundwater measurements were made in each borehole and in the installed observation well at GZ-5A OW. Groundwater was encountered in 7 of the 18 explorations at depths ranging from 8.8 to 18 feet below the ground surface. The depths correspond to elevations ranging from approximately El. 581 to 597.5 feet.

Fluctuations of the groundwater levels will occur due to variations in rainfall and other factors different than those prevailing at the time the readings were taken. The observed groundwater levels are shown on the exploration logs in Appendix B and summarized on Table 1.

GEOTECHNICAL DESIGN AND CONSTRUCTION RECOMMENDATIONS

This section presents geotechnical design and construction recommendations. Unless indicated otherwise, these recommendations are consistent with the 2003 International Building Code (IBC), and the Connecticut State Supplements, which together constitute the State of Connecticut Building Code.

Building Foundation Design

The proposed addition can be supported on shallow spread or strip footings bearing on one of the following:

- Naturally-deposited, undisturbed sand and gravel; or
- Naturally-deposited, undisturbed glacial till; or
- Compacted Structural Fill or Crushed Stone bearing on naturally-deposited sand and gravel, glacial till or bedrock.

Recommended net allowable footing bearing pressures and other design criteria are summarized below. These recommendations also apply to foundation walls and retaining wall footings.

Net Allowable Bearing Pressure:	4,000 psf
Minimum Frost Depth:	3.5 feet
Total Unit Weight of Backfill (γ):	130 pcf (compacted Granular Fill or Pervious Structure Backfill)

For footings less than three feet wide, the allowable bearing pressure should be reduced proportionately. Continuous footings should be at least 18 inches wide and isolated footings should be at least 24 inches wide. For frost protection, footings should extend at least 3.5 feet below final exterior grade. Interior footings or footings in heated areas should bear at least 18 inches below the bottom of the floor slab.

Larger bearing pressures could be used for design of footings bearing directly on bedrock. However, since the actual bearing stratum at each footing location will not be confirmed until construction, we recommend that all the footings be designed for the net allowable bearing pressure presented above. This approach will also limit removal of weathered or fractured bedrock present at subgrade level, which would be required if larger bearing pressure were assumed for footing design.

If large boulders are encountered above the bottom-of-footing elevation, we recommend that the boulder be over-excavated at least 12-inches below the bottom of isolated and strip footing elevations and backfilled with compacted Structural Fill or Crushed Stone, placed and compacted in accordance with the recommendations presented herein.

If bedrock is encountered above the bottom-of-footing elevation, we recommend that the exposed excavated bedrock surface be leveled with compacted Structural Fill, Crushed Stone or lean concrete following bedrock excavation to the bottom of footing elevation. Isolated footings should bear entirely on rock, structural fill, or on soil to avoid hard spots that could cause cracking due to uneven stress distribution below the bottom of footing.

Strip footings should not be placed partially on rock and partially on soil unless special provisions are made. These special provisions may include the following:

1. A vertical construction joint in the foundation and wall at the location of the change in the bearing material.

2. Additional reinforcement in the footing at the change in bearing material.

3. Excavation of rock 12 inches below the bottom of the footing and replacement with compacted Structural Fill.

4. A transition zone of at least 20 feet in length is incorporated. Excavate rock to 18 inches below the footing at the change in bearing material. Taper this rock excavation to 6 inches below the footing at 20 feet from the change and backfill with compacted Structural Fill.

For site preparation and foundations designed and constructed in accordance with the recommendations of this report, estimated total building settlements are expected to be less than 1 inch, the majority of which will occur during construction. Maximum anticipated differential settlement between adjacent columns is less than ½ inch.

The coefficient of friction for lateral sliding of foundation walls, retaining walls, slabs, and footings is 0.55 (concrete to soil).

Slabs-On-Grade

The proposed slab-on-grade should bear on a base course consisting of 12 inches of Select Fill, over one of the following:

- Naturally-deposited, undisturbed sand and gravel or glacial till; or
- At least 12 inches of compacted Structural Fill (placed over bedrock or large boulders).

The modulus of subgrade reaction recommended for slab design is 150 pounds per square inch per cubic inch (psi/in^3).

Vapor barrier and waterproofing requirements of the Building Code should be incorporated into the design. Subgrades for slabs-on-grade should be prepared in accordance with the recommendations in the "Footing and Slab-on-Grade Subgrade Preparation in the Proposed Building" section presented later in this report.

Earthquake Design Criteria

Soils at this site are not considered susceptible to liquefaction. Based on available subsurface data and in accordance with Section 1615.1.1 of the 2003 IBC, the Site Class is C.

According to the 2009 Supplement, CT State Building Code, the design response spectra for the town of Mansfield (Storrs), Connecticut should be constructed using the following coefficients:

$S_1 = 0.231g$ $S_s = 0.062g$

where:

- S_S is the spectral acceleration coefficient at 0.2-sec period
- S_1 is the spectral acceleration coefficient at 1.0-sec period

Lateral Earth Pressures

Active (K_a) and passive (K_p) lateral pressure coefficients of 0.33 and 3.0, respectively are recommended for design of retaining walls that are unrestrained at the top. For walls that are restrained at the top, an at-rest (K_o) lateral pressure coefficient of 0.5 is recommended. Total and buoyant unit weights of 130 and 68 pounds per square foot are recommended for compacted fill.

A minimum static surcharge pressure of 250 psf should be used for the design of retaining walls. Surcharge loads should be added to static loads for design.

The recommendations provided above do not include allowance for hydrostatic pressures on the walls. To reduce the possibility of hydrostatic pressures, free draining backfill should be used for wall backfill (Select Fill per the Recommended Fill and Backfill Section) within 3 feet laterally of the back of the wall. Foundation drains are recommended for site retaining walls and for any building walls subject to unbalanced lateral earth pressures (i.e. truck loading dock).

In general, passive pressure against interior column footings should be ignored in calculating lateral load resistance for footings with a shallow embedment. For cases where passive earth pressure is considered to resist lateral loads (i.e., deeply embedded footings), the upper foot of soil should be ignored. Where passive pressure will be used to resist lateral load, the backfill around the footing should be compacted within an area which extends at least 3 feet beyond the footing (at the bottom of the footing) or a horizontal distance equal to at least 2 times the depth from the finish grade to bottom of footing (whichever is greater).

The minimum factors of safety for sliding and overturning of retaining walls under static loads should be 1.5 and 2, respectively. If future excavation for structures or utilities in front of a retaining wall is planned, passive pressure at the toe of the wall should not be included as a resisting force when analyzing for overturning and sliding.

For mechanically stabilized modular block retaining walls, factors of safety and designs should be in accordance with the manufacturer's recommendations and the newest edition of the Design Manual for Segmental Retaining Walls as published by the National Concrete Masonry Association (NCMA).

Pavement Design

Recommended minimum pavement design sections are as follows:

	Light Duty Asphalt	**Heavy Duty Asphalt**
Layer (in descending order)	**Thickness (inches)**	**Thickness (inches)**
Bituminous Finish Course	1.5	1.5
Bituminous Binder Course	1.5	2.5
Base Course	6	6
Subbase Course	8	10

* See Recommended Fill and Backfill Section for material definitions.

For rigid concrete pavement, GZA recommends a minimum 6-inch-thick concrete section underlain by a 6-inch-thick base course and an 8-inch-thick subbase course.

Pavement and Foundation Drains

The proposed building will have a loading dock in the southern area of the proposed building footprint which has a finish floor at El. 603 feet. The exterior grades in the loading dock are at about El. 599 feet. Additionally, an approximate 65-foot-long and up to 7-foot-high retaining wall is proposed at the truck loading dock to facilitate design grade. The bottom of wall is at about El. 599 feet.

Groundwater was observed in the observation well installed in GZ-5OW at 9.5 feet below grade which corresponds to El. 597.5 feet. Therefore, foundation drains are recommended in the proposed building footprint in the loading dock area and pavement drains are recommended in the exterior area of the loading dock.

GZA recommends free-draining wall backfill (Select Fill) and continuous foundation wall drains behind foundation retaining walls for the proposed building loading dock. The wall drain should consist of 6-inch diameter perforated plastic (PVC) pipe surrounded by ¾-inch size crushed stone, which is in turn separated from the wall backfill with a Mirafi 1100N (or equal) non-woven geotextile fabric. The wall backfill should consist of Select Fill within a minimum distance of 3-feet laterally behind the wall.

Measured groundwater levels are more than 7.5 feet below the proposed building slab-on-grade which is at El. 605 feet. Therefore, perimeter foundation drains and underslab drains are not recommended for this portion of the proposed building.

Existing tennis courts are located northeast and upslope of the site. Runoff from the tennis courts and infiltration from the stormwater detention basin to the south of the tennis courts should be considered in the site drainage design.

Landscaped Slopes

Permanent cut and fill slopes in the on-site soils should not be steeper than 2.5H:1V, without special slope treatment. Permanent filled slopes constructed using Granular Fill (as defined in the Recommended Fill and Backfill Section) should not be steeper than 2H:1V.

Footing and Slab-on-Grade Subgrade Preparation for the Proposed Building

Existing topsoil/forest mat, subsoil and other deleterious materials, etc. should be removed in their entirety from within the proposed structure footprints and beneath their zones of influence (defined by a conceptual plane projected down and away from the bottom outside edge of footings at a 1V:1H slope) and within 10 feet of perimeter foundation walls. Excavations created by removal of these materials should be backfilled with compacted Structural Fill.

Exposed naturally-deposited soil subgrades should be surface-compacted by at least four passes of either a large vibratory plate compactor or a small vibratory roller in order to compact the soils which may have become loosened by the excavator teeth or construction

traffic. If the subgrade becomes disturbed at any time during excavation, it should be over-excavated and replaced with either Structural Fill or Crushed Stone overlying geotextile fabric. Boulders protruding above subgrades should be removed and the resulting voids backfilled with compacted Structural fill. Large boulders should be excavated to at least one foot below the proposed bottom of footing elevation and backfilled with compacted Structural Fill.

After excavation to slab base subgrade elevation or in areas where fill placement is required to reach slab base subgrade elevation, the exposed subgrades should be subjected to proof compaction. Proof compaction should consist of a minimum of six passes of a large vibratory roller having a minimum dynamic force of 5,000 pounds per foot drum width. Any weak or unstable areas identified should be overexcavated and replaced with compacted Structural or Select Fill. Vibrations should be discontinued if disturbance or weaving of the subgrade is observed.

If during construction, subgrade disturbance occurs, specifications should require the contractor to over-excavate and replace disturbed soils with compacted Structural Fill as a working mat. The Structural Fill should be placed and compacted in accordance with the recommendations below. As an alternative to Structural Fill, the Contractor may use Crushed Stone overlying geotextile fabric as a Working Mat. The Crushed Stone should be compacted to an unyielding surface.

Soil bearing surfaces below completed foundations and slabs should be protected against freezing before and after concrete placement. If construction is performed during freezing weather, footings on soil should be backfilled to a sufficient depth as soon as possible after they are constructed. Alternatively, insulating blankets or other measures should be used for protection against freezing.

Subgrade Preparation in Paved Parking Areas

The existing topsoil/forest mat should be completely removed. Subsoil and bedrock should be removed from within 3 feet vertically and horizontally from parking areas and driveways. Prior to any fill placement and construction of the pavement section (surface, base and subbase), subgrades should be subjected to proof compaction with a minimum of 6 passes of a vibratory roller having a minimum dynamic force of 5,000 pounds per foot of drum width. Vibrations should be discontinued if disturbance or weaving of the subgrade is observed. Any weak or unstable areas identified should be overexcavated and replaced with compacted Structural or Select Fill.

Sanitary Sewer Installation

The proposed sanitary sewer line is located at the toe of a 3H:1V slope which is about 10 feet-high and supports the tennis courts. Additionally, the sewer line continues around the stormwater detention pond toe of embankment which is located to the south of the tennis courts. The proposed sewer line will require excavation to depths of 10 to 12 feet below grade for installation. As part of the excavation support design for the sewer, GZA recommends a slope stability analysis for the tennis court slope and stormwater detention

pond embankment included in the Contractor submittals. The analysis should account for the sewer line excavation at the toe of slope, groundwater infiltration from the detention pond and the maximum water level in the detention pond.

Support of excavation is recommended to provide an OSHA-compliant trench that workers can safely perform their duties, and to maintain the adjacent soils which support the tennis court and stormwater detention pond. The support of excavation should take into account the surcharge loading from the adjacent slope and the stability analysis. Feasible systems include trench boxes or slide rail systems with hydraulic or pneumatic bracing systems. Braced soldier pile and lagging systems may also be considered. Dewatering in combination with the support systems will likely be required. The support of excavation system should be designed by a Registered Professional Engineer in the State of Connecticut.

Bedrock and/or large boulders will likely be encountered in the excavation at or above the design invert elevations along the proposed sanitary sewer line. Auger refusal was encountered along the sanitary sewer alignment at elevations ranging between approximately 591 and 596 feet (GZ-103, GZ-104, GZ-105, and GZ-106). Proposed sanitary sewer invert elevations range between approximately El. 587 feet (east manhole connection) and El. 597 feet (east building corner). Based on this data, trench excavation of up to 5 feet of bedrock may be required to reach invert elevations along the sanitary sewer alignment. Bedrock excavation for the sanitary sewer line is subject to the Bedrock Excavation requirements in the section below.

Bedrock Excavation

Bedrock or large boulder excavation will likely be required to reach the bottom of footing elevations, design invert elevations along the proposed sanitary sewer line, and other deep utility excavations. Bedrock excavation for the sanitary sewer is discussed above.

Based on the quality of bedrock collected in our cores and our experience on campus, we expect that bedrock excavation will be accomplished by hoe-ramming and ripping with large tracked-excavators. Alternatively, controlled blasting may be a more efficient means to remove the bedrock. The contractor should be required to maintain vibration and noise levels at adjacent structures below the limits established by the United States Bureau of Mines and the project specifications should include noise and vibration criteria.

RECOMMENDED FILL AND BACKFILL

Considering project requirements and available on-site and local materials, it is recommended that earth materials for fill, backfill and refill for this project be specified as follows:

Structural Fill for use as fill within the building area, except where Select Fill is specified, should be gravelly sand or sand and gravel free from ice, snow, roots,

sod, rubbish or other deleterious or organic matter and shall conform to the following gradation requirements:

Sieve Size	Percent Passing by Weight
3”	100
No. 4	40-85
No. 40	10-50
No. 200	0-12

Select Fill for applications requiring free draining, non-frost susceptible backfill should be free of ice, snow, roots, sod, rubbish and other deleterious or organic matter and shall conform to the following gradation requirements.

Sieve Size	Percent Passing by Weight
3”	100
No. 10	30-95
No. 40	10-70
No. 200	0-6

Crushed Stone for use as in drains and in wet conditions to aid in dewatering should consist of ⅜- to ¾-inch minus angular crushed stone and should conform to CTDOT Form 816, Division III, Section M.01.01, No. 8 or No. 6.

Geotextile Fabric should be used to separate crushed stone from surrounding soils. The fabric should consist of a filtration-type non-woven geotextile (Mirafi 1100N or approved equal).

Processed Aggregate Base below pavements should consist of CTDOT Form 816, Division III, Section M.05.01, Processed Aggregate Base.

Pavement Subbase below pavements should consist of CTDOT Form 816, Division III, Section M.02.06, Grading B.

Ordinary Fill for use as general fill and backfill in landscaped areas should be friable inorganic soil essentially free of trash, ice, snow, tree stumps, roots and organic materials. Ordinary fill shall contain no stone or rubble exceeding two-thirds of the specified loose lift thickness for material placement.

The recommended minimum degree of compaction for fill and backfill, based on percentage of maximum dry density as determined by ASTM D1557 (modified Proctor), is:

Below Structures	-	95%
Retaining Wall Backfill	-	95%
Pavement/Sidewalk Base and Subbase	-	95%
Utility Trenches (within 1½ feet of surface)	-	95%
Utility Trenches (more than 1½ feet below surface)	-	92%
Areas of General Landscape	-	92%

Recommended maximum loose lift thicknesses for soil fill and the minimum number of passes of compaction equipment are summarized on the following table.

		Maximum Loose Lift Thickness		Minimum Number of Passes	
Compaction Method	**Maximum Stone Size**	**Below Structures and Pavement**	**Less Critical Areas**	**Below Structures and Pavement**	**Less Critical Areas**
Hand-operated vibratory plate or light roller in confined areas	3”	6”	8”	6	4
Hand-operated vibratory drum rollers weighing at least 1,000# in confined areas	6”	8”	10”	6	4
Light vibratory drum roller, minimum dynamic force 3,000# per foot of drum width	6”	10”	14”	6	4
Medium to heavy vibra. drum roller, min. dynamic force 5,000-8,000# per foot drum width	8”	12”	18”	6	4

The Contractor should reduce or stop drum vibration if pumping or weaving of the subgrade is observed. Crushed Stone should be compacted to create an unyielding surface.

Compaction within 3-feet of retaining and foundation walls should be performed using hand-operated roller or plate compactors to reduce the potential for construction-induced damage to the walls. Extra care should be used when compacting adjacent to walls.

Reuse of On-Site Soils

Excavated materials and construction subgrades will consist largely of subsoil, sand and gravel and bedrock.

Subsoil: The high percentages of fines in the subsoil will make this soil slow draining and difficult to reuse as compacted Structural Fill. This material also contains variable amounts of roots. Subsoil should not be re-used as on-site fill beneath structures or paved areas. In addition, subgrades in the subsoil will be susceptible to disturbance and loss of strength if they are not properly protected during construction and will be susceptible to frost heave.

Sand and Gravel: The relatively high percentage of fines in the naturally-deposited sand and gravel will make it slow draining and may make it difficult to reuse as compacted Structural Fill, particularly during wet and winter weather conditions and when the moisture content is above the optimum compaction water content. Sand and gravel is also susceptible to disturbance when exposed to precipitation and construction traffic. Compaction and maintenance of subgrades will be difficult; in particular if they become wet. Although it is possible to place and compact this material as Structural Fill, it will be difficult and will require strict control of moisture. Drying of excessively wet soil will be required, and could take a long time due to the high fines content. The construction bid documents should clearly indicate the variable and sometimes high fines content of the sand and gravel, the expected difficulty re-using the material, and the technical specifications for placement and compaction.

Although the sand and gravel will not meet the gradation specification, it could potentially be re-used as Structural Fill, with certain exceptions and limitations. Boulders and cobbles are also present within the sand and gravel. Re-use of the on-site sand and gravel will require processing, culling, screening, and/or crushing boulders and cobbles to meet gradation requirements. Re-use of on-site sand and gravel will require laboratory testing (grain size analyses and modified Proctor density testing) following processing. In addition, foundation and pavement subgrades in the sand and gravel may be susceptible to disturbance and loss of strength if they are not properly protected during construction. These soils are also susceptible to frost heave. The contractor and the Owner should be aware that reliance on the reuse of these materials in wet weather may impact the project schedule.

Bedrock: Excavated bedrock and boulders should not be reused as Structural Fill unless it is processed and blended with the natural sand and gravel. Boulders and cobbles are present within the sand and gravel. Excavated bedrock should be processed in the same manner outlined above for the reuse of the cobbles and boulders.

CONSTRUCTION DEWATERING

Excavations for the proposed building foundations are not expected to encounter significant quantities of groundwater, however, the excavations for the new sanitary sewer alignment may.

Groundwater will likely be encountered when excavating for the proposed sanitary sewer line. Groundwater was measured at about El. 596 feet in the borings drilled along the sanitary alignment (GZ-104, GZ-105A, and GZ-106). The proposed invert elevations along the sanitary line range between El. 597 at the connection to the proposed building to El. 587 feet at the connection to the existing manhole southeast of the existing tennis courts. Therefore, sanitary sewer excavation may extend up to about 9 feet below groundwater.

It is anticipated that construction dewatering, where required, can be accomplished by creating interceptor trenches or ditches around the perimeter of the excavations and by open pumping from filtered sumps located within excavations. Dewatering should be

performed as necessary to allow excavation and observation of the subgrades in the dry and to maintain a stable and dry bottom.

Surface water may enter open excavations during periods of precipitation. Constructing small temporary earth berms and grading to force drainage away from the excavation is recommended to control surface water runoff. Discharge of accumulated water should be in accordance with local, State and Federal regulations.

EXCAVATION SLOPES

The Contractor is responsible for construction site safety and should be aware that slope height, slope inclination and excavation depths should in no case exceed those specified in local, state or federal safety regulations (e.g. OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926). Temporary cut and fill slopes in soil should be no steeper than 1.5H:1V. As a safety measure, it is recommended that all vehicles and earth stockpiles be kept a minimum lateral distance away feet from the edge of excavations at least equal to the slope height. Slope faces should be protected against degradation by the weather elements.

FINAL DESIGN AND CONSTRUCTION TESTING AND OBSERVATION

It is recommended that GZA be provided the opportunity to review foundation design plans and earthwork specifications for conformance with these recommendations. In addition, we recommend that GZA be retained to observe and document key geotechnical components of construction. Our involvement during construction will facilitate compliance with the Special Inspection requirements of the State Building Code and will allow evaluation of actual conditions exposed during excavation, and to allow a prompt response should unanticipated conditions be encountered. Earthwork monitoring during construction would include the following at a minimum:

- Building foundation and pavement subgrade preparation; and
- Placement and compaction of fill materials.

We appreciate the opportunity to work with you on this project. Please call the undersigned at (860) 286-8900 if you need additional information.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

David M. Barstow, P.E.
Project Manager

Thomas E. Billups
Consultant / Reviewer

Dan T. Kinard, P.E.
Associate Principal

Attachments:

Table 1:	Summary of Test Exploration Data
Figure 1:	Site Locus
Figure 2:	Exploration Location Plan
Appendix A:	Limitations, Contract Terms and Conditions
Appendix B:	Exploration Logs
Appendix C:	Laboratory Test Results
Appendix D:	Bedrock Core Photographs

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TABLES

TABLE 1
SUMMARY OF TEST BORING EXPLORATION DATA
Proposed Main Accumulation Area (MAA)
University of Connecticut
Storrs, Connecticut

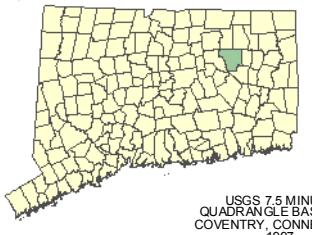
	Subsurface Exploration																	
	GZ-1	GZ-1A	GZ-2	GZ-2A	GZ-3	GZ-4	GZ-5	GZ-5A OW	GZ-6	GZ-7	GZ-101	GZ-102	GZ-102A	GZ-103	GZ-104	GZ-105	GZ-105A	GZ-106
Proposed Location	Landscape	Landscape	Infiltration Trench	Infiltration Trench	Landscape	Landscape	Building	Buliding	Landscape	Retaining Wall	Building	Building/ Sidewalk	Building/ Sidewalk	Building	Sanitary Sewer	Sanitary Sewer	Sanitary Sewer	Sanitary Sewer
Depth (ft) to:																		
Topsoil / Forest Mat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subsoil	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.4	0.7	0.7	0.5	0.4	0.6	0.6	0.4
Sand and Gravel	3.0	2.5	2.5	2.5	4.0	4.5	3.0	3.0	3.0	2.0	3.0	NE	4.5	3.0	3.0	3.5	3.5	3.5
Glacial Till	NE	13.0	NE	NE	NE	10.0	NE	NE	NE	NE	12.0	NE	10.5	NE	10.0	NE	NE	NE
Bedrock	≥ 6.5	≥ 22.0	≥ 10.3	≥ 9.5	≥ 9.0	≥ 22.0	≥ 8.0	≥ 12.0	8.9	≥ 10.7	≥ 17.0	≥ 4.6	≥ 14.9	≥ 9.5	≥ 13.8	≥ 9.2	≥ 13.2	≥ 13.2
Groundwater[2]	NE	18.0	NE	NE	NE	15.0	NE	9.5	NE	NE	10.0	NE	NE	NE	8.8	NE	9.3	8.8
Bottom of Exploration	6.5	22.0	10.3	9.5	9.0	22.0	8.0	12.0	14.0	10.7	17.0	4.6	14.9	9.5	13.8	9.2	13.2	13.2
Thickness (ft) of:																		
Topsoil / Forest Mat	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.4	0.7	0.7	0.5	0.4	0.6	0.6	0.4
Subsoil	2.7	2.2	2.2	2.2	3.8	4.4	2.9	2.9	2.9	1.9	2.6	≥3.9	3.8	2.5	2.6	2.9	2.9	3.1
Sand and Gravel	≥3.5	10.5	≥7.8	≥7.0	≥5.0	5.5	≥5.0	≥9.0	5.9	≥8.7	9.0	NE	6.0	≥6.5	7.0	≥5.7	≥9.7	≥9.7
Glacial Till	NE	≥9.0	NE	NE	NE	≥12.0	NE	NE	NE	NE	≥5.0	NE	≥4.4	NE	≥3.8	NE	NE	NE
Approximate Elevations (ft):																		
Ground Surface [3]	599.5	599.0	599.0	599.0	599.0	603.0	607.0	607.0	613.0	606.0	604.5	603.0	603.0	605.5	605.0	605.0	605.0	605.0
Top of Subsoil	599.2	598.7	598.7	598.7	598.8	602.9	606.9	606.9	612.9	605.9	604.1	602.3	602.3	605.0	604.6	604.4	604.4	604.6
Top of Sand and Gravel	596.5	596.5	596.5	596.5	595.0	598.5	604.0	604.0	610.0	604.0	601.5	NE	598.5	602.5	602.0	601.5	601.5	601.5
Top of Glacial Till	NE	586.0	NE	NE	NE	593.0	NE	NE	NE	NE	592.5	NE	592.5	NE	595.0	NE	NE	NE
Top of Bedrock	≤ 593.0	≤ 577.0	≤ 588.7	≤ 589.5	≤ 590.0	≤ 581.0	≤ 599.0	≤ 595.0	604.1	≤ 595.3	≤ 587.5	≤ 598.4	≤ 588.1	≤ 596.0	≤ 591.2	≤ 595.8	≤ 591.8	≤ 591.8
Groundwater	NE	581.0	NE	NE	NE	588.0	NE	597.5	NE	NE	594.5	NE	NE	NE	596.2	NE	595.7	596.2
Bottom of Exploration	593.0	577.0	588.7	589.5	590.0	581.0	599.0	595.0	599.0	595.3	587.5	598.4	588.1	596.0	591.2	595.8	591.8	591.8

NE - Not encountered, OW- Observation well installed
"A" indicates an offset boring was performed due to shallow refusal.

Notes:
1. Borings GZ-1 through GZ-7 performed on February 4 and 10, 2014 by Seaboard Drilling and observed by GZA personnel. Borings GZ-101 through GZ-106 performed on January 26 and 29, 2015 by Seaboard Drilling and observed by GZA personnel.
2. Groundwater readings were taken at the times and conditions noted on the logs.
3. Existing ground surface elevations at test exploration GZ-1 through GZ-7 provided by a survey by Loureiro. Existing ground surface elevations at test explorations GZ-101 through GZ-106 were interpolated from a plan entitled "Grading and Utilities Plan", Loureiro Engineering Associates, Not for Construction, Drawing C-2, Original Scale 1"=10'

FIGURES

GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com



USGS 7.5 MINUTE QUADRANGLE BASE MAP: COVENTRY, CONNECTICUT 1997

SITE LOCUS

UNIVERSITY OF CONNECTICUT
MANSFIELD, CONNECTICUT

Source: TOPO! maps are USGS topographic maps, Copyright:© 2011 National Geographic Society, i-cubed and are provided by arcgisonline.com.

PROJ MGR: DMB	REVIEWED BY: DMB	PROJECT NO. 05.0045269.01
DESIGNED BY:	DRAWN BY: MJS	DATE: 01-30-15

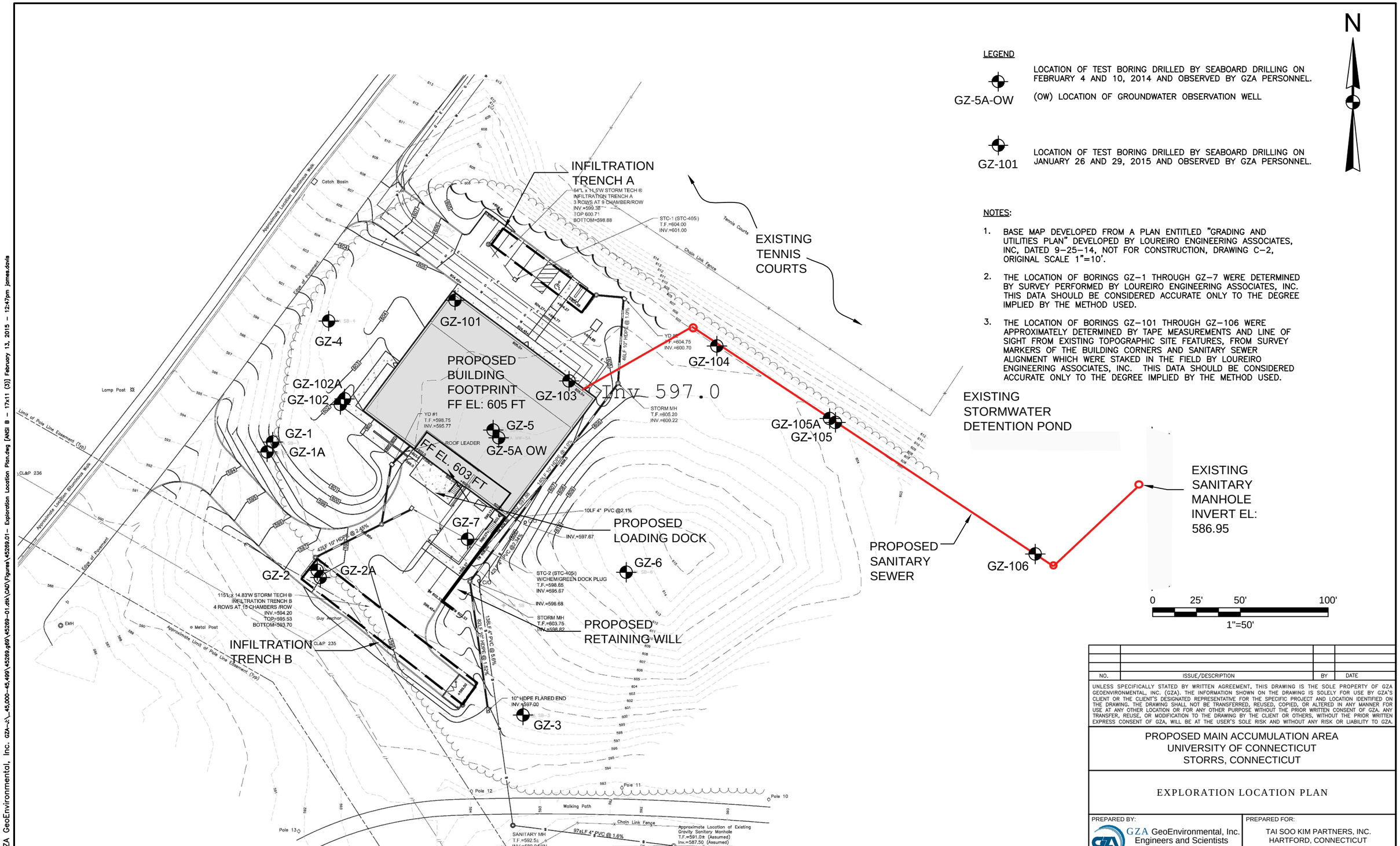
THIS MAP HAS BEEN COMPILED FROM OTHER MAPS AND/OR SOURCES OF INFORMATION.
THIS MAP SHOULD NOT BE CONSTRUED AS A PROPERTY SURVEY, NOR USED FOR CONSTRUCTION PURPOSES.

0 1,000 2,000 4,000 6,000 8,000
Scale in Feet

N

FIGURE
1

© 2015 - GZA GeoEnvironmental, Inc. J:_45,000-45,499\45269.g69\45269-01.dtk\GIS\mxd\FIG 1 SITE LOCUS.mxd, 1/30/2015, 2:40:44 PM, max.strubel



LEGEND

GZ-5A-OW — LOCATION OF TEST BORING DRILLED BY SEABOARD DRILLING ON FEBRUARY 4 AND 10, 2014 AND OBSERVED BY GZA PERSONNEL.

(OW) LOCATION OF GROUNDWATER OBSERVATION WELL

GZ-101 — LOCATION OF TEST BORING DRILLED BY SEABOARD DRILLING ON JANUARY 26 AND 29, 2015 AND OBSERVED BY GZA PERSONNEL.

NOTES:

1. BASE MAP DEVELOPED FROM A PLAN ENTITLED "GRADING AND UTILITIES PLAN" DEVELOPED BY LOUREIRO ENGINEERING ASSOCIATES, INC, DATED 9–25–14, NOT FOR CONSTRUCTION, DRAWING C–2, ORIGINAL SCALE 1"=10'.
2. THE LOCATION OF BORINGS GZ–1 THROUGH GZ–7 WERE DETERMINED BY SURVEY PERFORMED BY LOUREIRO ENGINEERING ASSOCIATES, INC. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
3. THE LOCATION OF BORINGS GZ–101 THROUGH GZ–106 WERE APPROXIMATELY DETERMINED BY TAPE MEASUREMENTS AND LINE OF SIGHT FROM EXISTING TOPOGRAPHIC SITE FEATURES, FROM SURVEY MARKERS OF THE BUILDING CORNERS AND SANITARY SEWER ALIGNMENT WHICH WERE STAKED IN THE FIELD BY LOUREIRO ENGINEERING ASSOCIATES, INC. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

NO.	ISSUE/DESCRIPTION	BY	DATE

UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEOENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE CLIENT OR OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.

PROPOSED MAIN ACCUMULATION AREA
UNIVERSITY OF CONNECTICUT
STORRS, CONNECTICUT

EXPLORATION LOCATION PLAN

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
TAI SOO KIM PARTNERS, INC.
HARTFORD, CONNECTICUT

PROJ MGR: DMB	REVIEWED BY: DMB	CHECKED BY: DTK	FIGURE
DESIGNED BY: JFD	DRAWN BY: JFD	SCALE: 1"=50'	2
DATE: FEB. 2015	PROJECT NO. 05.0045269.01	REVISION NO.	SHEET NO.

©2014 – GZA GeoEnvironmental, Inc. GZA–J:\...45,000–45,499\45269,g69\45269–01.dtk\CAD\Figures\45269.01– Exploration Location Plan.dwg [ANSI B – 17x11 (3)] February 13, 2015 – 12:47pm james.davis

APPENDIX A
LIMITATIONS, CONTRACT TERMS AND CONDITIONS

GEOTECHNICAL LIMITATIONS

Use of Report

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose and location identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use. Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location, or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the report,as appropriate, to reflect the unanticipated changed conditions .

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

Subsurface Conditions

4. The generalized soil profile provided in our Report is based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs.

5. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

6. Water level readings have been made in test holes as described in the report at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water table encountered in the course of the work may differ from that indicated in the Report.

7. GZA's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

8. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

Compliance with Codes and Regulations

9. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Additional Services

10. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

TERMS AND CONDITIONS FOR PROFESSIONAL SERVICES INCLUDING SITE INVESTIGATION, REMEDIATION, GEOTECHNICAL, CONSTRUCTION, AND TESTING

© 2011 by GZA GeoEnvironmental, Inc.

Client ("You"): _Tai Soo Kim Partners, Inc._

Proposal No: 05.P000393.14__

Site: New Main Accumulation Area at UCONN, Storrs, Connecticut

These Terms and Conditions, together with GZA's Proposal, make up the Agreement between GZA and you, Client, named above.

BEFORE SIGNING THE PROPOSAL, BE SURE YOU READ AND UNDERSTAND THE PARAGRAPHS ENTITLED "INDEMNIFICATION" AND "LIMITATION OF REMEDIES" WHICH DEAL WITH THE ALLOCATION OF RISK BETWEEN YOU AND GZA.

1. Services. GZA will perform the services set forth in its Proposal and any amendments or change orders authorized by you. Any request or direction from you that would require extra work or additional time for performance or would result in an increase in GZA's costs will be the subject of a negotiated amendment or change order.

2. Standard of Care; Warranties.

a. GZA will perform the services with the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services at the same time under similar conditions in the same or similar locality.
b. GZA warrants that its construction services will be of good quality, free of faults and defects and in conformance with the Proposal.
c. **EXCEPT AS SET FORTH IN SUBSECTIONS 2a AND 2b, ABOVE, NO WARRANTY, EXPRESS OR IMPLIED, INCLUDING WARRANTY OF MARKETABILITY OR FITNESS FOR A PARTICULAR PURPOSE, IS MADE OR INTENDED BY GZA'S PROPOSAL OR BY ANY OF GZA'S ORAL OR WRITTEN REPORTS.**
d. GZA assigns to you any manufacturers' warranties of equipment or materials purchased from others, to the extent they are assignable, and your sole recourse will be against the manufacturer. Full risk of loss of materials and equipment will pass to you upon delivery to the Site, and you will be responsible for insuring and otherwise protecting them against theft and damage.

3. Payment.

a. Except as otherwise stated in the Proposal, you will compensate GZA for the services at the rates set forth in the applicable Proposal, amendment or change order; reimburse its expenses, which will include a communication fee calculated as a percentage of labor invoiced; and pay any sales or similar taxes thereon.
b. Any retainer specified in GZA's Proposal shall be due prior to the start of services and will be applied to the final invoice for services.
c. GZA will submit invoices periodically, and payment will be due within 20 days from invoice date. Overdue payments will bear interest at 1½ percent per month or, if lower, the maximum lawful rate. GZA may terminate its services upon 10 days' written notice anytime your payment is overdue on this or any other project and you will pay for all services through termination, plus termination costs. You will reimburse GZA's costs of collecting overdue invoices, including reasonable attorneys' fees.

4. Your Responsibilities.

a. Except as otherwise agreed, you will secure the approvals, permits, licenses and consents necessary for performance of the services. If you are the owner or operator of the Site, you will provide GZA with all documents, plans, information concerning underground structures (including but not limited to utilities, conduits, pipes, and tanks), information related to hazardous materials or other environmental or geotechnical conditions at the Site and other information that may be pertinent to the services or, if you are not the owner or operator of the Site, you agree to make reasonable efforts to obtain these same documents and provide them to GZA. Unless otherwise indicated in writing, GZA will be entitled to rely on documents and information you provide.
b. If you use the services of a construction manager at the Site, you agree to use best and reasonable efforts to include in your agreement(s) with the construction contractor provisions obligating the latter:
   (i) to indemnify and hold harmless, to the fullest extent permitted by law, you and GZA, its officers, employees and principals, for or on account of any claims, liabilities, costs and expenses, including attorneys' fees, arising out of or relating to the design or implementation of construction means, methods, procedures, techniques, and sequences of construction, including safety precautions or programs, of the contractor, or any of its subcontractors or any engineer engaged by it;

(ii) to name you and GZA as additional insureds under general liability and builder's risk insurance coverages maintained by the contractor, or any of its subcontractors; and

(iii) to require that all of its subcontractors agree and be bound to the obligations set forth in (i) and (ii) above.

c. In the event that you are unable to secure such provisions in the agreement(s) with the construction contractor, you shall promptly notify GZA and GZA shall have the opportunity to negotiate with you reasonable substitute risk allocation and insurance indemnities and protections.

5. Right of Entry; Site Restoration. You grant GZA and its subcontractor(s) permission to enter the Site to perform the services. If you do not own the Site, you represent and warrant that the owner has granted permission for GZA to enter the Site and perform the services; you will provide reasonable verification on request; and you will indemnify GZA for any claims by the Site owner related to alleged trespass by GZA or its subcontractors. GZA will exercise reasonable care to limit damage to landscaping, paving, systems and structures at the Site that may occur and you agree to compensate GZA for any restoration it is asked to perform, unless otherwise indicated in the Proposal.

6. Underground Facilities. GZA's only responsibility under this Section will be to provide proper notification to the applicable state utility "Call-Before-You-Dig" program. You further agree to assume responsibility for and to defend, indemnify and hold harmless GZA with respect to personal injury and property damages due to GZA's interference with subterranean structures including but not limited to utilities, conduits, pipes, and tanks:

(i) that are not correctly shown on any plans and information you or governmental authorities provide to GZA; or

(ii) that are not correctly marked by the appropriate utility.

7. Reliance. The services, information, and other data furnished by you shall be at your expense, and GZA may rely upon all information and data that you furnish, including the accuracy and completeness thereof. You acknowledge that the quality of the services provided by GZA is directly related to the accuracy and completeness of the information and data that you furnish to GZA**. GZA's REPORTS ARE PREPARED FOR AND MADE AVAILABLE FOR YOUR SOLE USE. YOU ACKNOWLEDGE AND AGREE THAT USE OF OR RELIANCE UPON THE REPORT OR THE FINDINGS IN THE REPORT BY ANY OTHER PARTY, OR FOR ANY OTHER PROJECT OR PURPOSE, SHALL BE AT YOUR OR SUCH OTHER PARTY'S SOLE RISK AND WITHOUT ANY LIABILITY TO GZA.**

8. Lab Tests and Samples. GZA is entitled to rely on the results of laboratory tests using generally accepted methodologies. GZA may dispose of samples in accordance with applicable laws 30 days after submitting test results to you unless you request in writing for them to be returned to you or to be held longer, in which case you will compensate GZA for storage and/or shipping beyond 30 days.

9. GZA Professionals. GZA employees or consultants may act as licensed, certified or registered professionals (including but not limited to Professional Engineers, Licensed Site or Environmental Professionals, or Certified Industrial Hygienists collectively referred to in this section as "GZA Professionals") whose duties may include the rendering of independent professional opinions. You acknowledge that a federal, state or local agency or other third party may audit the services of GZA or other contractor/consultant(s), which audit may require additional services, even though GZA and such GZA Professionals have each performed such services in accordance with the standard of care set forth herein. You agree to compensate GZA for all services performed in response to such an audit, or to meet additional requirements resulting from such an audit, at the rates set forth in the applicable Proposal, amendment or change order.

10. Hazardous Materials; GZA "Not a Generator". Before any hazardous or contaminated materials are removed from the Site, you will sign manifests naming you as the generator of the waste (or, if you are not the generator, you will arrange for the generator to sign). You will select the treatment or disposal facility to which any waste is taken. GZA will not be the generator or owner of, nor will it possess, take title to, or assume legal liability for any hazardous or contaminated materials at or removed from the Site. GZA will not have responsibility for or control of the Site or of operations or activities at the Site other than its own. GZA will not undertake, arrange for or control the handling, treatment, storage, removal, shipment, transportation or disposal of any hazardous or contaminated materials at or removed from the Site, other than any laboratory samples it collects or tests. You agree to defend, indemnify and hold GZA harmless for any costs or liability incurred by GZA in defense of or in payment for any legal actions in which it is alleged that GZA is the owner, generator, treater, storer or disposer of hazardous waste.

11. Limits on GZA's Responsibility. GZA will not be responsible for the acts or omissions of contractors or others at the Site, except for its own subcontractors and employees. GZA will not supervise, direct or assume control over or the authority to stop any contractor's work, nor shall GZA's professional activities nor the presence of GZA or its employees and subcontractors be construed to imply that GZA has authority over or responsibility for the means, methods, techniques, sequences or procedures of construction, for work site health or safety precautions or programs, or for any failure of contractors to comply with contracts, plans, specifications or laws. Any opinions by GZA of probable costs of labor, materials, equipment or services to be furnished by others are strictly estimates and are not a guarantee that actual costs will be consistent with the estimates.

12. Changed Conditions.

a. You recognize the uncertainties related to environmental and geotechnical services, which often require a phased or exploratory approach, with the need for additional services becoming apparent during the initial services. You also recognize that actual conditions encountered may vary significantly from those anticipated, that laws and regulations are subject to change, and that the requirements of regulatory authorities are often unpredictable.
b. If changed or unanticipated conditions or delays make additional services necessary or result in additional costs or time for performance, GZA will notify you and the parties will negotiate appropriate changes to the scope of services, compensation and schedule.
c. If no agreement can be reached, GZA will be entitled to terminate its services and to be equitably compensated for the services already performed. GZA will not be responsible for delays or failures to perform due to weather, labor disputes, intervention by or inability to get approvals from public authorities, acts or omissions on your part, or any other causes beyond GZA's reasonable control, and you will compensate GZA for any resulting increase in its costs.

13. Documents and Information. All documents, data, calculations and work papers prepared or furnished by GZA are instruments of service and will remain GZA's property. Designs, reports, data and other work product delivered to you are for your use only, for the limited purposes disclosed to GZA. Any delayed use, use at another site, use on another project, or use by a third party will be at the user's sole risk, and without any liability to GZA. Any technology, methodology or technical information learned or developed by GZA will remain its property. Provided GZA is not in default under this Agreement, GZA's designs will not be used to complete this project by others, except by written agreement relating to use, liability and compensation.

14. Electronic Media. In accepting and utilizing any drawings, reports and data on any form of electronic media generated by GZA, you covenant and agree that all such electronic files are instruments of service of GZA, who shall be deemed the author and shall retain all common law, statutory law and other rights, including copyrights. In the event of a conflict between the signed documents prepared by GZA and electronic files, the signed documents shall govern. You agree not to reuse these electronic files, in whole or in part, for any purpose or project other than the project that is the subject of this Agreement. Any transfer of these electronic files to others or reuse or modifications to such files by you without the prior written consent of GZA will be at the user’s sole risk and without any liability to GZA.

15. Confidentiality; Subpoenas. Information about this Agreement and GZA's services and information you provide to GZA regarding your business and the Site, other than information available to the public and information acquired from third parties, will be maintained in confidence and will not be disclosed to others without your consent, except as GZA reasonably believes is necessary: (a) to perform its services; (b) to comply with professional standards to protect public health, safety and the environment; and (c) to comply with laws and court orders. GZA will make reasonable efforts to give you prior notice of any disclosure under (b) or (c) above. Information available to the public and information acquired from third parties will not be considered confidential. You will reimburse GZA for responding to any subpoena or governmental inquiry or audit related to the services, at the rates set forth in the applicable Proposal, amendment or change order.

16. Insurance. During performance of the services, GZA will maintain workers compensation, commercial general liability, automobile liability, and professional liability/contractor's pollution liability insurance. GZA will furnish you certificates of such insurance on request.

17. Indemnification. You agree to hold harmless, indemnify, and defend GZA and its affiliates and subcontractors and their employees, officers, directors and agents (collectively referred to in this paragraph as "GZA") against all claims, suits, fines and penalties, including mandated cleanup costs and attorneys' fees and other costs of settlement and defense, which claims, suits, fines, penalties or costs arise out of or are related to this Agreement or the services, except to the extent they are caused by GZA’s negligence or willful misconduct.

18. Limitation of Remedies.

a. To the fullest extent permitted by law and notwithstanding anything else in this Agreement to the contrary, the aggregate liability of GZA and its affiliates and subcontractors and their employees, officers, directors and agents (collectively referred to in this paragraph as "GZA") for all claims arising out of this Agreement or the services is limited to $50,000 or, if greater, 10% of the compensation received by GZA under this Agreement.
b. You may elect to increase the limit of liability by paying an additional fee, such fee to be negotiated prior to the execution of this Agreement.
c. Any claim will be deemed waived unless received by GZA within one year of substantial completion of the services.
d. GZA will not be liable for lost profits, loss of use of property, delays, or other special, indirect, incidental, consequential, punitive, exemplary or multiple damages.
e. GZA will not be liable to you or the Site owner for injuries or deaths suffered by GZA's or its subcontractors' employees.
f. You will look solely to GZA for your remedy for any claim arising out of or relating to this Agreement, including any claim arising out of or relating to alleged negligence or errors or omissions of any GZA principal, officer, employee or agent.

19. Disputes.

a. All disputes between you and GZA shall be subject to non-binding mediation.
b. Either party may demand mediation by serving a written notice stating the essential nature of the dispute, the amount of time or money claimed, and requiring that the matter be mediated within forty-five (45) days of service of notice.
c. The mediation shall be administered by the American Arbitration Association in accordance with its most recent Construction Mediation Rules, or by such other person or organization as the parties may agree upon.
d. No action or suit may be commenced unless mediation has occurred but did not resolve the dispute, or unless a statute of limitation period would expire if suit were not filed prior to such forty-five (45) days after service of notice.

20. Miscellaneous.

a. Massachusetts law shall govern this Agreement.
b. The above terms and conditions regarding Limitation of Remedies and Indemnification shall survive the completion of the services under this Agreement and the termination of the contract for any cause.
c. Any amendment to these Terms and Conditions must be in writing and signed by both parties.
d. Having received these Terms and Conditions, your oral authorization to commence services, your actions, or your use of the Report or Work Product constitutes your acceptance of them.
e. This Agreement supersedes any contract terms, purchase orders or other documents issued by you.
f. Neither party may assign or transfer this Agreement or any rights or duties hereunder without the written consent of the other party.
g. Your failure or the failure of your successors or assigns to receive payment or reimbursement from any other party for any reason whatsoever shall not absolve you, your successors or assigns of any obligation to pay any sum to GZA under this agreement.
h. These Terms and Conditions shall govern over any inconsistent terms in GZA's Proposal.
i. The provisions of this Agreement are severable; if any provision is unenforceable it shall be appropriately limited and given effect to the extent it is enforceable.
j. The covenants and agreements contained in this Agreement shall apply to, inure to the benefit of and be binding upon the parties hereto and upon their respective successors and assigns.

APPENDIX B
EXPLORATION LOGS

APPENDIX B
EXPLORATION LOGS

EXPLANATION OF SAMPLE DESCRIPTIONS

SOIL DESCRIPTION

Soil sample descriptions are based on a modification of the Burmister identification system. The following explains the key soil classification terminology.

Component Gradation Terms:

Material	Fraction	Sieve Size
Gravel	Coarse Fine	¾” to 3” No. 4 to 3/4”
Sand	Coarse Medium Fine	No. 10 to No. 4 No. 40 to No. 10 No. 200 to No. 40
Fines		Passing No. 200

Relative Density or Consistency Terms:

Non-Plastic Soils		Plastic Soils	
Blows/Ft	**Density**	**Blows/Ft**	**Plastic Soils**
0 to 4	Very Loose	< 2	Very Soft
4 to 10	Loose	2 to 4	Soft
10 to 30	Medium Dense	4 to 8	Medium Stiff
30 to 50	Dense	8 to 15	Stiff
> 50	Very Dense	15 to 30	Very Stiff
		> 30	Hard

Fines Fraction:

Plasticity	PI	Name	Smallest Thread Diameter Rolled
Non-Plastic	0	SILT	None
Slight	1 to 5	Clayey SILT	1/4”
Low	5 to 10	SILT & CLAY	1/8”
Medium	10 to 20	CLAY & SILT	1/16”
High	20 to 40	Silty CLAY	1/32”
Very High	> 40	CLAY	1/64”

Proportional Terms:

Proportional Term	Percent by Weight
And	35 to 50
Some	20 to 35
Little	10 to 20
Trace	1 to 10

ROCK DESCRIPTION

Rock descriptions consist of the below factors plus color, rock type, and other pertinent characteristics. EXAMPLE: Moderately hard, slightly weathered, slightly fractured, fine grained, red-brown SILTSTONE, medium shallow dipping bedding, occasional high angle joints with clay and calcite fillings.

HARDNESS

Very hard	Cannot be scratched with knife or sharp pick; requires several hard blows of hammer to break.
Hard	Can be scratched with knife or sharp pick with difficulty; requires hard blow of hammer to break.
Moderately Hard	Can be scratched with knife or pick; breaks with moderate blow of hammer.
Soft	Can be gouged or scraped by knife or sharp pick; small thin pieces can be broken with fingers.
Very Soft	Can be easily scraped or peeled with knife; crumbles under hammer blow; pieces 1 inch or more in thickness can be broken with fingers.

WEATHERING

Fresh	No visible signs of decomposition or discoloration; rings under hammer impact if crystalline.
Slightly Weathered	Slight discoloration from open fractures extending inwards up to 1 inch; otherwise similar to fresh.
Moderately Weathered	Discoloration throughout; weaker minerals such as feldspar decomposed; strength somewhat less than fresh rock but cores cannot be broken by hand or scraped by knife; texture preserved; has dull sound under hammer.
Highly Weathered	Most minerals somewhat decomposed; specimens can be broken by hand with effort or shaved with knife; core stones present in rock mass; texture becoming indistinct but fabric preserved.
Completely Weathered	Minerals decomposed to soil but fabric and structure preserved (Saprolite); specimens easily crumbled or penetrated.

ROCK CONTINUITY

Any break in rock core, even if fresh.

Extremely Fractured	Drill core stem less than 1 inch
Moderately Fractured	Drill core stem 1 inch to 4 inches
Slightly Fractured	Drill core stem 4 inches to 8 inches
Sound	Drill core stem greater than 8 inches

TEXTURE

Amorphous	Too small to be seen with naked eye
Fine Grained	Barely seen with naked eye
Medium Grained	Barely seen with naked eye to 1/8-inch
Coarse Grained	1/8-inch to 1/4-inch

DISCONTINUITY SPACING

Description for Structural Features (Bedding, Foliation, or Flow Banding)	Spacing	Description for Joints, Faults, or Other Fractures
Very thickly (bedded, foliated, or banded)	More than 6 feet	Very widely (fractured or jointed)
Thickly	2 to 6 feet	Widely
Medium	8 to 24 inches	Medium
Thinly	2-1/2 to 8 inches	Closely
Very thinly	3/4- to 2-1/2 inches	Very closely

ATTITUDE

Attitude	Angle
Horizontal	0° to 5°
Shallow or low angle	5° to 35°
Moderately dipping	35° to 55°
Steep or high angle	55° to 85°
Vertical	85° to 90°

ROCK QUALITY DESIGNATION (RQD)

$$\text{RQD in \%} = \frac{\text{Length of Core in Pieces 4 inches and longer}}{\text{Length of Run}} \times 100$$

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

PROPOSED MAA
UNIVERSITY OF CONNECTICUT
STORRS, CT

EXPLORATION NO.: GZ-1
SHEET: 1 of 1
PROJECT NO: 05.0045269.00
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: F. Harrington

Type of Rig: Truck
Rig Model: B53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 599.5
Final Boring Depth (ft.): 6.5
Date Start - Finish: 2/4/2014 - 2/4/2014

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
2/4/14	0945	Dry	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		S-1	0-2	24	9	4 4 5 7	9	S-1 : Top 3": Dark-brown, fine SAND and SILT, trace Roots/Organics			0.3	TOPSOIL	599.2
		S-2	2-4	24	16	6 7 14 10	21	Bottom 6": Brown, fine to medium SAND, some Silt, trace fine Gravel, trace Roots S-2 : Medium dense, brown, fine to coarse SAND, some Silt, trace fine Gravel	1		3	SUBSOIL	596.5
5		S-3	4-6	24	16	10 13 34 20	47	S-3 : Dense, brown, fine to coarse SAND, some Silt, little fine Gravel				SAND AND GRAVEL	
		S-4	6-6.5	6	2	120/6"		S-4 : Gray ROCK fragments			6.5		593.0
								End of exploration at 6.5 feet.	2				
10													
15													
20													
25													
30													

REMARKS

1 - Auger chatter and increase in resistance between approximately 3 and 6.5 feet below ground surface.
2 - Auger and split spoon refusal at approximately 6.5 feet below grade.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-1

GZA TEMPLATE TEST BORING; 2/5/2015; 4:05:39 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

PROPOSED MAA
UNIVERSITY OF CONNECTICUT
STORRS, CT

EXPLORATION NO.: GZ-1A
SHEET: 1 of 1
PROJECT NO: 05.0045269.00
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: F. Harrington

Type of Rig: Truck
Rig Model: B53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 599
Final Boring Depth (ft.): 22
Date Start - Finish: 2/4/2014 - 2/4/2014

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
2/4/14	1230	18	1.5 hrs.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
			0-10					: See Boring GZ-1 for Soil Descriptions	1		0.3	TOPSOIL	598.7
												SUBSOIL	
									2		2.5		596.5
5													
												SAND AND GRAVEL	
10		S-1	10-12	24	13	5 17 23 27	40	S-1 : Dense, brown, fine to coarse SAND, some Silt, little fine Gravel					
		S-2	13-13.7	9	9	17 80/3"		S-2 : Gray-brown, fine to coarse SAND and Clayey SILT, trace fine Gravel	3		13		586.0
15		S-3	15-17	24	19	17 20 21 36	41	S-3 : Dense, gray-brown, fine to coarse SAND and Clayey SILT, little fine to coarse Gravel					
												GLACIAL TILL	
20		S-4	20-22	24	15	6 12 17 26	29	S-4 : Medium dense, gray-brown, fine to coarse SAND and Clayey SILT, little fine to coarse Gravel			22		577.0
								End of exploration at 22 feet.					
25													
30													

REMARKS

1 - Stratigraphy above sample S-1 based on drilling resistance and offset boring GZ-1.
2 - Auger chatter and increase in resistance between approximately 2.5 feet and 13 feet below ground surface.
3 - Increase in drilling resistance between 13 feet and 22 feet below ground surface.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-1A

GZA TEMPLATE TEST BORING; 2/5/2015; 4:05:40 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

PROPOSED MAA
UNIVERSITY OF CONNECTICUT
STORRS, CT

EXPLORATION NO.: GZ-2
SHEET: 1 of 1
PROJECT NO: 05.0045269.00
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: F. Harrington

Type of Rig: ATV
Rig Model: CME-55
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 599
Final Boring Depth (ft.): 10.3
Date Start - Finish: 2/4/2014 - 2/4/2014

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
2/4/14	1200	Dry	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		S-1	0-2	24	6	3 2 1 2	3	S-1 : Top 3": Dark brown, fine SAND and SILT, trace Organics Bottom 3": Orange-brown SILT and fine SAND			0.3	TOPSOIL	598.7
		S-2	2-4	24	19	5 14 16 19	30	S-2 : Top 2": Orange-brown, fine SAND, some Silt Bottom 17": Light brown, fine to coarse SAND, some Silt, little fine Gravel (Mottled)	1		2.5	SUBSOIL	596.5
5		S-3	5-7	24	12	5 12 17 20	29	S-3 : Medium dense, light brown, fine to coarse SAND, some Silt, trace fine Gravel (Mottled)				SAND AND GRAVEL	
10		S-4	10-10.3	3	2	140/3"		S-4 : Gray, ROCK fragments	2		10.3		588.7
								End of exploration at 10.3 feet.					
15													
20													
25													
30													

REMARKS

1 - Auer chatter and increase in resistance between approximately 2.5 feet and 10.3 feet below ground surface.
2 - Auger and split spoon refusal at 10.3 feet.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-2

GZA TEMPLATE TEST BORING; 2/5/2015; 4:05:40 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

PROPOSED MAA
UNIVERSITY OF CONNECTICUT
STORRS, CT

EXPLORATION NO.: GZ-2A
SHEET: 1 of 1
PROJECT NO: 05.0045269.00
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: F. Harrington

Type of Rig: ATV
Rig Model: CME-55
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 599
Final Boring Depth (ft.): 9.5
Date Start - Finish: 2/4/2014 - 2/4/2014

H. Datum: Project
V. Datum: Project

Hammer Type: None
Hammer Weight (lb.):
Hammer Fall (in.):
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: NA
Sampler O.D. (in.): NA
Sampler Length (in.): NA
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
2/4/14	1250	Dry	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
			0-9.5					: See Boring GZ-2 for Soil Descriptions	1		0.3	TOPSOIL	598.7
												SUBSOIL	
									2		2.5		596.5
5												SAND AND GRAVEL	
											9.5		589.5
10								End of exploration at 9.5 feet.	3				
15													
20													
25													
30													

REMARKS

1 - Stratigraphy based on drilling resistance and offset boring GZ-3.
2 - Auger chatter and increase in drilling resistance between approximately 2.5 feet and 9.5 feet.
3 - Auger refusal at approximately 9.5 feet.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-2A

GZA TEMPLATE TEST BORING; 2/5/2015; 4:05:41 PM

TEST BORING LOG

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Engineers and Scientists

PROPOSED MAA
UNIVERSITY OF CONNECTICUT
STORRS, CT

EXPLORATION NO.: GZ-3
SHEET: 1 of 1
PROJECT NO: 05.0045269.00
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: F. Harrington

Type of Rig: ATV
Rig Model: CME-55
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 599
Final Boring Depth (ft.): 9.1
Date Start - Finish: 2/4/2014 - 2/4/2014

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
2/4/14	1345	Dry	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		S-1	0-2	24	2	WH 1 1 2	2	S-1 : Very loose, dark-brown, FOREST MAT			0.2	FOREST MAT	598.8
		S-2	2-4	24	7	4 4 3 7	7	S-2 : Loose, orange-brown, fine to medium SAND, some Silt, little fine Gravel, trace Roots				SUBSOIL	
5		S-3	5-7	24	4	11 13 13 18	26	S-3 : Medium dense, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel (Gravel stuck in spoon tip)	1		4	SAND AND GRAVEL	595.0
10		S-4	9-9.1	1	1	50/1"		S-4 : No Recovery End of exploration at 9.1 feet.	2		9		590.0
15													
20													
25													
30													

REMARKS

1 - Auger chattering and increased drilling resistance between 4 and 9 feet below ground surface.
2 - Split spoon and auger refusal at 9.1 feet below ground surface.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-3

GZA TEMPLATE TEST BORING; 2/5/2015; 4:05:42 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

PROPOSED MAA
UNIVERSITY OF CONNECTICUT
STORRS, CT

EXPLORATION NO.: GZ-4
SHEET: 1 of 1
PROJECT NO: 05.0045269.00
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: F. Harrington

Type of Rig: ATV
Rig Model: CME-55
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 603
Final Boring Depth (ft.): 22
Date Start - Finish: 2/4/2014 - 2/4/2014

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
2/4/14	1530	Dry	5 min.
2/10/14	0830	15.0	6 days

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		S-1	0-2	24	4	WH 1 1 1	2	S-1 : Top 1": Dark brown TOPSOIL Bottom 3": Orange-brown, fine to medium SAND, some Silt, trace Roots			0.1	TOPSOIL	602.9
		S-2	2-4	24	7	2 2 3 5	5	S-2 : Loose, orange-brown, fine to medium SAND, some Silt				SUBSOIL	
5		S-3	5-7	24	12	6 11 13 12	24	S-3 : Medium dense, light brown, fine to coarse SAND, some Silt, trace fine Gravel (Mottled)			4.5	SAND AND GRAVEL	598.5
10		S-4	10-12	24	12	18 22 29 31	51	S-4 : Very dense, gray-brown, fine to coarse SAND and Clayey Silt, little fine Gravel	1		10	GLACIAL TILL	593.0
15		S-5	15-17	24	6	9 23 26 54	49	S-5 : Dense, gray-brown, fine to coarse GRAVEL, little fine to coarse Sand, little Clayey SIlt					
20		S-6	20-22	24	12	7 12 23 39	35	S-6 : Dense, gray-brown, fine to coarse SAND and Clayey SILT, trace fine to coarse Gravel			22		581.0
								End of exploration at 22 feet.					
25													
30													

REMARKS

1 - Increase in drilling resistance between 10 feet and 22 feet below ground surface.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-4

GZA TEMPLATE TEST BORING; 2/5/2015; 4:05:43 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

PROPOSED MAA
UNIVERSITY OF CONNECTICUT
STORRS, CT

EXPLORATION NO.: GZ-5
SHEET: 1 of 1
PROJECT NO: 05.0045269.00
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: F. Harrington

Type of Rig: ATV
Rig Model: CME-55
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 607
Final Boring Depth (ft.): 8
Date Start - Finish: 2/10/2014 - 2/10/2014

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
2/10/14	1430	Dry	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		S-1	0-2	24	6	1 1 2 1	3	S-1 : Top 1": Dark-brown FOREST MAT Bottom 5": Orange-brown, fine to medium SAND and SILT, trace fine Gravel, trace Roots			0.1	FOREST MAT	606.9
		S-2	2-4	24	16	2 5 10 12	15	S-2 : Top 5": Orange-brown, fine to coarse SAND, some Silt, trace fine Gravel, trace Roots Bottom 11": Brown, fine to coarse SAND, some Silt, trace fine Gravel	1		3	SUBSOIL	604.0
5		S-3	5-7	24	7	10 18 20 32	38	S-3 : Dense, brown, fine to coarse SAND, some Silt, little fine Gravel			8	SAND AND GRAVEL	599.0
								End of exploration at 8 feet.	2				
10													
15													
20													
25													
30													

REMARKS

1 - Increased drilling resistance starting at 4 feet below ground surface. Chattering of augers starting at approximately 6.5 feet below ground surface.
2 - Auger refusal at approximately 8 feet below ground surface.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-5

GZA TEMPLATE TEST BORING; 2/5/2015; 4:05:43 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

UNIVERSITY OF CONNECTICUT
STORRS, CT

BORING NO.: GZ-5A-OW
PAGE: 1 of 1
FILE NO: 45269.01
CHECKED BY: D. Barstow

Drilling Co.: Seaboard Drilling
Foreman: F. Harrington
GZA Rep: J. Davis

Rig Type: ATV
Rig Model: CME-55
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.) 607
Bottom of Boring (ft.): 12
Date Start - Finish: 2/10/2014 - 2/10/2014

Datum:

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30

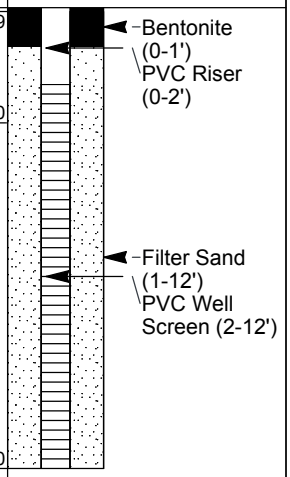
Sampler Type: SS
Sampler I.D. (in.): 2.0
Sampler Length (in.): 24
Rock Core Size: NA

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
2/10/14	1630	10.5	1.25 hrs
2/24/14	0700	10.3	14 days
1/29/15	0800	9.5	363 days

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft.)	Stratum Description	Stratum Elev. (ft.)
			0-10				49	: See Boring GZ-5 for Soil Descriptions	1		0.1	FOREST MAT	606.9
											3	SUBSOIL	604.0
5									2				
10		S-1	10-12	24	7	40 34 15 31		S-1 : Dense, brown, fine to medium SAND, little Silt, trace fine Gravel layered with 1 to 2" thick layers of brown, fine Sand, little Silt			12	SAND AND GRAVEL	595.0
									3 4				
15								End of exploration at 12 feet.					
20													
25													
30													

Equipment Installed



REMARKS

1 - Stratigraphy based on drilling resistance and offset boring GZ-5.
2 - Increased drilling resistance starting at 4 feet below ground surface. Chattering of augers between 6 and 8.5 feet below ground surface and between 10 feet and 12 feet.
3 - Auger refusal at 12 feet below ground surface.
4 - 10 feet of 2 inch diameter, Schedule 40, threaded, flush joint, 10-slot PVC well screen set at approximately 12 feet below grade. Well completed to ground surface with a 2 inch diameter, Schedule 40, threaded, flush joint, PVC riser. Filter sand placed in annulus around well from 1 to 12 feet below grade. Bentonite seal installed from 0 to 1 feet below grade.

Stratification lines represent approximate boundaries between soil types. Transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.: GZ-5A-OW

GZA TEMPLATE SOIL BORING W/EQUIP; 2/13/2015; 10:14:12 AM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

PROPOSED MAA
UNIVERSITY OF CONNECTICUT
STORRS, CT

EXPLORATION NO.: GZ-6
SHEET: 1 of 1
PROJECT NO: 05.0045269.00
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: F. Harrington

Type of Rig: ATV
Rig Model: CME-55
Drilling Method: Rotary-Wash

Boring Location: See Plan
Ground Surface Elev. (ft.): 613
Final Boring Depth (ft.): 14
Date Start - Finish: 2/10/2014 - 2/10/2014

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: Nx

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
2/10/14	1015	Dry	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Description	Depth (ft.)	Elev. (ft.)
	515	S-1	0-2	24	3	1 1	3	S-1 : Top 1": Dark-brown FOREST MAT			FOREST MAT	0.1	612.9
	30					2 2		Bottom 2": Orange-brown, fine to medium SAND, some Silt, trace Roots			SUBSOIL		
	43	S-2	2-4	24	5	3 5	15	S-2 : Medium dense, orange-brown, fine to medium SAND, some Silt, trace fine Gravel				3	610.0
	45					10 8							
	61	S-3	4-6	24	8	6 10	27	S-3 : Top 1": Brown, fine to coarse SAND, some Silt, trace coarse Gravel					
5	65					17 17		Bottom 7": Gray-brown ROCK fragments			SAND AND GRAVEL		
	81	S-4	6-8	24	10	9 10	23	S-4 : Medium dense, orange-brown, fine to coarse SAND and fine to coarse GRAVEL, little Silt					
	89					13 16							
	2.5	S-5	8-8.9	11	9	16 50/5"		S-5 : Orange-brown, fine to coarse SAND, some fine to coarse Gravel, some Silt	1			8.9	604.1
	4	C-1	9-12	36	15	RQD = 0%		C-1 : Hard, moderately to highly weathered, moderately fractured, fine grained, gray GNEISS, moderately dipping foliation	2 3				
10	8												
	2										ROCK		
	3.5	C-2	12-14	24	24	RQD = 33%		C-2 : Top 9": Hard, moderately to highly weathered, extremely fractured, fine to coarse grained, gray GNEISS with moderately dipping fractures	4			14	599.0
15								Bottom 15": Hard, slightly weathered, moderately fractured, fine to coarse grained, white GNEISS, steeply dipping foliation					
								End of exploration at 14 feet.					
20													
25													
30													

REMARKS

1 - Chattering of drill rods starting at approximately 8 feet below grade. Split spoon and roller bit refusal at approximately 8.9 feet below grade.
2 - Rock coring performed with approximately 400 psi of down pressure.
3 - Loss of approximately 250 gallons of washwater during collection of C-1.
4 - Loss of approximately 200 gallons of washwater during collection of C-2.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-6

GZA TEMPLATE TEST BORING; 2/5/2015; 4:05:45 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

PROPOSED MAA
UNIVERSITY OF CONNECTICUT
STORRS, CT

EXPLORATION NO.: GZ-7
SHEET: 1 of 1
PROJECT NO: 05.0045269.00
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: F. Harrington

Type of Rig: ATV
Rig Model: CME-55
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 606
Final Boring Depth (ft.): 10.7
Date Start - Finish: 2/10/2014 - 2/10/2014

H. Datum: Project
V. Datum: Project

Hammer Type: Automatic Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
2/10/14	1600	Dry	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Description	Depth (ft.)	Elev. (ft.)
		S-1	0-2	24	4	1 3 3 3	6	S-1 : Top 1": Dark-brown FOREST MAT Bottom 3": Orange-brown, fine to medium SAND, some Silt, trace Roots			FOREST MAT	0.1	605.9
											SUBSOIL	2	604.0
		S-2	2-4	24	12	6 14 18 23	32	S-2 : Dense, light brown, fine to medium SAND, some Silt, trace fine Gravel					
5		S-3	5-7	24	15	9 11 9 10	20	S-3 : Medium dense, light-brown, fine to coarse SAND, some Silt, trace fine to coarse Gravel	1		SAND AND GRAVEL		
10		S-4	10-10.7	8	8	16 50/2"		S-4 : Brown, fine to coarse GRAVEL, some fine to coarse SAND, some Silt	2			10.7	595.3
								End of exploration at 10.7 feet.					
15													
20													
25													
30													

REMARKS

1 - Increased drilling resistance starting at 4 feet below ground surface.
2 - Split spoon and auger refusal at approximately 10.7 feet below ground surface.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-7

GZA TEMPLATE TEST BORING; 2/5/2015; 4:05:46 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Proposed MAA
University of Connecticut
Storrs, CT

EXPLORATION NO.: GZ-101
SHEET: 1 of 1
PROJECT NO: 05.0045269.01
REVIEWED BY: D. Barstow

Logged By: J. Ryan
Drilling Co.: Seaboard Drilling
Foreman: M. Glynn

Type of Rig: ATV
Rig Model: Mobile B-48
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 604.5
Final Boring Depth (ft.): 17
Date Start - Finish: 1/26/2015 - 1/26/2015

H. Datum: Project
V. Datum: Project

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
1/26/15	1050	10'	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		S-1	0-2	24	5	1 1 1 2	2	S-1 : Very loose, dark brown TOPSOIL			0.4	TOPSOIL	604.1
												SUBSOIL	
											3		601.5
5		S-2	5-6.5	18	16	17 26 39 50	65	S-2 : Very dense, light brown, fine to coarse SAND, some Silt, trace fine to coarse Gravel	1			SAND AND GRAVEL	
10		S-3	10-12	24	12	3 13 19 14	32	S-3 : Dense, brown, fine to medium SAND and SILT, little fine to coarse Gravel			12		592.5
15		S-4	15-17	24	0	8 18 18 30	36	S-4 : NO RECOVERY				GLACIAL TILL	
											17		587.5
								End of exploration at 17 feet.					
20													
25													
30													

REMARKS

1 - Increased drilling resistance from approximately 7-8.5 feet below ground surface.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-101

GZA TEMPLATE TEST BORING; 2/5/2015; 4:04:24 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Proposed MAA
University of Connecticut
Storrs, CT

EXPLORATION NO.: GZ-102
SHEET: 1 of 1
PROJECT NO: 05.0045269.01
REVIEWED BY: D. Barstow

Logged By: J. Ryan
Drilling Co.: Seaboard Drilling
Foreman: M. Glynn

Type of Rig: ATV
Rig Model: Mobile B-48
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 603
Final Boring Depth (ft.): 4.6
Date Start - Finish: 1/26/2015 - 1/26/2015

H. Datum: Project
V. Datum: Project

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
1/26/15	-	Dry	-

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		S-1	0-2	24	8	2 2 1 1	3	S-1 : Very loose, dark brown, FOREST MAT			0.7	FOREST MAT	602.3
												SUBSOIL	
									1		4.6		598.4
5								End of exploration at 4.6 feet.	2				
10													
15													
20													
25													
30													

REMARKS

1 - Increased drilling resistance at 4.5 feet below ground surface.
2 - Auger refusal at 4.6 feet below ground surface.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-102

GZA TEMPLATE TEST BORING; 2/5/2015; 4:04:24 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Proposed MAA
University of Connecticut
Storrs, CT

EXPLORATION NO.: GZ-102A
SHEET: 1 of 1
PROJECT NO: 05.0045269.01
REVIEWED BY: D. Barstow

Logged By: J. Ryan
Drilling Co.: Seaboard Drilling
Foreman: M. Glynn

Type of Rig: ATV
Rig Model: Mobile B-48
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 603
Final Boring Depth (ft.): 14.9
Date Start - Finish: 1/26/2015 - 1/26/2015

H. Datum: Project
V. Datum: Project

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
1/26/15	1320	Dry	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
			0-5					: See Boring GZ-102 for Soil Description	1		0.7	TOPSOIL	602.3
												SUBSOIL	
											4.5		598.5
5		S-1	5-7	24	5	7 19 21 22	40	S-1 : Dense, light brown, fine to coarse SAND, little Silt (Rock fragments in tip of spoon)				SAND AND GRAVEL	
10		S-2	10-12	24	23	14 29 36 48	65	S-2 : Top 4": Orange-brown, fine to medium SAND, some Silt Bottom 19": Brown, fine to medium SAND, some Silt, little fine to coarse Gravel	2		10.5		592.5
		S-3	13-14.9	23	23	16 27 34 50/5	61	S-3 : Very dense, grayish-brown, fine to coarse SAND and SILT, little fine to coarse Gravel				GLACIAL TILL	
15											14.9		588.1
								End of exploration at 14.9 feet.					
20													
25													
30													

REMARKS

1 - Stratigraphy above sample S-1 based on drilling resistance, offset boring GZ-102 and previous borings.
2 - Increased drilling resistance from 12 to 13 feet below ground surface.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-102A

GZA TEMPLATE TEST BORING; 2/5/2015; 4:04:25 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Proposed MAA
University of Connecticut
Storrs, CT

EXPLORATION NO.: GZ-103
SHEET: 1 of 1
PROJECT NO: 05.0045269.01
REVIEWED BY: D. Barstow

Logged By: J. Ryan
Drilling Co.: Seaboard Drilling
Foreman: M. Glynn

Type of Rig: ATV
Rig Model: Mobile B-48
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 605.5
Final Boring Depth (ft.): 9.5
Date Start - Finish: 1/26/2015 - 1/26/2015

H. Datum: Project
V. Datum: Project

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
1/26/15	1445	Dry	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		S-1	0-2	24	7	2 2 3 4	5	S-1 : Top 2": Dark brown TOPSOIL Bottom 5": Light brown, fine to medium SAND and SILT, trace fine to coarse Gravel			0.5	TOPSOIL	605.0
											3	SUBSOIL	602.5
5		S-2	5-7	24	14	13 49 45 53	94	S-2 : Very dense, light brown, fine to coarse SAND, some fine to coarse Gravel, some Silt	1		9.5	SAND AND GRAVEL	596.0
10		S-3	9.5-9.5	0	0	50/0		S-3 : No Penetration End of exploration at 9.5 feet.	2				
15													
20													
25													
30													

REMARKS

1 - Increased drilling resistance between 5.5 and 9.5 feet below ground surface.
2 - Auger and split spoon refusal at approximately 9.5 feet below grade.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-103

GZA TEMPLATE TEST BORING; 2/5/2015; 4:04:26 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Proposed MAA
University of Connecticut
Storrs, CT

EXPLORATION NO.: GZ-104
SHEET: 1 of 1
PROJECT NO: 05.0045269.01
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: M. Glynn

Type of Rig: ATV
Rig Model: Mobile B-48
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 605
Final Boring Depth (ft.): 13.8
Date Start - Finish: 1/29/2015 - 1/29/2015

H. Datum: Project
V. Datum: Project

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
1/29/15	1215	8.8'	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		S-1	0-2	24	12	1 1 2 1	3	S-1 : Top 5": Dark brown, FOREST MAT Bottom 7": Orange-brown, fine SAND and SILT, trace fine Gravel, trace Roots	1		0.4	FOREST MAT	604.6
												SUBSOIL	
											3		602.0
5		S-2	5-7	24	22	14 22 24 23	46	S-2 : Dense, brown, fine to medium SAND, some Silt, trace fine Gravel				SAND AND GRAVEL	
10		S-3	10-12	24	12	8 12 12 24	24	S-3 : Medium dense, brown, fine to coarse SAND and Clayey SILT, trace fine Gravel (1" thick red-brown fine to medium SAND, trace Silt layer in tip of spoon)			10	GLACIAL TILL	595.0
		S-4	13.5-13.8	4	0	75/4"		S-4 : No Recovery	2		13.8		591.2
15								End of exploration at 13.8 feet.					
20													
25													
30													

REMARKS

1 - Auger chatter and increase in resistance at approximately 3 feet, at 11.5 feet and between approximately 12.5 and 13.8 feet.
2 - Auger refusal at approximately 13.8 feet.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-104

GZA TEMPLATE TEST BORING; 2/5/2015; 4:04:27 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Proposed MAA
University of Connecticut
Storrs, CT

EXPLORATION NO.: GZ-105
SHEET: 1 of 1
PROJECT NO: 05.0045269.01
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: M. Glynn

Type of Rig: ATV
Rig Model: Mobile B-48
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 605
Final Boring Depth (ft.): 9.2
Date Start - Finish: 1/29/2015 - 1/29/2015

H. Datum: Project
V. Datum: Project

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
1/29/15	1330	Dry	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		S-1	0-2	24	11	5 4 2 1	6	S-1 : Top 7": Dark brown, fine to medium SAND and SILT, trace fine Gravel, trace Roots Bottom 4": Orange-brown, fine SAND and SILT, trace fine Gravel, trace Roots			0.6	TOPSOIL	604.4
												SUBSOIL	
											3.5		601.5
5		S-2	5-7	24	12	27 34 17 26	51	S-2 : Very dense, brown, fine to coarse SAND, some Silt, little fine to coarse Gravel				SAND AND GRAVEL	
									1				
		S-3	9-9.2	2	0	50/2"		S-3 : No Recovery	2		9.2		595.8
10								End of exploration at 9.2 feet.					
15													
20													
25													
30													

REMARKS

1 - Auger chatter and increased drilling resistance between approximately 7.5 and 9 feet.
2 - Auger refusal at approximately 9 feet.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-105

GZA TEMPLATE TEST BORING; 2/5/2015; 4:04:28 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Proposed MAA
University of Connecticut
Storrs, CT

EXPLORATION NO.: GZ-105A
SHEET: 1 of 1
PROJECT NO: 05.0045269.01
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: M. Glynn

Type of Rig: ATV
Rig Model: Mobile B-48
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 605
Final Boring Depth (ft.): 13.2
Date Start - Finish: 1/29/2015 - 1/29/2015

H. Datum: Project
V. Datum: Project

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
1/29/15	1400	9.3'	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
			0-10					: See Boring GZ-105 for Soil Description	1		0.6	TOPSOIL	604.4
												SUBSOIL	
											3.5		601.5
5									2				
												SAND AND GRAVEL	
10		S-1	10-11.7	20	18	39 75 46 65/2"	R	S-1 : Top 12": Dark gray, fine to coarse GRAVEL, some Silt, little fine to coarse Sand (possible broken cobble/boulder) Bottom 6": Orange-brown, fine SAND, some Silt					
		S-2	13-13.2	2	0	75/2"		S-2 : No Recovery	3		13.2		591.8
15								End of exploration at 13.2 feet.					
20													
25													
30													

REMARKS

1 - Stratigraphy above sample S-1 based on drilling resistance and offset boring GZ-105.
2 - Auger chatter and increased drilling resistance between approximately 6 and 8 feet and between 10 and 11 feet.
3 - Increased drilling resistance at 13 feet below ground surface, Split spoon refusal at approximately 13.2 feet.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-105A

GZA TEMPLATE TEST BORING; 2/5/2015; 4:04:28 PM

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Proposed MAA
University of Connecticut
Storrs, CT

EXPLORATION NO.: GZ-106
SHEET: 1 of 1
PROJECT NO: 05.0045269.01
REVIEWED BY: D. Barstow

Logged By: J. Davis
Drilling Co.: Seaboard Drilling
Foreman: M. Glynn

Type of Rig: ATV
Rig Model: Mobile B-48
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 605
Final Boring Depth (ft.): 13.2
Date Start - Finish: 1/29/2015 - 1/29/2015

H. Datum: Project
V. Datum: Project

Hammer Type: Safety Hammer
Hammer Weight (lb.): 140
Hammer Fall (in.): 30
Auger or Casing O.D./I.D Dia (in.): 4-1/4"

Sampler Type: SS
Sampler O.D. (in.): 2.0
Sampler Length (in.): 24
Core Barrel Size: NA

Groundwater Depth (ft.)			
Date	Time	Water Depth	Stab. Time
1/29/15	1530	8.8'	5 min.

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		S-1	0-2	24	10	4 10 7 7	17	S-1 : Top 5": Dark brown, fine to medium SAND and SILT, trace fine Gravel, trace Roots Bottom 5": Orange-brown, fine SAND and SILT, little fine to coarse Gravel	1		0.4	TOPSOIL	604.6
											3.5	SUBSOIL	601.5
5		S-2	5-7	24	16	13 20 29 25	49	S-2 : Dense, brown and gray, fine to coarse SAND, some Silt, trace fine Gravel (mottled and trace Roots in top 8")				SAND AND GRAVEL	
10		S-3	10-12	24	11	21 41 30 14	71	S-3 : Very dense, brown, fine to coarse SAND and SILT, little fine Gravel					
		S-4	13-13.2	2	1	75/2"		S-4 : Dark gray, decomposed ROCK fragments	2		13.2		591.8
15								End of exploration at 13.2 feet.					
20													
25													
30													

REMARKS

1 - Auger chatter and increased drilling resistance between approximately 1 and 3 feet and between 12 and 13 feet.
2 - Auger refusal at approximately 13 feet.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-106

GZA TEMPLATE TEST BORING; 2/5/2015; 4:04:29 PM

APPENDIX C
LABORATORY TEST RESULTS

LABORATORY TESTING DATA SHEET

Project Name UCONN - Proposed MAA
Project No. 05.0045269.00
Project Manager D. Barstow

Project Location Storrs, CT
Assigned By J. Davis
Date 2/21/2014

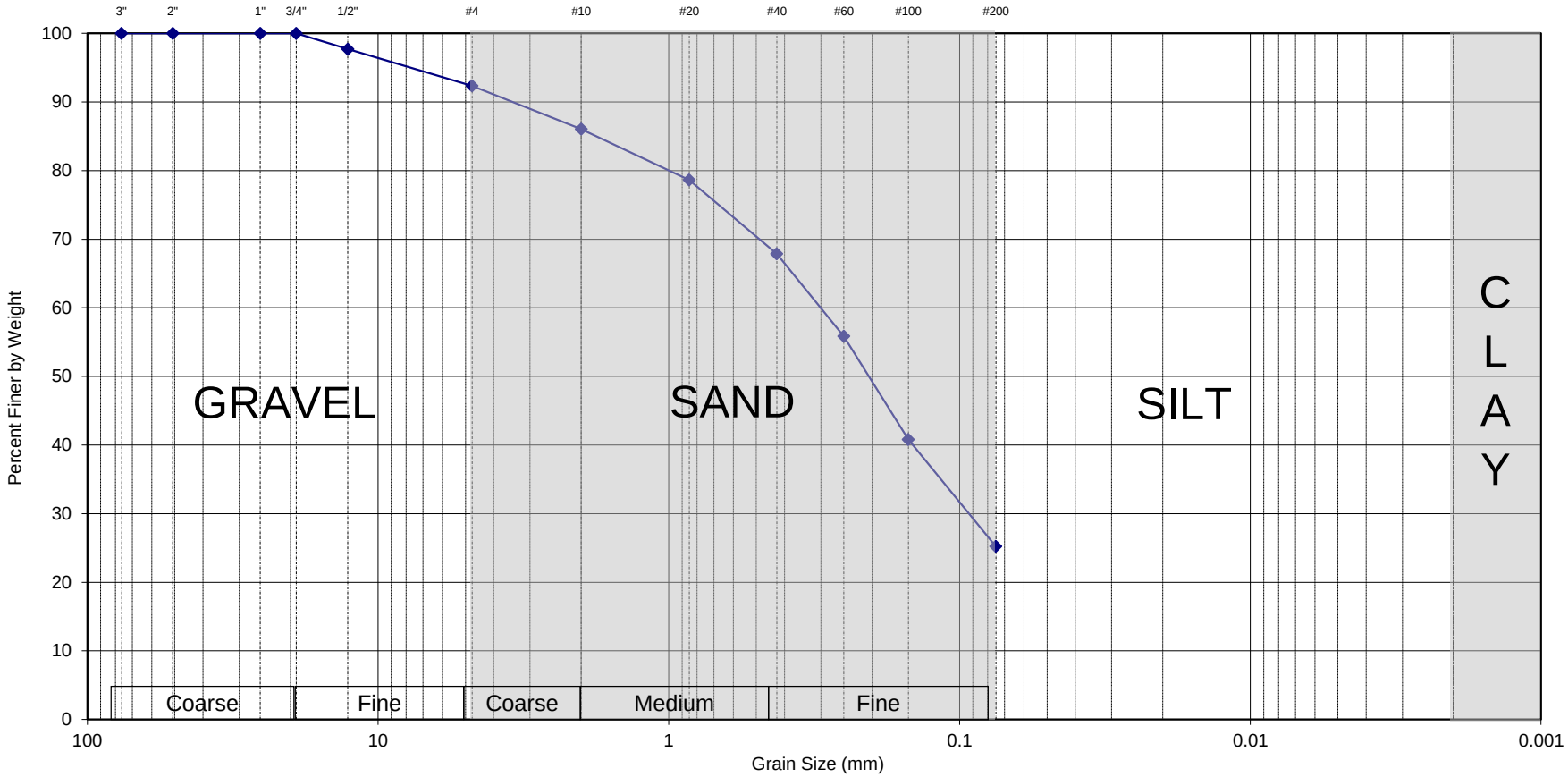
Reviewed By
Date Reviewed 2/21/2014

Boring/ Test Pit No.	Sample No.	Depth ft.	Lab No.	Identification Tests: Water Content %	LL %	PL %	OD LL %	Sieve -200 %	Hyd -2μ %	ORG %	Dry unit wt. pcf	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	Consol. $\frac{C_c}{1 + e_0}$	Laboratory Log and Soil Description
GZ-2	S-3	5-7	1					25.2										Brown f-m SAND, some Silt, trace fine Gravel
GZ-4	S-2	2-4	2					27.2										Brown f-m SAND, some Silt, trace fine Gravel
GZ-7	S-2	2-4	3					25.8										Brown f-m SAND, some Silt, little f-c Gravel

THIELSCH ENGINEERING
195 Frances Avenue
Cranston, RI 02910

ASTM D422

U.S. STANDARD SIEVE AND HYDROMETER



Gravel	Sand	Fines
7.6%	67.1%	25.2%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
1	GZ-2	S-3	5-7'	Brown f-m SAND, some Silt, trace fine Gravel				

Sieve Size	% Passing
¾"	100.0
½"	97.7
#4	92.4
#10	86.1
#20	78.6
#40	67.9
#60	55.9
#100	40.8
#200	25.2

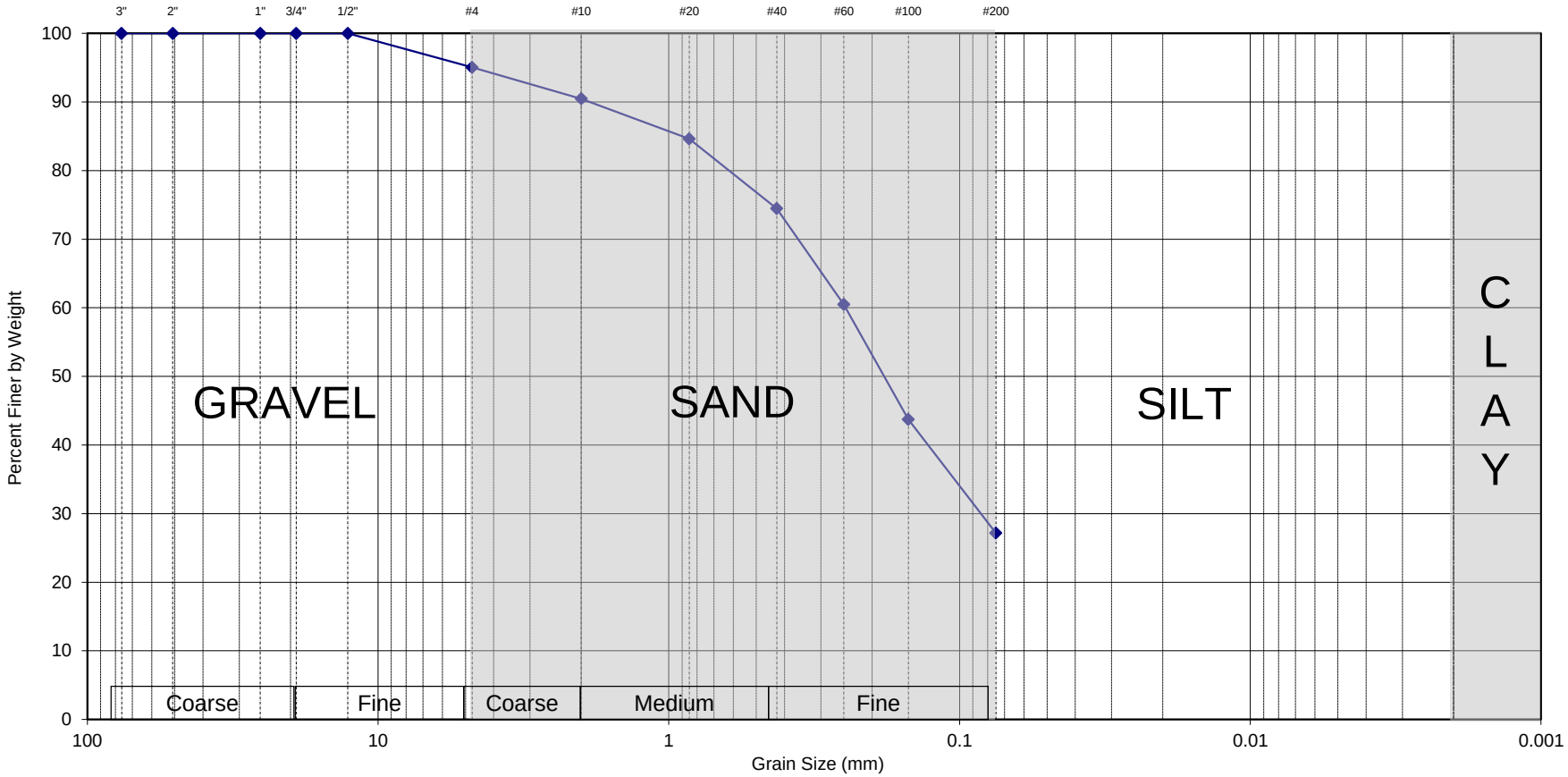
THIELSCH ENGINEERING
195 Frances Ave., Cranston, RI 02910
401-467-6454

CTS-74-14-0003
UCONN - Proposed MAA
Storrs, CT
GZA File # 05.0045269.00

Tested by: GG Date: 2/21/14
Reviewed by: MBP Date: 2/21/14

ASTM D422

U.S. STANDARD SIEVE AND HYDROMETER



Gravel	Sand	Fines
5.0%	67.9%	27.2%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
2	GZ-4	S-2	2-4'	Brown f-m SAND, some Silt, trace fine Gravel				

Sieve Size	% Passing
¾"	100.0
½"	100.0
#4	95.0
#10	90.5
#20	84.6
#40	74.5
#60	60.5
#100	43.7
#200	27.2

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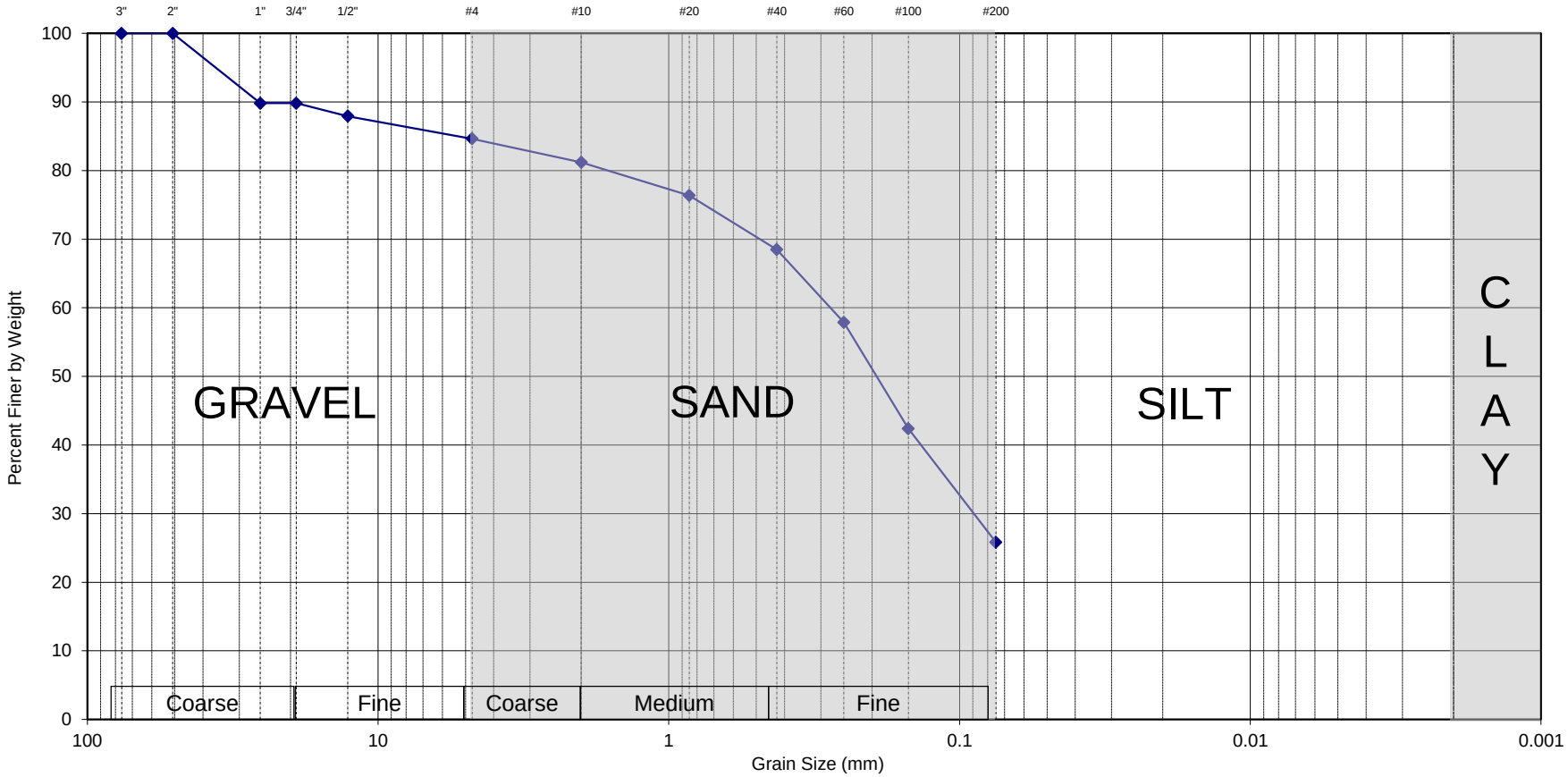
GZA File # 05.0045269.00

Tested by: GG Date: 2/21/14
Reviewed by: MBP Date: 2/21/14

ASTM D422

U.S. STANDARD SIEVE AND HYDROMETER



Gravel	Sand	Fines
15.4%	58.8%	25.8%

Lab #	Exploration	Sample	Depth	Description	WC	LL	PL	PI
3	GZ-7	S-2	2-4'	Brown f-m SAND, some Silt, little f-c Gravel				

Sieve Size	% Passing
¾"	89.8
½"	87.9
#4	84.6
#10	81.2
#20	76.4
#40	68.5
#60	57.9
#100	42.4
#200	25.8

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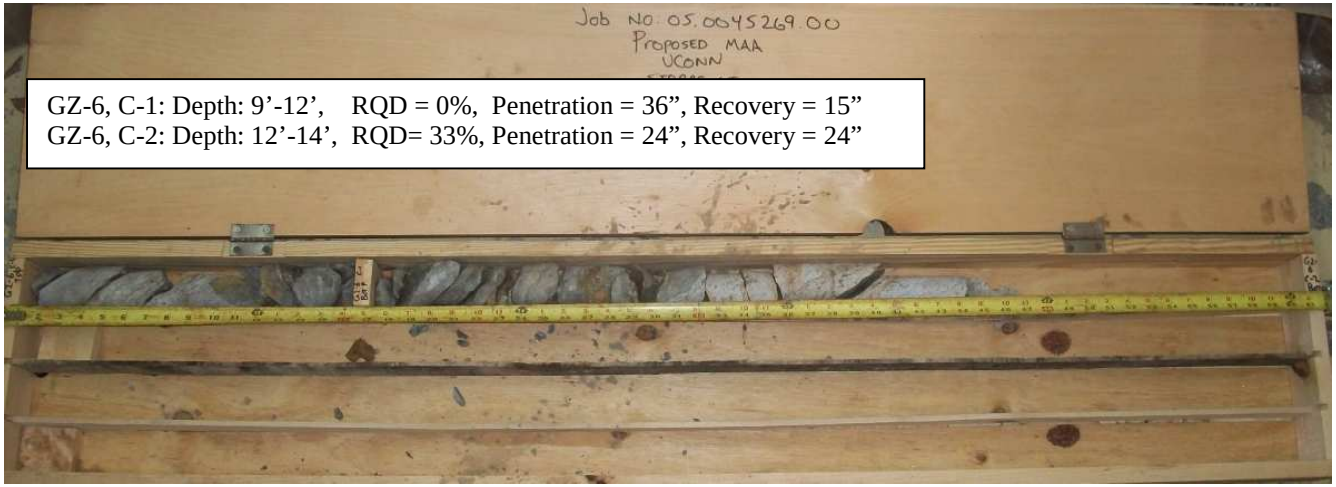
401-467-6454

CTS-74-14-0003
UCONN - Proposed MAA
Storrs, CT
GZA File # 05.0045269.00

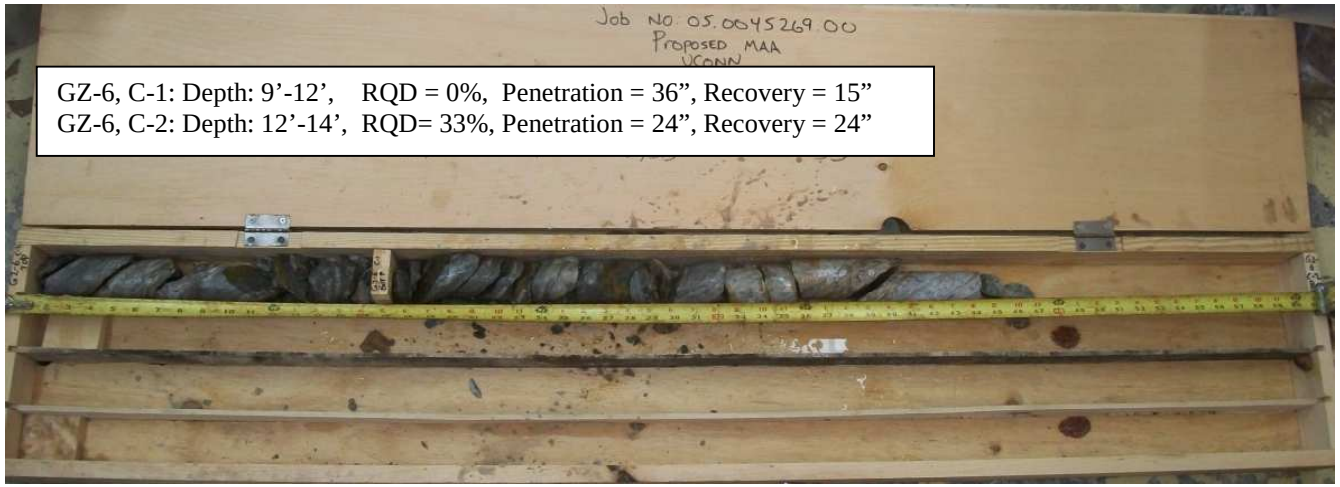
Tested by: GG Date: 2/21/14
Reviewed by: MBP Date: 2/21/14

APPENDIX D
BEDROCK CORE PHOTOGRAPHS

APPENDIX D – BEDROCK CORE PHOTOGRAPHS



Dry Core Photograph



Wet Core Photograph

SECTION 010100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section summarizes the Work of the Project, including the following:

1. Project Description
2. Time of Completion
3. Work Under Other Contracts
4. Work Day
5. Work Sequence
6. Contractor's Use of Premises
7. Owner Occupancy
8. Owner Furnished Products
9. University Contract Vendors
10. Specification Formats and Conventions

1.3 PROJECT DESCRIPTION

A. The Project consists of the "Main Accumulation Area for Regulated Waste" at "21 C-Lot Drive, Storrs", Connecticut, as shown on Contract Documents prepared by "Tai Soo Kim Partners Architects" dated 4/6/2015. "Main Accumulation Area for Regulated Waste is one story high, with concrete foundation, steel-framed structure, non-load bearing brick and block exterior cavity walls, and metal panels. There is a single ply green roof. This project is designed to achieve a LEED silver rating from the USGBC, and to meet the requirements of the CT High Performance Buildings regulations.

B. The Work consists of the following:

1. Fencing, soil erosion control and temporary protection.

2. Site clearing and grubbing.

3. Provision of new site utilities.

4. Excavation.

5. Construction of new 7,334 SF building (inside face of exterior wall including overhangs) including but not limited to concrete foundation and slabs, loading dock, fire suppression over flow basins and fiberglass grating, masonry cavity walls, storefront, metal panels, metal roof deck, green roof construction, metal roof screen, wall, roof, and foundation insulation, interior partitions, millwork, doors and frames, blow out panels (explosion venting), roof hatches and vents, interior finishes, toilet accessories, fire extinguishers, walk-in refrigerator, wood laboratory casework, fume hoods, roller window shades, fire suppression, plumbing, HVAC, electrical power and lighting, emergency generator, and communications systems.

6. Provision of site improvements.

7. Landscaping the site and green roof.

8. Commissioning building systems.

9. Flushout for indoor air quality.

10. LEED documentation.

11. Removal of all debris caused by this contract.

Refer to the complete set of Drawings and Specifications for complete information.

C. Protection for the public, building, grounds from damage during this contract is the responsibility of the Contractor for this project at all times.

1.4 TIME OF COMPLETION

A. Work required by the project shall commence immediately upon receipt of a Notice to Proceed.

1. The successful bidder shall obtain the Certificate of Substantial Completion as defined in the Contract Documents no later than 04/12/2016.

B. Due to the nature of this institution, it is required that the academic schedule must be maintained. Contractor shall cooperate and coordinate with the University to assure that the academic schedule will be maintained. The Academic Schedule including exam periods can be found on the following website: registrar.uconn.edu/acadcal.html.

1.5 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

1.6 WORK DAY

A. The normal workday shall be 7:00 a.m. to 4:30 p.m. Monday through Friday, excluding State granted Holidays. Permission must be requested and approved in writing to perform work outside the normal working hours or on a State Holiday.

B. In addition to reasons determined by the University, approval of deviations in work hours is dependent upon availability of University supervisory personnel.

1. No person shall be employed to work or permitted to work more than eight hours in any day or more than forty hours in any week on any work provided for under this Contract. The observance of such limitations of hours of work may be suspended during an emergency, upon approval of the Executive Director of Architectural and Engineering Services.

C. If the Contractor determines that work on this project must be performed during a time other than normal working hours of the University, costs for any premium time must be included in the Base Bid.

1.7 CONTRACTOR USE OF PREMISES

A. General: Limit use of the premises to construction activities in areas indicated.

1. Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

2. Keep driveways and entrances serving the premises clear and available to the Owner and the Owner's employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

3. Burial of Waste Materials: Do not dispose of organic and hazardous material on site, either by burial or by burning.

B. Contractor shall restrict use of construction related trucks on local roads.

1.8 OWNER OCCUPANCY

A. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and

install equipment in completed areas of the building, prior to Substantial Completion provided that such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. A Certificate of Substantial Completion will be executed for each specific portion of the Work to be occupied prior to Owner occupancy.

2. Certifications. The Contractor at completion of construction shall provide to the University a "Certificate of Substantial Compliance with the State Building and Fire Safety Codes" bearing original signatures of an officer of the company stating: "This is to CERTIFY that in my professional opinion the complete structure/renovations described above is in substantial compliance with the approved construction documents on file with the University of Connecticut. Minor deviations and special stipulations are noted below (if any)".

3. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy the Owner will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.

1.9 PRE-ORDERED PRODUCTS (None)

1.10 OWNER-FURNISHED ITEMS

A. The Owner will provide selected materials and equipment for incorporation into the Work. The Work includes providing support systems to receive Owner's equipment and any required mechanical and electrical connections.

1. The Owner will arrange and pay for delivery of Owner-furnished items in accordance with the Contractor's Construction Schedule, and will inspect deliveries for damage.

B. If Owner-furnished items are damaged, defective or missing, the Owner will arrange for replacement. The Owner will also arrange for manufacturer's field services, and the delivery of manufacturer's warranties and bonds to the Contractor.

C. The Contractor is responsible for designating the delivery dates of Owner-furnished items in the Contractor's Construction Schedule and for receiving, unloading and handling Owner- furnished items at the site. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements, and to repair or replace items damaged as a result of his operations.

D. Schedule of Owner-Furnished Items:

1. Georgia Pacific toilet paper dispensers.

1.11 UNIVERSITY CONTRACT VENDORS

A. The Owner has a contract with a specific vendor to provide the following:

a. Building/Energy Management Systems
   i. Schneider Electric (Storrs and Stamford Campuses)
      1. Contact Person: Ray Hansen
   ii. Johnson Control (Branch campuses)

b. Audio/Visual Contractors

HB Communications, Inc.
Tim Downes
60 Dodge Avenue
North Haven, CT 06473
Tele # 203.234.9246 Ext. 7077
Fax # 203.234.2013
www.tdownes@hbcommunications.com

Advanced Lighting and Sound
Ian Gagnon
63 Slater Road #4
Manchester, CT 06045-0837
Tele # 800.622.8872
Fax # 860.643.9032
igagnon@aiss1.com

c. Fire Alarm System (Material Only)
   i. Simplex Grinnell
      1. Contact: Jennifer Jersey and/or Gerald Campion

d. Hardware Core/Keying System

   i. Sargent Hardware.

1.12 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 33-division format and CSI/CSC's "MasterFormat 2004" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.

2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

   a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 010010

SECTION 010400 – PROJECT COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:

1. Coordination and Coordination Drawings.
2. Administrative and supervisory personnel.
3. General installation provisions.
4. Cleaning and protection.

C. Progress meetings, coordination meetings and pre-installation conferences are included in Section 012000, Project Meetings.

D. Requirements for the Contractor's Construction Schedule are included in Section 013300, Submittals.

1.3 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project Close-out activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

2. EFFICIENCY: Shall have a minimum or higher efficiency to comply with CL & P, EPA's Energy Star, D.O.E. and CNG requirements for HVAC, lighting/controls; building envelope and appliances.

1.4 KEY PERSONNEL

A. The University requires as a minimum, the following Key Personnel be assigned to this project. [Please note % time for each.]

1. Project Manager - Part Time – 50%.
2. Project Superintendent – Full Time.
4. Project Engineer – Full time.
6. Safety Manager – Part Time – 10%.
8. MEP Coordinator – Part Time – 10%.

9. LEED Coordinator – Part Time – 5%.

B. Each individual listed above shall have not less than _5_ years experience performing work of a similar nature to this project and in a comparable position to the position assigned on this project. Resumes will be required on all key personnel prior to acceptance. Removal of any personnel denoted as Key Personnel from the project will require Owner's prior approval.

1.5 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section 013300, Submittals.

B. Staff Names: Within 10 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses, telephone numbers and include a copy of their resumes.

1. Comply with requirements contained in Section 013300, Submittals.

2. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

PART 2 - PRODUCTS (Not Use)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION

A. Coordinate in field with affected trades for proper relationship to Work based on Project conditions.

B. Notify Architect of conflicts and other coordination issues requiring resolutions prior to commencing construction in each affected area.

C. Submit Contractor's certification to Architect that Coordination Drawings have been completed and coordination issues have been identified and resolved prior to commencing construction in each affected area.

D. Make Coordination Drawings available in field office for review by Architect and Owner during entire period on construction.

3.2 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

F. Recheck measurements and dimensions, before starting each installation.

G. Install each component to ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.3 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High speed operation,
21. Improper lubrication,
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 010400

SECTION 012000 – PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A . Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Pre-Construction Conference.
2. Pre-Installation Conferences.
3. Coordination Meetings.
4. Progress Meetings.

C. Construction schedules are specified in Section 013300, Submittals.

1.3 PRE-CONSTRUCTION CONFERENCE

A. The successful bidder shall attend a preconstruction conference and organizational meeting at the University of Connecticut Office of Architectural and Engineering Services, with the University Representative prior to any field work to review responsibilities and personnel assignments and to insure that Specifications, drawings and all conditions are understood to properly complete this Contract.

B. The meeting will be scheduled by the University Representative.

C. Attendees: The Owner, Architect and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.

D. Agenda: Discuss items of significance that could affect progress including such topics as:

1. Construction schedule.
2. Critical Work sequencing.
3. Labor Market Regulations.
4. Designation of responsible personnel and emergency phone numbers.
5. Procedures for processing field decisions and Change Orders.
6. Procedures for processing Applications for Payment.
7. Distribution of Contract Documents and correspondence.
8. Submittal of Shop Drawings, Product Data and Samples.
9. Preparation of record documents.
10. Use of the premises, including dust and noise control.
11. Parking and parking permits.
12. Office, Work and storage areas.
13. Equipment deliveries and priorities.
14. Safety procedures, including the University's Hazard Communication Program and policies on pest control, asbestos, lead-based paints, lockout/tagout procedures, excavation and trenching, disposal of PCB containing light ballasts, use of solvents, solvent- or epoxy-based paints, confined space entries and use of open flames.
15. First aid.
16. Unacceptable behavior.
17. Security.
18. Construction debris and housekeeping.
19. Working hours.
20. Procedures to comply with LEED and CT High Performance Requirements.

1.4 PRE-INSTALLATION CONFERENCES

A. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Architect and University Representative of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:

   a. Contract Documents.
   b. Options.
   c. Related Change Orders.
   d. Purchases
   e. Deliveries.
   f. Shop Drawings, Product Data and quality control Samples.
   g. Possible conflicts.
   h. Compatibility problems.

i. Time schedules.
j. Weather limitations.
k. Manufacturer's recommendations.
l. Compatibility of materials.
m. Acceptability of substrates.
n. Temporary facilities.
o. Space and access limitations.
p. Governing regulations.
q. Safety.
r. Inspection and testing requirements.
s. Required performance results.
t. Recording requirements.
u. Protection.

2. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Architect.

3. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 COORDINATION MEETINGS

A. Conduct Project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

C. Notify Owner and Architect 48 hours in advance of all coordination meetings.

D. Record meeting results and distributes copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 PROGRESS MEETINGS

A. Conduct progress meetings at the Project site at weekly intervals. Notify the Owner and Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress or involved in planning,

coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

2. Review the present and future needs of each entity present, including such items as:

a. Interface requirements.
b. Time.
c. Sequences.
d. Deliveries.
e. Off-site fabrication problems.
f. Access.
g. Site utilization.
h. Temporary facilities and services.
i. Hours of Work.
j. Hazards and risks.
k. Housekeeping.
l. Quality and Work standards.
m. Change Orders.
n. Documentation of information for payment requests.

D. Reporting: No later than 3 days after each progress meeting date, Contractor shall distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012000

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. If necessary, additional requirements will be issued by Change Order.

C. Types of allowances include the following:

1. Unit-cost allowances.
2. Quantity allowances.

D. Related Sections:

1. Division 1 Section "Unit Prices" for procedures for using unit prices.
2. Divisions 2 through 33 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Owner of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Owner’s request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Owner from the designated supplier.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 UNIT-COST AND QUANTITY ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered or selected by Owner under allowance and shall include freight and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Owner, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.

2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.

3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.

4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.

2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1 – TBD.

END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Vegetative Roof Pre-Grown Modular System – Provide modules, growing media, plants, and edging, as shown on the drawings and specified in Specification Section 075423.

B. Alternate No. 2: Building Envelope Air Leakage Test – Provide Orifice Blower Door Test as specified in Section 019119.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section includes administrative and procedural requirements for substitutions.

C. Related Sections:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.
3. Division 01 Section "Allowances" for products selected under an allowance.
4. Division 01 Section "Alternates" for products selected under an alternate.
5. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
6. Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use CSI Form 13.1A.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

   a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
   b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
   c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
   d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
   e. Samples, where applicable or requested.
   f. Certificates and qualification data, where applicable or requested.
   g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
   h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
   i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
   j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
   k. Cost information, including a proposal of change, if any, in the Contract Sum.
   l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
   m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. LEED Materials Documentation Sheet: Submit Completed LEED Materials Documentation Sheet from Section 018113.13 “Sustainable Design Requirements” for proposed substituted product.

4. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 14 days of receipt of a request for substitution. Architect will notify Contractor through the Construction Manager of acceptance or rejection of proposed substitution within 14 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

    a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
    b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 21 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    b. Substitution request is fully documented and properly submitted.
    c. Requested substitution will not adversely affect Contractor's construction schedule.
    d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    e. Requested substitution is compatible with other portions of the Work.
    f. Requested substitution has been coordinated with other portions of the Work.
    g. Requested substitution provides specified warranty.

h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

i. Requested substitution of proposed product or material complies with requirements of LEED and CT High Performance Buildings Standard.

B. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012700 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section includes administrative and procedural requirements for unit prices.

C. Related Sections:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price 1: Temporary Excavation Support.

1. Description: Provide additional Temporary Excavation Support including excavation, backfilling, tie backs, soil nails and all work required for a complete installation.

2. Unit of Measurement: Fifty (50) square feet of exposed excavation face.

B. Unit Price 2: General Rock Excavation.

1. Description: Provide general rock excavation in open areas by ripping. Legally dispose of excavated materials off-site.

2. Unit of Measurement: One (1) cubic yard.

C. Unit Price 3: Trench Rock Excavation.

1. Description: Provide trench rock excavation in by ripping. Legally dispose of excavated materials off-site.

2. Unit of Measurement: One (1) cubic yard.

D. Unit Price 4: Sprinkler Head in acoustical lay in or suspended gypsum board ceiling.

1. Description: Provide additional fire sprinkler head in acoustical lay in or gypsum board ceiling.

2. Unit of Measurement: One (1) sprinkler head and associated piping.

E. Unit Price 5: Sprinkler Head in area without ceiling.

1. Description: Provide additional fire sprinkler head.

2. Unit of Measurement: One (1) sprinkler head and associated piping.

F. Unit Price 6: Fire Alarm Horn Strobe.

1. Description: Provide additional fire alarm horn strobe with 25 feet of circuiting.

2. Unit of Measurement: One (1) fire alarm horn strobe with associated circuiting.

G. Unit Price 7: Smoke Detector.

1. Description: Provide additional smoke detector with 25 feet of circuiting.

2. Unit of Measure: One (1) smoke detector with associated circuiting.

H. Unit Price 8: Duplex electrical receptacle:

1. Description: Provide additional duplex electrical receptacle with 25 feet of circuiting.

2. Unit of Measure: One (1) duplex electrical receptacle with associated circuiting.

I. Unit Price 9: Data Drop.

1. Description: Provide additional data drop with 100 foot cabling.

2. Unit of Measure: One (1) data drop with associated cabling.

END OF SECTION 012700

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

1. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1. Contractor's construction schedule.
2. Submittal schedule.
3. Shop Drawings.
4. Coordination Drawings and layouts.
5. Daily Construction Reports.
6. Product Data.
7. Samples.
8. Site Mobilization Plan
9. Safety Plan.
10. Construction Photographs.

B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals, including, but not limited to:

1. General and Supplementary General Conditions for:

a. Permits.
b. Applications for payment.
c. Performance and payment bonds.
d. Insurance certificates.
e. List of Subcontractors.
f. Schedule of Values.

C. Related Sections include the following:

1. Division 1 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.

2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.

3. Division 1 Section "Closeout Procedures" for submitting warranties.

4. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

5. Division 1 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.

6. Divisions 2 through 33 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect, upon receipt of waiver from Contractor regarding the reuse of the electronic copies, for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay. The Architect will retain 2 (two) copies of each submittal. The Owner will retain two (2) copies of each approved submittal. Provide sufficient copies for Architect, Owner, and Contractor.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of

submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 7 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow 7 business days for review of each resubmittal.

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.

3. Include the following information on label for processing and recording action taken:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Section number followed by a dash, then a sequential number followed by a dash and then the submission number (e.g., 07840-01-01). Resubmittals shall include the next numerical suffix after the second dash (e.g., 07840-01-02).

g. Number and title of appropriate Specification Section.
h. Drawing number and detail references, as appropriate.
i. Location(s) where product is to be installed, as appropriate.
j. Other necessary identification.

E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked "No Exceptions Noted”.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals with mark indicating “No Exceptions Noted " or “Exceptions Noted” taken by Architect.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar- chart type Contractor's construction schedule. Submit three copies of the schedule to the University Representative within 15 days after the Contract Award or at the Preconstruction Meeting, whichever occurs first.

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".

2. The level of detail should be such that no activity should exceed 20 working days. Where similar activities continue beyond the 20 day limit, these activities should be broken into subgroups, specific areas, or phases so that the 20 day maximum duration is maintained.

3. The schedule shall show a clear and definable critical path for the work as a whole as well as each of the definable work areas. All imposed or constrained dates shall be clearly identified. Include/coordinate schedule with submittal schedule, regulatory agency permits/approvals and "Work Under Other Contract" activities.

4. Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.

5. Prepare the schedule on a sheet, or series of sheets, of sufficient width to show data for the entire construction period.

6. Coordinate each element on the schedule with other construction activities. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.

7. Coordinate the Contractor's construction schedule with the Schedule of Values, and other schedules.

8. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Engineer's procedures necessary for certification of Substantial Completion, commissioning, as well as punch list and close-out requirements.

9. The Schedule shall be submitted the third week of the month and/or in conjunction with the submission of the pencil requisition or whenever a substantial change in the proposed schedule has occurred.

B. Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by requirements for phased completion to permit Work by separate Contractors and partial occupancy by the Owner prior to Substantial Completion. Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.

C. Distribution: Following response to the initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

1.7 SUBMITTAL SCHEDULE

A. After development and acceptance of the Contractor's construction schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for establishment of the Contractor's construction schedule.

1. Coordinate submittal schedule with the list of subcontracts, Schedule of Values and the list of products as well as the Contractor's construction schedule.

2. Provide the following information:

a. Scheduled date for the first submittal.
b. Related Section number.
c. Submittal category item title.
d. Name of subcontractor.

1.8 SHOP DRAWINGS

A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules patterns, templates and similar drawings. Include the following information:

1. Dimensions.

2. Identification of products and materials included.

3. Compliance with specified standards.

4. Notation of coordination requirements.

5. Notation of dimensions established by field measurement.

6. Sheet Size: Except for templates, patterns and similar full- size Drawings, submit Shop Drawings on sheets at least 8-1/2" x 11" but no larger than 24" x 36".

7. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

C. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.

1. Preparation of coordination Drawings is specified in Section 01040, Project Coordination, and may include components previously shown in detail on Shop Drawings or Product Data.

2. Submit coordination Drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

1.9 COORDINATION DRAWINGS AND LAYOUTS

A. General: Coordination drawings are not shop drawings and shall not be submitted to Architect for approval. Coordination drawings shall be completed and submitted prior to commencement of work.

1. Coordination drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided and to function as intended.

2. Prepare composite coordination drawings to scale of 3/8" = 1'-0" or larger, detailing major elements, components, and systems of architectural, structural, mechanical, and electrical equipment and materials in relationship with each other, and with building components. Include dimensions.

3. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to efficient flow of Work affecting one or more trades.

4. Indicate scheduling, sequencing, movement, and positioning of large equipment into building during construction.

5. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installation.

6. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communications systems components, sprinklers, and other ceiling-mounted devices.

7. Show interrelationship of components to be shown on separated Shop Drawings.

8. Indicate required installation sequences.

1.10 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report recording the following information concerning events at the site, and submit duplicate copies to the UConn Representative and/or Architect at weekly intervals:

1. List of subcontractors at the site.
2. Approximate count of personnel at the site.
3. High and low temperatures, general weather conditions.
4. Accidents and unusual events.
5. Meetings and significant decisions.

6. Stoppages, delays, shortages, and losses.
7. Meter readings and similar recordings.
8. Emergency procedures.
9. Orders and requests of governing authorities.
10. Change Orders received, implemented.
11. Services connected, disconnected.
12. Equipment or system tests and startups.
13. Partial Completions, occupancies.
14. Substantial Completions authorized.

1.11 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

   a. Related Specification section number.
   b. Project name.
   c. Project number.
   d. Manufacturer's printed recommendations.
   e. Compliance with recognized trade association standards.
   f. Compliance with recognized testing agency standards.
   g. Application of testing agency labels and seals.
   h. Notation of dimensions verified by field measurement.
   i. Notation of coordination requirements.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

B. Submit complete LEED Materials Documentation Sheet with each submittal as follows:

1. Materials and products from Divisions 3-10, and Division 12 furnishings and casework, plus all paving, site foundations, site improvements, plantings, turf and grasses – complete entire for.
2. Any product with adhesives and sealants, paints and coatings (including touch-up) installed on site, inside building weather barrier, and/or any floor products, and any wood based or agrifiber components – complete IEQ section of form.

1.12 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.

1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Include the following:

a. Generic description of the Sample.
b. Product name or name of manufacturer.

2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3), that show approximate limits of the variations.

b. Selection of painting colors shall be made by the Architect, who will be responsible for obtaining approval of the using agency. After receipt of this approval, this selection will be given to the University Representative for return to the Contractor.

3. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.

a. Preliminary submittals will be reviewed and returned with the Architect's mark indicating selection and other action.

4. Maintain sets of Samples, as returned, at the Project site, for quality comparisons throughout the course of construction.

1.13 SITE MOBILIZATION PLAN

A. Prior to the start of operations on the site, the Contractor shall submit to the University Representative, a Site Specific Mobilization Plan which shall indicate pertinent dates and times, logistics, traffic flow and compliance with the General Requirements to a level of detail commensurate with the complexity of the construction and the sensitivity of the Owner's ongoing activities on site.

1.14 SAFETY PLAN

A. Prior to, and as a condition of mobilization on site, the Contractor shall submit a project specific Safety Plan consisting of no less than the following information:

1. Material Safety Data Sheets for all potentially harmful substances.

2. A list of Contractor, Subcontractor, and University personnel to be notified in the event of an emergency.

3. A list of Contractor's personnel to be notified by the University in the event of an emergency during "off" hours.

4. Evacuation plans.

5. Emergency medical procedures.

6. Locations of emergency medical equipment.

7. Egress plan for each phase of the work (to be approved by UCONN DPES in advance).

1.15 CONSTRUCTION PHOTOGRAPHS

A. On the date the work is begun and on or about the first day of each month thereafter (until the work is at least 95 percent complete), the Contractor shall have photographs of the construction taken by a professional photographer.

B. Take at least twenty-four (24) digital pictures each time. Note the date the picture was taken, the Project number, identification of the view, and the vantage point. Deliver pictures to the University Representative on a CD with submission of pay requisition.

C. As photographs are a record of the work progress, they shall be taken each month, whether or not they show work done during the preceding month.

1.16 PRODUCTS INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

9. Number of Copies: Submit two (2) copies of each submittal, unless otherwise indicated. Architect will not return copies.

10. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

D. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

E. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

F. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

H. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

I. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

J. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

K. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

L. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

M. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

N. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."

O. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.

2. Statement on condition of substrates and their acceptability for installation of product.

3. Statement that products at Project site comply with requirements.

4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.

6. Statement whether conditions, products, and installation will affect warranty.

7. Other required items indicated in individual Specification Sections.

R. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

1.17 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

2. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 2 - EXECUTION

2.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

2.2 ARCHITECT'S / ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 – QUALITY CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section specifies administrative and procedural requirements for quality control and quality control services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.

2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

3. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 RESPONSIBILITIES

A. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.

1. The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility.

B. Contractor Responsibilities: The Contractor shall notify the University Representative and testing laboratory 24 hours before the expected time of testing.

1. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

2. Additional Tests: The Contractor is responsible for employing and paying for additional tests if for the Contractor's convenience.

3. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.

b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.

d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

e. Security and protection of samples and test equipment at the Project site.

C. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the University Representative promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.

3. The agency shall not perform any duties of the Contractor.

D. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

1.4 SUBMITTALS

A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the University Representative, in duplicate.

1. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:

a. Date of issue.
b. Project title and number.
c. Name, address and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the Work and test method.
g. Identification of product and Specification Section.
h. Complete inspection or test data.
i. Test results and an interpretations of test results.
j. Ambient conditions at the time of sample-taking and testing.
k. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

1.5 QUALITY ASSURANCE

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

1.6 REFERENCES

A. Conform to reference standard by date of issue current on date of Contract Documents where no date is specified with standard.

B. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

1.7 MOCK-UPS

A. Tests will be performed under provisions identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachments and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-up shall be a comparison standard for the remaining work.

D. Where mock-up has been accepted by Architect/Engineer, remove mock-up and clear area when directed to do so.

E. Provide mock-ups as specified within other specification sections.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for "Cutting and Patching."

1. Protect construction exposed by or for quality control service activities, and protect repaired construction.

2. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 014000

SECTION 01 4150 - VOLATILE ORGANIC COMPOUND LIMITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Lists of volatile organic compound (VOC) content limits for field-applied adhesives, sealants, paints and architectural coatings used for interior applications on the Project.

C. Related Sections:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, recycling, and disposing of non hazardous waste.
3. Divisions 03 through 33 Sections for LEED requirements specific to the work of each of these Sections.

1.3 REFERENCES

A Definitions:

1. EPA: U.S. Environmental Protection Agency.
2. GBCI: Green Building Certification Institute.
3. GS: Green Seal.
4. LEED: Leadership in Energy and Environmental Design.
5. SQAMD: South Coast Air Quality Management District.
6. USGBC: United States Green Building Council.

B. Reference Standards:

1. South Coast Air Quality Management District (SCAQMD) Rule #1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 20052. GS Standard GS-36 for Commercial Adhesives, requirements in effect October 19, 2000.
2. South Coast Air Quality Management District (SCAQMD) Rule #1113, 2004.
3. Green Seal Standard GS-11 for Architectural Coatings, 1st Edition, May 20, 1993.
4. Green Seal Standard GC-03 for Anti-Corrosive Paints 2nd Edition, January 7, 1997.
5. U. S. EPA Reference Test Method 24.

C. Definitions:

1. Volatile Organic Compound (VOC): Any volatile compound of carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, ammonium carbonate, and exempt compounds. Exempt compounds are defined in SCAQMD Rule 10
2. VOC Products: Field applied adhesives, aerosol adhesives, sealants, primers, paints, coatings, and rust inhibitors used for interior applications as part of the Work. Interior applications are those that are within the building weatherproofing

1.4 ACTION SUBMITTALS

A. Submittal requirements are specified in Section 018113.13 “Sustainable Design Requirements”.

1.5 CLOSEOUT SUBMITTALS

A. Following substantial completion at a date determined by the Owner, submit a final tabulation of all field-applied adhesives, sealants, paints and coatings used for interior applications as part of the Work. Include: the manufacturer; the product name; the VOC content of each product; the allowable VOC content of each product based on the information provided in this section. Organize the tabulation by category: adhesive; sealant; paint; coating.

1.6 VOC LIMITS FOR ADHESIVES SEALANTS AND SEALANT PRIMERS

A. General VOC Content Limitations for Adhesives Sealants and Sealant Primers:

1. Do not exceed the VOC content limits for adhesives, adhesive-bonding primers, or adhesive primers defined in SCAQMD Rule 1168 “Adhesive and Sealant Applications”.

B. VOC content limitations: VOC content limitations are specified in Section 018113.13 “Sustainable Design Requirements”.

1.7 VOC LIMITS FOR PAINTS AND COATINGS

A. General VOC Content Limitations for Paints and Coatings:

1. Do not exceed the VOC content limits defined in GS-11, 1993, GS-03 1997 and SCAQMD Rule 1113, 2004 as applicable for paints and primers field applied inside the weatherproofing system.

B. VOC content limitations: VOC content limitations are specified in Section 018113.13 “Sustainable

1.09 QUALITY ASSURANCE

A. Meet the following requirements if the results of a third-party test are used as part of an Action Submittal under this Section:

1. Provide qualifications of the testing agency to perform the required tests.
2. Determine the VOC content by the United States Environmental Protection Agency (USEPA) Reference Test Method 24 (Determination of Volatile Matter, Content, Water Content, Density, Volume Solids and Weight Solids of Surface Coatings, Code of Federal Regulations Title 40, Part 60, Appendix A)
2. Determine exempt compounds content by Method 303 (Determination of Exempt Compounds) in the South Coast Air Quality Management District (SCAQMD) "Laboratory Methods of Analysis for Enforcement Samples" manual.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 015000 – TEMPORARY CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section specifies requirements for temporary services and facilities, including:

1. Utilities.
2. Temporary construction.
3. Construction aids.
4. Barriers and enclosures.
5. Security.
6. Access roads and parking.
7. Temporary controls.
8. Traffic regulation.
9. Project identification and signs.
10. Field offices and sheds.

C. Temporary utilities required include but are not limited to:

1. Temporary electric power and light.
2. Temporary heating, cooling and ventilating.
3. Telephone service.
4. Water service and distribution.
5. Temporary sanitary facilities, including drinking water.
6. Temporary sewers and drainage.
7. Temporary fire protection.

D. Construction aids required include but are not limited to:

7. Temporary lifts and hoists.

E. Barriers and enclosures required include but are not limited to:

1. Temporary enclosures.
2. Barricades, warning signs and light.
3. Enclosure fence for the site.

F. Security required includes but is not limited to:

1. Permanent fire protection.
2. Security enclosures and lockups.

G. Access roads and parking required include but are not limited to:

1. Temporary roads and paving.
2. Contractors' parking.

H. Temporary controls required include but are not limited to:

1. Dewatering facilities and drains.
2. Waste disposal.
3. Rodent and pest control.
4. Environmental protection.
5. Nuisance dust control.
6. Noise control.

I. Project identification and sign include but are not limited to:

1. Temporary Project identification signs and bulletin boards.

J. Field offices and sheds required include but are not limited to:

1. Field offices and storage sheds.

K. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.

1.3 SUBMITTALS

A. Temporary Utilities: Submit reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Submit a schedule indicating implementation and termination of each temporary utility within 10 days of the date established for commencement of the Work.

1.4 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:

1. Building Code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, Fire Department and Rescue Squad rules.
5. Environmental protection regulations.

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.

2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

B. Lumber and Plywood: Comply with requirements in Division-6 Section "Rough Carpentry."

1. For job-built temporary offices, shops and sheds within the construction area, provide UL labeled, fire treated lumber and plywood for framing, sheathing and siding.

2. For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated.

3. For fences and vision barriers, provide exterior type, minimum 3/8" thick plywood.

4. For safety barriers, sidewalk bridges and similar uses, provide minimum 5/8" thick exterior plywood.

C. Gypsum Wallboard: Provide gypsum wallboard complying with requirements of ASTM C 36 on interior walls of temporary offices.

D. Roofing Materials: Provide UL Class "A" standard weight asphalt shingles complying with ASTM D 3018, or UL Class "C" mineral surfaced roll roofing complying with ASTM D 249 on roofs of job- built temporary offices, shops and sheds.

E. Paint:

1. For job-built temporary offices, shops, sheds, fences and other exposed lumber and plywood, provide exterior grade acrylic-latex emulsion over exterior primer.

2. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.

3. For interior walls of temporary offices, provide two coats interior latex flat wall paint.

F. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

G. Water: Provide potable water approved by local health authorities.

H. Open-Mesh Metal Fencing: Provide 11-gage, galvanized 2-inch, chain link fabric fencing 8-feet high and galvanized steel pipe posts, 1-1/2" I.D. for line posts and 2-1/2" I.D. for corner posts.

2.2 EQUIPMENT

A. General: Provide new equipment; if acceptable to the Architect, undamaged previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

1. The Contractor will not be allowed to use any of the Owners's shop facilities, equipment, tools or materials unless specifically mentioned in the specifications.

B. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.

G. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows and serviceable finishes. Provide heated and air- conditioned units on foundations adequate for normal loading.

H. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

I. First Aid Supplies: Comply with governing regulations.

J. Fire Extinguishers: Provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 GENERAL

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

C. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the University Representative and shall be built with labor and materials furnished by the Contractor without expense to the University. The temporary buildings and utilities shall remain the property of the Contractor at its expense upon completion of the work. With the written consent of the University Representative, the buildings and utilities may be abandoned and need not be removed.

3.2 TEMPORARY UTILITIES

A. General: Electricity and water are available in moderate quantities, when on or adjacent to the premises, for the use of the Contractor without cost. The University reserves the right to require the Contractor to install meters and, if obvious and excessive use is observed, to pay for these utilities.

1. Contractor shall furnish and install all necessary temporary switches, wiring, fixtures, bulbs, piping, valves and other devices as may be required to connect to existing water and electrical systems.

B. Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.

1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.

a. The University must be notified at least 48 hours in advance of any proposed shutdown to perform Work which requires any type of service interruption in order that all affected departments may be advised and have time to adjust their schedules accordingly.

b. Any service (steam, water, electricity, etc.) shutdown which will interrupt the continuity of an experiment or be detrimental to a research project or which, in the opinion of the University, is required for other valid reasons, shall be maintained by safe and adequate temporary means and such temporary piping, wiring and associated devices shall be removed when no longer required.

c. The University reserves the right to limit the down time to a specified number of net hours and to set the date for each occasion of complete shutdown.

2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.

3. Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.

1. Except where overhead service must be used, install electric power service underground.

2. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

D. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.

2. Install exterior yard and sign lights so that signs are visible when Work is being performed.

E. Temporary Heat: Provide temporary heat required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

1. The Contractor shall provide temporary heat during construction for interior areas included in the Contract, to counteract low temperatures or excessive dampness and in any event, between October 15th and May 15th, maintain during said period or periods until final completion of the Contract, unless otherwise approved by the University Representative in writing. Provide heat and ventilation to maintain specified conditions for construction operations and to protect materials and finishes from damage by temperature or humidity. Costs shall be paid by the Contractor.

2. The University Representative shall have the sole discretion to assign minimum heating criteria.

F. Heating Facilities: Except where use of the permanent system is authorized, provide vented self-contained LP gas or fuel oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open flame, or salamander type heating units is prohibited.

G. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period. Install telephone on a separate line for each temporary office and first aid station. Where an office has more than two occupants, install a telephone for each additional occupant or pair of occupants. Contractor shall arrange and pay for his own telephone service.

1. At each telephone, post a list of important telephone numbers.

H. Temporary Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

1. Sterilization: Sterilize temporary water piping in accordance with AWWA requirements prior to use.

I. Temporary Sanitary Facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

1. Use of the Owner's existing sanitary facilities will not be permitted.

2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

3. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.

4. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.

    a. Provide safety showers, eyewash fountains and similar facilities for convenience, safety and sanitation of personnel.

5. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.

    a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7 to 13 deg C).

J. Temporary Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.

1. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways before discharge.

2. Connect temporary sewers to the municipal system as directed by the sewer department officials.

3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.

K. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations."

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.

2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

5. No gasoline shall be stored in or close to any building at any time.

3.3 TEMPORARY CONSTRUCTION

A. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

3.4 CONSTRUCTION AIDS

A. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 BARRIERS AND ENCLOSURES

A. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

B. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.

3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.

4. Where temporary wood or plywood enclosure exceeds 100 square feet in area, use UL-labeled fire-retardant treated material for framing and main sheathing.

C. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

D. Enclosure Fence: When excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except by the entrance gates.

1. Provide open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth. Provide opaque slats or similar means of closing the site to view from outside the enclosure fence.

E. Contractor's Parking Enclosure: Contractor's parking may be provided within the construction limits and chain link fence, with approval from the UConn Representative.

3.6 SECURITY AND PROTECTION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested by the Architect.

B. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

C. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

3.7 ACCESS ROADS AND PARKING

A. The Contractor shall, under regulations prescribed by the University Representative, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the University Representative. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

B. Temporary Paving: Construct and maintain temporary roads and paving to adequately support the indicated loading and to withstand exposure to traffic during the construction period. Locate temporary paving for roads, storage areas and parking where the same

permanent facilities will be located. Review proposed modifications to permanent paving with the Architect.

1. Paving: Comply with Division-32 Section "Asphalt Paving" for construction and maintenance of temporary paving.

2. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of sub-base, and installation of base and finish courses of permanent paving.

3. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas that are without damage or deterioration when occupied by the Owner.

4. Delay installation of the final course of permanent asphalt concrete paving until immediately before Substantial Completion. Coordinate with weather conditions to avoid unsatisfactory results.

5. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration and supervision.

C. The Contractor shall, under regulations prescribed by the University Representative, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the University Representative. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

D. Contractor's Parking: Contractors working for the University of Connecticut at Storrs are required to obtain a parking permit through the Parking Services Office. For additional information please contact the Parking Service Office at 486-4930. A thirty–five dollar ($35.00) per month fee will be charged per vehicle for selected parking lots. Contractor is responsible for payment of all fees for parking permits. Parking fees may be prorated monthly.

1. The University will provide a maximum of three (3) contractor parking places in the vicinity of the work. Additional parking required by the Contractor will be designated at a location specified by the Owner’s Representative.

2. Construction vehicles are exempt from this requirement. Neither personal nor construction vehicles are allowed to park under trees on any part of the campus.

3.8 TEMPORARY CONTROLS

A. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division-32 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations and construction free of water.

B. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

1. All removed materials that are salvageable are the property of the Contractor unless otherwise noted in the specifications.

2. All debris resulting from the performance of this contract will be the property of the Contractor and will be completely removed from the campus and disposed of in a legal manner.

3. Chutes and dumpster type containers designed to keep dust and spillage to a minimum will be used by the Contractor. Dumpsters will be completely covered with a waterproof covering at all times when not in use.

4. Comply with requirements of Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.

C. Rodent and Pest Control: Provide pest management per Section 015013 “Construction Integrated Pest Management Control Plan”.

D. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result.

E. Nuisance Dust Control: The following provisions shall apply during demolition or construction phases of work:

1. It is the intent of this specification to insure that nuisance dusts resulting from demolition or construction activities do not impact occupied areas of the building. The Contractor shall take all measures necessary to accomplish this goal. These measures will include as minimum polyethylene sheeting or wet methods of fugitive dust control.

2. The Contractor shall submit a plan prior to commencement of work that will detail all methods of dust control. This plan shall be approved by the University Representative prior to commencement of work. Upon approval, this plan shall be distributed to the University Representative and the building representative on the Safety Committee.

3. Failure to comply shall result in immediate stoppage of work until effective dust control measures are employed.

F. Noise Control: The Contractor shall make every effort to minimize noise disruption to occupants of buildings and adjacent buildings. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site. No noise generating work that interferes with classroom operation shall be tolerated. No noise generating work shall be allowed during exam periods where the noise will impact classroom functions. Examples of noise generating work include, but are not limited to sawing, drilling and hammering and/or jackhammering.

1. Avoid use of tools and equipment, which produce harmful noise. No gasoline-powered equipment shall be used during times that the buildings are occupied. No gasoline-powered equipment may be used in the interior of buildings at any time.

3.9 TRAFFIC CONTROL

A. Due to the large volume of pedestrian and vehicular traffic within the campus, it shall be the responsibility of the Contractor to provide continuous traffic accessibility to all areas of the campus.

B. The Contractor shall comply with Connecticut Regulation13b-17-28, Safety to Traffic, which requires that "When portions of the traveled way are made dangerous for the movement of vehicles or pedestrians, a sufficient number of uniformed police officers, flagmen, or traffic men, shall be employed by the permittee to direct traffic safely through the area."

C. The requirement to maintain pedestrian and vehicular traffic is further defined in the Connecticut Department of Transportation Specifications Section 9.71, Form 814, which requirements are incorporated herein by reference.

D. The Contractor may contact the University Police Department, Town of Mansfield Police Department, or other private sources to obtain the necessary manpower to comply with these regulations. The University Representative assigned to the given construction project shall be informed by the General Contractor of his traffic control procedures prior to the commencement of construction.

3.10 PROJECT IDENTIFICATION AND SIGNS

A. Temporary Signs: Prepare signs to provide directional and safety information to construction personnel and visitors. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.

B. Other Signs: Any other signage shall be submitted to the University Representative for approval.

3.11 FIELD OFFICES AND SHEDS

A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.

1. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

E. Provide incombustible construction for offices, shops and sheds located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.

F. Field Offices: Provide insulated, weathertight temporary offices with electric lighting, air conditioning and heat and of sufficient size to accommodate required office personnel at the Project site. The Field Office shall have two rooms, each approximately 150 square feet in size. The offices shall have ample natural light, a heater of sufficient capacity to maintain 70 degrees (F) in Winter and an air conditioner of sufficient capacity to maintain 75 degrees (F) in Summer. No trailer will be allowed on University property unless permanent markings indicating the name of the company are clearly visible. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices with a minimum of the following:

1. Furnish with desks and chairs, file cabinets, plan tables, plan racks, waste receptacles, conference room table and at least eight chairs.

2. Equip with a water cooler and private toilet complete with water closet, lavatory and mirror-medicine cabinet unit.

3. Equip with a 5 lb. ABC fire extinguisher and an OSHA-approved first aid kit.

4. Provide a facsimile machine and copier for use by the Contractor, University Representative and Architect/Engineer.

G. Storage and Fabrication Sheds: Install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or

elsewhere on the site, however, sheds for tools, materials, equipment and/or products requiring controlled conditions shall be weathertight with heat, lighting and ventilation.

3.12 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.

2. Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the University Representative requests that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.

2. Remove temporary paving that is not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that does not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances, which might impair growth of plant materials or lawns. Repair or replace street paving, curbs and sidewalks at the temporary entrances, as required by the governing authority.

3. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to:

b. Replace air filters and clean inside of ductwork and housings.

c. Replace significantly worn parts and parts that have been subject to unusual operating conditions.

d. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

e. Restore all existing facilities and grounds used during construction to specified or to original condition.

END OF SECTION 015000

SECTION 015013 – CONSTRUCTION INTEGRATED PEST MANAGEMENT CONTROL PLAN

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes:

1. Requirements for the development and implementation of an Integrated Pest Management Control Plan during construction.

   a. Pests include but are not limited to cockroaches, ants, winged termites, bees, wasps, and rodents.

C. Related Sections:

1. Section 018113.13 – Sustainable Design Requirements.
2. Section 015000 – Temporary Control.

1.3 REFERENCES

A. Reference Standards:

1. CT High Performance Building Standard Mandatory Requirements.

1.4 SUBMITTALS

A. Integrated Pest Management Control Plan:

1. Include at a minimum the following:

   a. Proposed Housekeeping Plan: Provide means and methods of excluding pests from site and building during construction including but not limited to limiting their access to food, water, and nesting areas. Propose goals for removing litter from the site on a regular basis.

b. Proposed Materials and Equipment for Service: Provide current labels and Material Safety Data Sheets for all pesticides and control devices.
c. Proposed Methods for Monitoring and Detecting Pests: Describe methods and procedures for identifying pest harborage and access during the Construction Contract.
d. Service Schedule: Provide schedule of visits and include visits on project schedule. Schedule should include the following:

    1. Initial visit before foundation work has been completed to examine the work for conditions that could harbor rodents, roaches, or other pests; and to identify voids in the construction that could allow pests into the completed structure.
    2. Minimum of two visits after the building is fully enclosed and before ceilings have been hung to access presence of pests, identify points of entry into the building, and provide corrective measures.
    3. Final visit prior to Substantial Completion to perform extermination and control procedures to ensure building is free of pests at time of occupancy.

e. Commercial Pesticide Applicator Certificates or Licenses for all on site service personnel.

2. Coordinate tasks and sequences with project requirements listed in Divisions 01 thru 49 specific to Work of those Sections.

1.5 CLOSEOUT SUBMITTALS

A. Provide record of all inspections conducted and any corrective actions taken.

PART 2 – PRODUCTS

2.1 PESTICIDES

A. Chemical controls should be used only when necessary and in the least toxic and volatile formulations that are effective. The Contractor shall use non-pesticide methods of control, such as portable vacuums and trapping devices whenever possible.

B. The Contractor shall not apply any pesticide product that has not been included in the Integrated Pest Management Control Plan.

C. The Contractor shall not store any pesticide product on site.

PART 3 – EXECUTION

3.1 GENERAL

A. The primary goal of the State of Connecticut's High Performance Building's Integrated Pest Management Control Requirement is to reduce the amounts of pesticides applied by using alternative methods of pest control that will help to eliminate conditions that are favorable to pest infestation, making their survival more difficult.

B. In addition to requirements of other Sections of this Specification, the General Contractor is responsible for blocking all openings in the building enclosure larger than ¼ inch by ¼ inch with permanent materials approved by the Architect. Caulk all cracks larger than 1/16th, including all plumbing and electrical penetrations.

C. Complete the Construction Integrated Pest Management Plan prior to start of on-site construction activities.

D. Incorporate Pest Management measures into the construction schedule.

3.2 GENERAL REQUIIREMENTS

A. Protect construction materials from contamination and pollution by contact with pesticides.

B. Schedule inspections at intervals required by the Integrated Pest Management Control Plan. If additional inspections and treatments are required due to infestations, they will be done at no additional cost to the owner.

C. Employ least hazardous method of control in conformance with the approved Pest Management Control Plan.

D. Take all necessary precautions to ensure safety of on site personnel.

E. At completion of pest management activities, remove all equipment and pesticides from site.

END OF SECTION

SECTION 015150 – CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT PLAN

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes:

1. Requirements for minimum indoor air quality (IAQ) performance standards during the construction period and during occupancy.
2. Requirements for the development of a Construction Indoor Air Quality Management Plan (alternately referred to as the IAQ Plan or the Plan) to achieve IAQ performance goals.
3. Requirements for the preparation, storage and installation sequence of absorptive and emitting materials.
4. Requirements for protection of building HVAC systems during construction.
5. Requirements for completing a building flush-out.

C. Related Sections:

1. Section 018113.13 – Sustainable Design Requirements.
2. Section 013330 – Submittal Procedures.
3. Section 017419 – Construction Waste Management and Disposal.
4. Section 019110 – General Commissioning Requirements.
5. Division 23 Heating Ventilation and Air Conditioning.
6. Specific Sections of this Specification as they relate to Indoor Air Quality.

1.3 REFERENCES

A. Reference Standards:

1. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) "IAQ guidelines for Occupied Buildings under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 Chapter 3".

2. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) 52.2-1999, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size".
3. United States Environmental Protection Agency (EPA) "Compendium of Methods for the Determination of Air Pollutants in Indoor Air".
4. United States Green Building Council (USGBC): Leadership in Energy and Environmental Design (LEED™) "LEED 2009 for New Construction & Major Renovations".

1.4 PERFORMANCE REQUIREMENTS

A. Prevent exposure of building systems to environmental tobacco smoke during construction. At a minimum take the following measures:

1. Do not allow smoking at the project site.

B. During construction meet or exceed the minimum requirements of the recommended Control Measures of SMACNA IAQ Guidelines noted in Reference Standards.

C. Protect absorptive materials from moisture damage when stored on-site and after installation.

D. During construction, use of permanently installed air handlers is <u>not</u> permitted.

E. After construction ends but before occupancy, comply with the LEED IEQc3.2 requirements for Building Flush-out.

1.5 SUBMITTALS

A. Construction IAQ Management Plan: Submit 3 copies of plan within 30 days of date established for the notice to proceed, or prior to submission of the first Application for Payment, whichever comes first.

1. Include at a minimum the following:

a. Plan for meeting minimum air quality standards included in the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) "IAQ guidelines for Occupied Buildings under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 Chapter 3". Include control methods in the following 5 areas.

i. HVAC Protection.
ii. Source Control.
iii. Pathway interruption.
iv. Housekeeping.
v. Scheduling.

b. Sequence of procurement and installation of materials demonstrating how absorptive materials shall be protected from moisture damage when stored on-site and after installation.
c. Sequence of finish installation highlighting measures to reduce the absorption of VOCs by materials that act as 'sinks'.
d. Plan for protection of air handling equipment and ductwork during construction and immediately prior to occupancy.
e. Sequence of activities occurring immediately prior to occupancy that are required for building flush-out.
f. Selection of cleaning products and procedures to be used during construction and final cleaning.

2. Coordinate tasks and sequences included in the IAQ Management Plan with project requirements listed in Divisions 01 thru 33 specific to Work of those Sections.

3. Coordinate Construction IAQ Management Plan with Owner's current IAQ management plans and procedures.

4. Comply with requirements of LEED IEQ Credits 3.1 and 3.2.

B. Construction schedule outlining the start-up date and expected duration of all Construction IAQ Management Plan control measures.

C. Schedule of operation of temporary heat, dehumidification, and ventilation systems to be used during construction.

D. Manufacturers' product data for temporary products used to seal duct penetrations, including fresh air intakes exhaust air vents.

E. Manufacturers' product data for filtration media used during occupancy.

F. Schedule of proposed activities to fulfill LEED credits EQc3.2:

1. Building Flush-out (for each air-handling unit or ventilation system), include the following:

a. Area of space served.
b. Volume of outside air to be delivered.
c. Volume of outside air required for LEED EQc3.2.
d. Start and end date of flush-out.
e. Indoor temperature ranges that will be maintained.

1.6 CLOSEOUT SUBMITTALS

A. Submit the final Construction IAQ Management Plan.

B. LEED Credit IEQc3.1 Submittals:

1. A minimum of eighteen photographs (at least six photographs taken on at least three different occasions) documenting the implementation of the Construction IAQ Management Plan throughout the course of construction. Include photographs of ductwork sealing and protection, temporary ventilation measures, and conditions of on-site materials storage (to prevent moisture damage). Provide on each photo, integral date stamping and a brief description of the SMACNA measure illustrated.
2. Project meeting minutes or similar project documents illustrating the resolution of IAQ Management problems encountered during the Work.
3. Product Cut Sheets for filtration media installed immediately prior to occupancy, with MERV values highlighted.
4. Letter confirming that new filtration media has been installed in each air-handling unit (as approved by the mechanical engineer) immediately prior to occupancy.

C. LEED Credit IEQc3.2 Submittals:

1. Final log of flush-out procedure including for each air-handling unit:

   a. Designation of air-handling unit.
   b. Area (square feet) of the space served.
   c. Flush-out beginning and end dates (number of hours of flush-out provided).
   d. Outdoor air volume required.
   e. Outdoor air volume provided.
   f. Indoor air temperature and relative humidity range maintained during flush-out.

1.7 DELIVERY STORAGE AND HANDLING

A. Deliver, store and handle materials in a manner that will prevent accumulation of moisture and/or development of mold and mildew inside packaging and on products.

B. Immediately remove from site and properly dispose of materials showing signs of mold and mildew, including materials with moisture stains.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.1 IMPLEMENTATION AND COORDINATION

A. Complete the Construction IAQ Management Plan prior to start of on-site construction activities.

B. Distribute copies of the Construction IAQ Plan to the on-site Superintendent, each Subcontractor, the Owner and the Architect.

C. Designate one individual as IAQ coordinator, with the following responsibilities:

1. Oversee implementation of the Construction IAQ Management Plan.
2. Maintain LEED documentation including photo logs.
3. Report status of the Plan's implementation to the Owner and Architect at regular intervals.

D. Provide education and physical resources to sub-contractors and field personnel for implementation of the plan.

E. Incorporate IAQ measures, including building flush-out into the construction schedule.

3.2 INSTALLATION AND REPLACEMENT OF FILTRATION MEDIA

A. Replace all filtration media after building flush-out, and prior to owner occupancy.

3.3 GENERAL REQUIIREMENTS

A. Protect construction materials from contamination and pollution by contact with construction dust, debris, fumes, solvents and other environmentally polluting materials.

B. Sequence installation of absorptive materials after installation of emitting materials when feasible.

C. Allow furnishings and materials such as carpet, floor tile, acoustical tile, textiles, office furniture and casework to off gas (air out) in a clean and controlled environment prior to installation.

1. Store carpet and carpet tiles away from materials such as paint and sealants that have high emissions of VOCs or other contaminants.
2. Remove carpet and carpet tiles from their packaging 24 to 48 hours prior to installation and store in ventilated un-occupied space. Do not store with ceiling tiles or in spaces where ceiling tiles have been installed.
3. Allow casework to off-gas before delivery to site for minimum 3 day period.

D. Conduct regular inspection and maintenance of indoor air quality measures including ventilation system protection and ventilation rate.

E. Use low-toxic, low-odor cleaning supplies for surfaces, equipment and workers' personal use. Suppress dust using low-odor wetting agents and sweeping compounds. Institute a regular housekeeping schedule that includes cleaning of hidden and hard-to-reach surfaces.

F. Immediately clean spills involving solvents or cleaners.

3.4 HEATING, VENTILATION AND AIR CONDITIONING

A. Do not run building HVAC systems during construction. Seal ductwork penetrations including fresh air intakes and exhaust air vents.

B. Heat, dehumidify and ventilate building during course of work as necessary to maintain environmental conditions suitable for drying and curing materials and for prevention of conditions conducive to microbial and fungal growth.

1. Use flexible ducted temporary exhaust fans to maintain a negative pressure in the work area relative to occupied areas. Do not exhaust via the building HVAC system.
2. Temper and dehumidify air as needed to remove excess moisture.
3. Do not use propane heaters or other moisture generating heating systems.

3.5 BUILDING FLUSH-OUT

A. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14,000 cubic feet. of outdoor air per square foot of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity no higher than 60 percent.

B. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3,500 cubic feet of outdoor air per square foot of floor area to the space. Following occupancy, ventilate occupied spaces at a minimum rate of 0.30 cfm per square foot of outside air or the design minimum outside air rate determined in LEED EQ Prerequisite 1, whichever is greater. During each day of the post-occupancy flush-out period, begin ventilation a minimum of three hours prior to occupancy and continue during occupancy. Maintain these conditions until a total of 14,000 cubic feet per square foot of outside air has been delivered to the space.

C. At the completion of the building flush-out, replace the filtration media with new filters, except the filters solely processing outside air.

END OF SECTION

SECTION 015639 TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hearby made a part of this Section of Specifications.

1.2 SUMMARY

A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

C. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary site fencing.
2. Section 018113.13 “Sustainable Design Requirements”
3. Section 311000 "Site Clearing" for removing existing trees and shrubs.

1.3 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inches (150 mm) above the ground for trees up to and including 4-inch (100-mm) size at this height and as measured at a height of 12 inches (300 mm) above the ground for trees larger than 4-inch (100-mm) size.

B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:

   a. Tree-service firm's personnel, and equipment needed to make progress and avoid delays.
   b. Quality-control program.
   c. Coordination of Work and equipment movement with the locations of protection zones.
   d. Trenching by hand or with air spade within protection zones.
   e. Field quality control.
   f. .

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For arborist and tree service firm.

B. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

C. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

D. Quality-control program.

1.6 QUALITY ASSURANCE

A. Arborist Qualifications: Licensed arborist in jurisdiction where Project is located or Registered Consulting Arborist as designated by ASCA.

1.7 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.

6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Wood and bark chips.
2. Size Range: 3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum.
3. Color: Natural.

C. Protection-Zone Fencing: Fencing fixed in position and meeting one of the following requirements:

1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch (50-mm) opening, 0.148-inch- (3.76-mm-) diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- (60-mm-) OD line posts, and 2-7/8-inch- (73-mm-) OD corner and pull posts; with 1-5/8-inch- (42-mm-) OD top rails; with 0.177-inch- (4.5-mm-) diameter top tension wire and 0.177-inch- (4.5-mm-) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

   a. Height: 48 inches (1200 mm) <**Insert dimension**>.

2. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch (50-mm) maximum opening in pattern and weighing a minimum of 0.4 lb/ft. (0.6 kg/m); remaining flexible from minus 60 to plus 200 deg F (minus 16 to plus 93 deg C); inert to most chemicals and acids; minimum tensile yield strength of 2000 psi (13.8 MPa) and ultimate tensile strength of 2680 psi (18.5 MPa); secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches (2400 mm) apart.

   a. Height: 48 inches (1200 mm).
   b. Color: High-visibility orange, nonfading.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag each tree trunk at 54 inches (1372 mm) above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 6 inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches (150 mm) of tree trunks.

3.3 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.

B. Maintain protection zones free of weeds and trash.

C. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.4 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.

D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.5 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Cut Ends: Do not paint cut root ends.
3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."

B. Root Pruning at Edge of Protection Zone: Prune tree roots flush with the edge of the protection zone by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use

narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.6 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.

1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).

B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.

C. Cut branches with sharp pruning instruments; do not break or chop.

D. Do not paint or apply sealants to wounds.

E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.

F. Chip removed branches and dispose of off-site.

3.7 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.

1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

D. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.8 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Small Trees: Provide new trees of same size and species as those being replaced for each tree that measures 6 inches (150 mm) or smaller in caliper size.
2. Large Trees: Provide two new tree(s) of 6-inch (150-mm) caliper size for each tree being replaced that measures more than 6 inches (150 mm) in caliper size.

    a. Species: As selected by Architect.

3. Plant and maintain new trees as specified in Section 329300 "Plants."

C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 3 inches uniform thickness to remain.

D. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 feet (3 m) beyond drip line and no closer than 36 inches (900 mm) to tree trunk. Drill 2-inch- (50-mm-) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) o.c. Backfill holes with an equal mix of augered soil and sand.

3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.
3. Division 1 Section "Closeout Procedures" for submitting warranties for Contract closeout.
4. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.

B. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

4. "Foreign Products", as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions; or produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of nor living within the United States and its possessions.

C. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor are considered requests for "substitutions." The following are not considered substitutions.

1. Revisions to Contract Documents requested by the Owner or Architect.

2. Specified options of products and construction methods included in Contract Documents.

3. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

4. Equipment: A product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping

5. Materials: Products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

D. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products acceptable to the Architect and University Representative. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.

2. Form: Tabulate information for each product under the following column headings:

a. Specification Section number and title.
b. Generic name used in the Contract Documents.
c. Proprietary name, model number, and similar designations.
d. Manufacturer's name and address.
e. Supplier's name and address.
f. Installer's name and address.
g. Projected delivery date or time span of delivery period.
h. Identification of items that require early submittal approval for scheduled delivery date.
i. Identification of product as one of the following:
1) Product as specified
1) Proposed Substitution
2) Proposed Equal

3. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Substitution Request Submittal: Requests for substitution will be considered if received within 30 days after the Contract award or at the Preconstruction Meeting, whichever occurs first. Requests received after this period will not be considered.

C. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.

b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.

f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

j. Cost information, including a proposal of change, if any, in the Contract Sum.

k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

m. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract

Documents, and that it will perform adequately in the application indicated.

2. Architect's Action: Architect's Action: Within 2 weeks of receipt of the request the Architect will evaluate the data and send his recommendation of acceptance or rejection of the proposed substitution, with two copies, to the University Representative and the University Representative will notify the Contractor. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name.

3. If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.

b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

D. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Division 1 Section "Submittal Procedures."

b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

E. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

B. Source Limitations: Provide products of the same kind, from a single source.

1. When specified products are available only from sources that do not or cannot produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect for a determination of the most important product qualities before proceeding. Qualities may include attributes relating to visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources that produce products that possess these qualities, to the fullest extent possible.

C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion in the Work:

0. No available domestic product complies with the Contract Documents.

1. Domestic products that comply with Contract Document are only available at prices or terms that are substantially higher than foreign products that also comply with the Contract Documents.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface, which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

a. Name of product and manufacturer.
b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. All deliveries of material, equipment, etc., shall be made to the Contractor and accepted only by him and only during working hours. University personnel will not receive or accept any material or equipment, etc., at any time.

6. Contractor shall restrict use of delivery and other construction related trucks on local roads, such as Gilbert, Hillside, Hillyndale, Eastwood and Westwood Roads.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.

2. Store materials in a manner that will not endanger Project structure.

3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

4. Store cementitious products and materials on elevated platforms.

5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.

3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.

6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements. No substitutions will be permitted.

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.

3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements. No substitution will be permitted, unless:

   a. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the provisions concerning "substitutions" to obtain approval for use of an unnamed product.

4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.

8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.

9. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of

a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

10. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.

    e. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.

11. .Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified

12. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.

13. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.

    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

14. Allowances: Refer to individual Specification Sections and provisions in Section 01020, Allowances, for allowances that control product selection, and for procedures required for processing such selections.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

2. Requested substitution does not require extensive revisions to the Contract Documents.

3. Requested substitution is consistent with the Contract Documents and will produce indicated results.

4. Substitution request is fully documented and properly submitted.

5. Requested substitution will not adversely affect Contractor's Construction Schedule.

6. Requested substitution has received necessary approvals of authorities having jurisdiction.

7. Requested substitution is compatible with other portions of the Work.

8. Requested substitution has been coordinated with other portions of the Work.

9. Requested substitution provides specified warranty.

10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

11. The request is directly related to an "or equal" clause or similar language in the Contract Documents.

12. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.

C. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents

does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.

C. Related Sections:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section "Submittal Procedures" for submitting surveys.
4. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate how long services and systems will be disrupted.

D. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include but are not limited to the following:

a. Primary operational systems and equipment.

b. Fire separation assemblies.
c. Air or smoke barriers.
d. Fire-suppression systems.
e. Mechanical systems piping and ducts.
f. Control systems.
g. Communication systems.
h. Electrical wiring systems.
i. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Exterior wall construction.
d. Equipment supports.
e. Piping, ductwork, vessels, and equipment.
f. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. Utilize products for patching that comply with requirements of Division 01 Section "Sustainable Design Requirements."

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.
b. List of detrimental conditions, including substrates.
c. List of unacceptable installation tolerances.
d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Owner's Representative.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect and Owner's Representative. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Owner's Representative before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.

E. Final Property Survey: Engage a professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain ceiling heights shown on drawings.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Temporary Support: Provide temporary support of work to be cut.

C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete, Stone and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend from one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste; and the following:

   a. NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Utilize containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.11 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017400 – WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.

2. General closeout requirements are included in Section 017000, Project Closeout.

3. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions-2 through -16.

4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C.. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 DEFINITIONS

A. Standard Product Warranties: Preprinted written warranties published by individual manufacturers for particular products specifically endorsed by the manufacturer to the Owner.

B. Special Warranties: Written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign.

1.5 SUBMITTALS

A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within fifteen days of completion of that designated portion of the Work.

B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.

1. Refer to individual Sections of Divisions-2 through -16 for specific content requirements, and particular requirements for submittal of special warranties.

C. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS, the Project title or name, and the name of the Contractor.

3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.6 FORM OF GUARANTEE/WARRANTIES

A. The General Contractor will furnish to the Office of Architectural and Engineering Services the foregoing documents in the following manner:

1. Address to: Executive Director of Architectural and Engineering Services, Office of Architectural and Engineering Services, University of Connecticut Box Unit-3038, Storrs, Connecticut 06269-3038

2. All guarantees/warranties shall reference the project name and number as indicated in the Contract Documents.

3. All required guarantees/warranties will be by the respective company made out to the University of Connecticut.

4. All guarantees/warranties supplied by subcontractors or manufacturers shall be countersigned by the General Contractor.

B. All work shall be covered by the standard one (1) year guarantee as set forth in the General Conditions. The Contractor shall visit the project site at 11 months into the guarantee period to determine the scope of any required guarantee work. The Contractor shall contact the University Representative prior to this visit so that the University Representative may attend.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - SCHEDULES

4.1 SCHEDULE OF SPECIAL WARRANTIES

A. Schedule: Provide special warranties and bonds on products and installations as specified in the following Sections:

1. Section 071310 Self-Adhering Sheet Waterproofing
2. Section 071700 Bentonite Waterproofing
3. Section 074213 Metal Plate Wall Panels
4. Section 075423 Thermoplastic Polyolefin (TPO) Vegetative Roof System
5. Section 083323 Overhead Coiling Doors
6. Section 084113 Aluminum Framed Entrances and Storefronts
7. Section 087100 Door Hardware
8. Section 088000 Glazing
9. Section 096813 Carpeting
10. Section 101100 Visual Display Surfaces
11. Section 102800 Toilet Accessories
12. Section 104413 Fire Protection Specialties
13. Section 105113 Metal Lockers
14. Section 108200 Extruded Aluminum Screens
15. Section 111300 Loading Dock Equipment
16. Section 114000 Walk-In Refrigeration Equipment
17. Section 114510 Appliances and Equipment
18. Section 224000 Plumbing Fixtures
19. Section 225000 Plumbing Equipment
20. Section 237400 Packaged Roof Top Air Conditioning Units
21. Section 260511 Requirements for Electrical Installations

END OF SECTION 017400

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FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN

MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

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FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION

MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (A)	EST. WASTE - % (B)	TOTAL EST. QUANTITY OF WASTE* (C = A x B)	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

* Insert units of measure.

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous construction waste.
2. Recycling nonhazardous construction waste.
3. Disposing of nonhazardous construction waste.

C. Develop a Waste Management Plan (WMP), quantifying material diversion by either weight or volume to recycle and /or salvage at least 75% of non-hazardous construction and demolition debris for LEED MRc2 (and 95% if this credit is to be pursued as Exemplary)."

D. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements".
2. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.
3. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work, or 95% if pursuing the Exemplary credit. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

1.5 SUBMITTALS

A. Waste Management Plan: Submit 3 copies of plan within 30 days of date established for the notice to proceed, or prior to submission of the first Application for Payment, whichever comes first.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit a Waste Reduction Progress Report. Include separate reports for demolition and construction waste. Include the following information for the time period covered:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. LEED Submittal: LEED letter template for Credit MR 2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of **site-clearing and construction** waste generated by the Work. Use **Form CWM-1 for construction waste**. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use **Form CWM-3 for construction waste**. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

D. Construction Waste Management and Disposal Plan: Targeted materials include but are not limited to the following:

1. Construction Waste:

   a. Masonry and CMU.
   b. Lumber.
   c. Wood sheet materials.
   d. Wood trim.
   e. Metals.
   f. Roofing.
   g. Insulation.
   h. Carpet and pad.
   i. Gypsum board.
   j. Piping.
   k. Electrical conduit.

2. Packaging: Regardless of salvage/recycle goal indicated in “General” Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials.

   a. Paper.
   b. Cardboard.
   c. Boxes.
   d. Plastic sheet and film.
   e. Polystyrene packaging.
   f. Wood crates.
   g. Plastic pails.
   h. Pallets.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Control."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 01 Section "Temporary Control" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Sale and Donation: Not permitted on Project site.

3.3 RECYCLING CONSTRUCTION AND DEMOLITION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING CONSTRUCTION WASTE

A. General: Recycle paper and beverage containers used by on-site workers.

B. Preparation Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

D. Recycle packaging as indicated below:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

E. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

F. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.
3. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Divisions 2 through 26 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.

2. Advise Owner of pending insurance changeover requirements.

3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, consent of surety and similar releases.

5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

8. Complete final cleaning requirements, including touchup painting.

9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment.

2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

5. Submit consent of surety to final payment.

6. Submit a final liquidated damages settlement statement.

7. Submit all final LEED documentation, in hard and electronic copy, per credit for review and submission to LEED for the construction application.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected, except items whose completion has been delayed because of circumstances acceptable to Architect.

C. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide experienced personnel for as long a period as necessary as determined by the Owner. If installers are not experienced in procedures, provide instruction by manufacturer's representatives.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit (2) electronic copies of list to the Architect and Owner. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Page number.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

1. Note: General cleaning during construction is required by the General Conditions and included in Section 01500, Construction Facilities and Temporary Controls.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Remove snow and ice to provide safe access to building.

f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

h. Sweep concrete floors broom clean in unoccupied spaces.

i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-

obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

j. Remove labels that are not permanent.

k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

m. Replace parts subject to unusual operating conditions.

n. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

o. Leave Project clean and ready for occupancy.

p. Clean roof gutters and downspouts.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

D. Pest Control: Comply with requirements of 015013 “Construction Integrated Pest Management Control Plan”.

END OF SECTION 017700

SECTION 017810 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements

B. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

C. Related Sections include the following:

1. Division 1 Section "Closeout Procedures" for general closeout procedures.

2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

3. Divisions 2 through 16 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up Record Prints.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

   b. Accurately record information in an understandable drawing technique.

   c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made by Change Order or Construction Change Directive.
   k. Changes made following Architect's written orders.
   l. Details not on the original Contract Drawings.
   m. Field records for variable and concealed conditions.
   n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1. Upon completion of the Work, submit record Specifications to the University Representative for the Owner's records.

B. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.

5. Note related Change Orders**,** Record Product Data and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders**,** Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

2.5 REVENUE SERVICE REQUIREMENTS

A. Upon receipt of the Certificate of Substantial Completion, the Contractor shall submit the following information required by the Connecticut Department of Revenue Services.

1. The identify and addresses of all subcontractors performing work on the project.

2. The Connecticut tax registration numbers of the General Contractor and all subcontractors.

3. The Federal Social Security account numbers, or Federal Employer Identification numbers, or both, if applicable, for the General Contractor and all subcontractors.

2.6 RECORD SAMPLE SUBMITTALS

A. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Architect and the Owner's personnel to determine which of the submitted Samples that have been maintained during progress of the Work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017810

UNIVERSITY OF CONNECTICUT
MASS ACUMULATION AREA (MAA)
PROJECT NO,. 901807

LEED CREDITS DOCUMENTATION SHEET - SUBMIT WITH RELEVANT PRODUCT SUBMITTAL

CONTRACTOR:	PRODUCT:	APPLICABLE LEED CREDITS:
CONTRACTOR ADDRESS:	SPEC. SECTION:	
CONTACT NAME:	SUBMITTAL NO:	

UNIVERSITY OF CONNECTICUT
MASS ACUMULATION AREA (MAA)
PROJECT NO,. 901807

LEED CREDITS DOCUMENTATION SHEET - CONTINUED

PRODUCT INFORMATION			MRc7			IEQc4.1		IEQc4.2		IEQc4.3				IEQc4.4	ALL
			FSC CERTIFIED WOOD MATERIALS			LOW EMITTING MATERIALS									
PRODUCT / COMPONENT	VENDOR or MANUFACTURER / PRODUCT TYPE (e.g. Flat Paint, Carpet); NOTE: for flooring - provide adhesive info as well	MATERIAL COST (excluding labor & equipment)	FSC Pure, Mixed Credit, OR Mixed %	Chain of Custody Certificate Number	% FSC Material Value ($) - Non-FSC is 0%	Adhesives & Sealants VOC Content (g/L)		Paints & Coatings VOC Content (g/L)		Flooring Systems				Comp. Wood	Source of VOC/ NAUF Data Provided
						Actual	Allowable	Actual	Allowable	Carpet /Pad	Adhe-sive/ Coat'g	Adhe-sive/ Grout	Hard Surf. Flr'g	No Added Urea Formaldehyde (T/F)	
										Green Label Plus	Green Seal Standard	SCAQMD	FloorScore		
1															
2															
3															
4															
5															
6															
7															
8															

For definitions of terms refer to Division 1 Specification Section 018113.13 SUSTAINABLE DESIGN REQUIREMENTS

CONTRACTOR CERTIFICATION:

I, _____, a duly authorized representative of _____, hereby certify that the material information contained herein is an accurate representation of the material qualifications to be provided by us, as components of the final building construction. Furthermore, I understand that any change in such qualifications during the purchasing period will require prior written approval from the Construction Manager and Owner.

SIGNATURE OF AUTHORIZED REPRESENTATIVE: _____ Date: _____

SUSTAINABILITY MATRIX
University of CT - Main Accumulation Area
Based on CT High Performance Std State Bldgs (HPS), LEED 2009 and University of Connecticut Sustainable Design Guidelines (SDG)
Rev. January 15, 2015 - Scorecard CD

Reference			Sustainable Strategy Info					Action	Respons.	Phase	LEED Points Anticipated				Pts. Avail	
LEED Credit	CT HPS Section	UCONN SDG	Credit / Goal	Intent	Criteria & Metrics - Standards	Implementation Strategies	Challenge to Implementation	Action Required	Assigned	Design / Constr.	Certain	Likely	Not Likely	Not Possible	LEED Points Avail.	CT HPS Strate-gies
LEED for NEW CONSTRUCTION V. 2009 with CT HPS Comparables (Same and Similar)																
LEED - Minimum Project Requirements																
MPR1			Environmental Laws	Project must comply w/ environmental laws.					LEED	D	Yes				Req'd	
MPR2			Complete Permanent Bldg or Space	Must be complete, permanent building.					LEED	D	Yes				Req'd	
MPR3			Reasonable Site Boundary	All disturbance w/in LEED Project Boundary.				1/15 - LEED Project Boundary (LPB) to be revised after grading tweaked	Civil	D	Yes				Req'd	
MPR4			Min. Floor Area Requirements	Building must be min. of 1,000 SF.					LEED	D	Yes				Req'd	
MPR5			Minimum Occupancy Rates	Building to serve min. 1 FTE occupant				1/15 - Occupants now at (4); transients TBD	LEED	D	Yes				Req'd	
MPR6			Commit to Sharing Whole Bldg Energy & Water Use	Must share energy and water usage data for 5					EHS (UCONN)	D	Yes				Req'd	
MPR7			Minimum Bldg to Site Area Ratio	Building GFS must be at least 2% of site area.					LEED	D	Yes				Req'd	
LEED - Sustainable Sites																
SSp1	**Mandatory** 3(h)		Construction Activity Pollution Prevention	Reduce pollution from construction activities.	Comply w/ the more stringent: EPA 2003 Construc. Gen Permit or local stds				Civil / GC	C	Yes				Req'd	Yes
SSc1	4(e)1	Tech. SS Goal 1	Site Selection	Reduce environmental impact on bldg. site.	Not on prime farmland, undevel. land w/in el. <5' abv. 100 yr. flood, habitat, w/in 100' of wetlands or distance per local regs, undevel. land w/in 50' water body, OR parkland				Civil / UCONN	D	1				1	0
SSc2 / **RP**	4(e)1		Development Density and Community Connectivity	Channel development to urban areas with existing infrastructure.		N/A				D	0			5	5	
SSc3 / **RP**	4(e)2		Brownfield Development	Reduce pressure on undeveloped land.		N/A				D	0			1	1	0
SSc4.1 / **E**	4(e)3	Tech SS Goal 3	Alt. Transportation - Public Transp. Access	Reduce pollution impacts from auto use.	(2) or more public, campus, or private bus lines with min. 1 stop ea., w/in 1/4 mile; E - Comprehensive Transportation Plan	Campus-wide bus system - (2) lines for Husky Bus: N. Eagleville Rd & N. Hillside Rd.; future Hartford line to IPB in by 12/15		1/15 - Tom will confirm bus lines.	UCONN	D	6				6	
SSc4.2 / **E**	4(e)4	Tech SS Goal 3	Alt Transportation - Bicycle Storage & Changing Rooms	Reduce pollution impacts from auto use.	Bike Racks: 5% of peak occupancy; Showers: 0.5% of FTE	3 FTE and 3 Vendors; provide min. 1 bike rack or use tennis court bike racks (w/in 200 yds).			Civil	D	1				1	1
SSc4.3 / **E**	4(e)5		Alt. Transp.- Low-Emit'g & Fuel Effi. Vehicles	Reduce pollution impacts from auto use.	Preferred parking for FEV for 5% of parking capacity; OR alt. fueling stations for 3% pkg capac. OR provide FEV vehicles for 3% FTE	Provide FEV parking space			Civil	D	3				3	1

LEED Credit	CT HPS Section	UCONN SDG	Credit / Goal	Intent	Criteria & Metrics - Standards	Implementation Strategies	Challenge to Implementation	Action Required	Assigned	Design / Constr.	Certain	Likely	Not Likely	Not Possible	LEED Points Avail.	CT HPS Strate-gies
LEED - Sustainable Sites - continued																
SSc4.4 / **E**	4(e)6	Tech SS Goal 3	Alt. Tranp. - Parking Capacity	Reduce pollution impacts from auto use.	Don't exceed zoning req'ts & have preferred pkg for van/car pools OR if no zoning have 25% fewer spaces than ITE Study	N/A				D	0			2	2	0
SSc5.1 / **E**	4(e)7	Tech SS Goal 2	Site Development - Protect or Restore Habitat	Conserve exg natural areas - provide habitat & promote biodiversity.	Greenfield Site: limit disturbance to 40' beyond bldg, 10' @ walkways & pkg., 15' @ roadways & trenches, 25' @ construct. areas w/ permeable surf.				Civil	D	1				1	
SSc5.2 / **E**	4(e)8		Site Development- Maximize Open Space	Promote biodiversity with open space.	Case 2: Vegetated open space adj. to bldg. = to area of bldg. footprint.	Footprint including overhang is 8,500 SF; area doubled for **E** credit.			Landsc.	D	1				1	
SSc6.1 / **E**	4(e)9	Tech SW Goal 1	Stormwater Design - Quantity Control	Limit disruption of natural hydrology.	Case 1: Exg impervious. 50% or less: SWM Plan options			Determine Path	Civil	D	1				1	1
SSc6.2 / **RP** / E	4(e)10	Tech SW Goal 1	Stormwater Design - Quality Control	Limit disruption and pollution of natural water flows - manage SW runoff.	SWM Plan that reduces impervious cover, promotes infiltration and captures & treats SW run-off from 90% annual rain.				Civil	D	1				1	1
SSc7.1 / **E**	4(e)11	Tech SS Goal 4	Heat Island Effect - Nonroof - 50%	Reduce heat islands to minimize impacts on microclimates/habitats	50% hardscape shaded by trees, structures w/ solar panels, or arch. devices, OR high SRI or open-grid system.	N/A				C	0			1	1	1
SSc7.2 / **E**	4(e)12	Tech SS Goal 4	Heat Island Effect -Roof	Reduce heat islands to minimize impacts on microclimates/habitats	50% of roof area (minus mech equip): high albedo mtl, vegetated roof, or combo; E = 100%	Combination of vegetated roof with high albedo roof at perimeter; entire area for **E** credit.			Arch	D	1				1	1
SSc8	4(e)13	Tech SS Goal 5	Light Pollution Reduction	Min. light trespass from bldgs; reduce sky-glow.	Int: auto. Shut-off 11pm-5am; Ext: Light areas for safety and comfort, full cut-off fixtures; follow Dark Sky	Determine lighting zone, comply w/ zone req'ts.			Arch, Elec Engr.	D	1				1	1
										SUBTOTAL - SUSTAINABLE SITES	17	0	0	9	26	
LEED Credit	CT HPS Section	UCONN SDG	Credit / Goal	Intent	Criteria & Metrics - Standards	Implementation Strategies	Challenge to Implementation	Action Required	Assigned	Design / Constr.	Certain	Likely	Not Likely	Not Possible	LEED Points Avail.	CT HPS Strate-gies
LEED - Water Efficiency																
WEp1	**Mandatory** 3(f)	Tech SW Goal 4	Water Use Reduction - 20%	Reduce burden on public water supply & wastewater systems.	More efficient toilets, Urinals, Sinks, Showers, pre-rinse spray valves			Look into dual flush toilets, low flow showers, etc.	Plumbing	D	Yes				Req'd	Yes
WEc1	4(c)2	Tech SW Goal 2	Water Efficient Landscaping - Reduce potable water by 50%	Limit or eliminate use of potable water for irrigation.		No irrigation			Landsc.	D	2				2	1
"	4(c) 3	Tech SW Goal 2	Water Efficient Landsc. - No Potable Water Use or Irrigation	Limit or eliminate use of potable water for irrigation.		No irrigation			Landsc.	D	2				2	1
WEc2 / **RP**		Tech SW Goal 1, 3, 5	Innovative Wastewater Technologies	Reduce wastewater generation/potable water demand.	Reduce potable water for sewage conveyance OR treat wastewater onsite	N/A				D	0			2	2	

LEED Credit	CT HPS Section	UCONN SDG	Credit / Goal	Intent	Criteria & Metrics - Standards	Implementation Strategies	Challenge to Implementation	Action Required	Assigned	Design / Constr.	Certain	Likely	Not Likely	Not Possible	LEED Points Avail.	CT HPS Strate-gies
LEED - Water Efficiency - continued																
WEc3 / E	4(c)1	Tech SW Goal 4	Water Use Reduction - by 30%	Reduce burden on public water supply & wastewater systems.	Improve upon WEp1				Plumbing	D	2				2	?
"		Tech SW Goal 4	Water Use Reduction - by 35%			N/A				D	0			1	1	
"	4(c)4 (50%)	Tech SW Goal 4	Water Use Reduction - by 40%			N/A				D	0			1	1	
										SUBTOTAL - WATER EFFICIENCY	6	0	0	4	10	
LEED - Energy and Atmosphere																
EAp1	**Mandatory** 3(a)	EE Goal 4	Fundamental Commissioning of Building Energy Sys.	To verify systems are installed and perform as intended.	Designate CxA; review OPR, BOD; develop Cx Plan, incorporate Cx req'ts into docs; verify install. & perf. of systems; Cx Report			1/15 - TH will update OPR Draft ; ES will complete Energy Model; BOD and Systems Manual will follow OPR numbering	CxA	C	Yes				Req'd	Yes
EAp2	**Mandatory** 3(c)	Tech EE Goal 1	Min. Energy Perf. - 10% improvement over code	Reduce environment. & economic impacts from excessive energy use.	Compare against baseline				Mech Engr.	D	Yes				Req'd	Yes
EAp3	**Mandatory** 3(k)	EE Goal 3	Fundamental Refrigerant Management	Reduce stratospheric ozone depletion.	Zero use of CFC-based refrigerants in new bldg				Mech Engr.	D	Yes				Req'd	Yes
EAc1	**Mandatory**	Tech EE Goal 1	Optimize Energy Performance - improve by 12% New/8% Reno	Reduce environment. & economic impacts from excessive energy use.	Continue improvement on energy efficiency		Outside Air		Mech Engr.	D	1				1	
"	**Mandatory**		Energy Perf - 14%/10%		Continue improvement on energy efficiency				Mech Engr.	D	1				1	
"	**Mandatory**		Energy Perf - 16%/12%		Continue improvement on energy efficiency				Mech Engr.	D	1				1	
"	**Mandatory**		Energy Perf - 18%/14%		Continue improvement on energy efficiency				Mech Engr.	D	1				1	
"	**Mandatory** 3(c) 21%		Energy Perf - 20%/16%		Continue improvement on energy efficiency				Mech Engr.	D	1				1	Yes
"			Energy Perf - 22%/18%		Continue improvement on energy efficiency				Mech Engr.	D	1				1	
"	4(a)1 24.5%		Energy Perf - 24%/20%			N/A				D	0			1	1	
"			Energy Perf - 26%/22%			N/A				D	0			1	1	
"	4(a)2 28%		Energy Perf - 28%/24%			N/A				D	0			1	1	
"	4(a)3 31.5%		Energy Perf - 30%/26%			N/A				D	0			1	1	
"			Energy Perf - 32%/28%			N/A				D	0			1	1	
"	4(a)4 35%		Energy Perf - 34%/30%			N/A				D	0			1	1	
"			Energy Perf - 36%/32%			N/A				D	0			1	1	
"	4(a)5 38.5%		Energy Perf - 38%/34%			N/A				D	0			1	1	
"			Energy Perf - 40%/36%			N/A				D	0			1	1	

LEED Credit	CT HPS Section	UCONN SDG	Credit / Goal	Intent	Criteria & Metrics - Standards	Implementation Strategies	Challenge to Implementation	Action Required	Assigned	Design / Constr.	Certain	Likely	Not Likely	Not Possible	LEED Points Avail.	CT HPS Strate-gies
LEED - Energy and Atmosphere - continued																
EAc1 cont.	4(a)6 42%		Energy Perf - 42%/38%			N/A				D	0			1	1	
"			Energy Perf - 44%/40%			N/A				D	0			1	1	
"			Energy Perf - 46%/42%			N/A				D	0			1	1	
"			Energy Perf - 48%/44%			N/A				D	0			1	1	
EAc2 / **RP** 1%		Tech EE Goal 1, 2	On-Site Renewable Energy - 1%	Reduce environment. & economic impacts from fossil fuel use.	Energy produced by renewable sys. as %'g of bldg's annual energy cost					D	0			1	1	
"	4(a)7 3%		Renew. Energy - 3%							D	0			1	1	1
"			Renew. Energy - 5%							D	0			1	1	
"	4(a)8 7%		Renew. Energy - 7%							D	0			1	1	
"			Renew. Energy - 9%							D	0			1	1	
"	4(a)9 10%		Renew. Energy - 11%							D	0			1	1	
"			Renew. Energy - 13%							D	0			1	1	
EAc3 / **E**	**Mandat ory** 3(a)	EE Goal 4	Enhanced Commissioning	Start Cx process early; follow-up after systems perf. verification completed.	Review of design docs, contractor submittals, , develop systems manual, verify training req'ts, review bldg operations with staff, plan for issues; E = Bldg Env. Cx	(3) AHU, (1) Fan, (3) Hoods			CxA	C	2				2	Yes
EAc4	4(f)1	EE Goal 3	Enhanced Refrigerant Management	Reduce ozone deplet., minimize contributions to climate change.	No refrigerants OR specify refrigerants that don't con-tribute to ozone depletion & global warming	Select products whose product lit clearly states compliance with LEED			Mech Engr.	D	2				2	1
EAc5	4(a)11		Measurement & Verification	Provide ongoing bldg. energy consumption accountability.	Development M&V Plan				Mech Egnr.	C	3				3	1
EAc6 / **E**	4(a)10	Tech EE Goal 2	Green Power - 35% - 2 yr. contract	Encourage grid-source renew. energy technol.	UCONN participates in green power program	Contract received ends 1 year after occupancy. Will need documentation that contract will be extended.		1/15 - TH to supply documentation; SD to review comparable doc.	UCONN	C	**2**	0			2	0
										SUBTOTAL - ENERGY & ATMOSPHERE	15	0	0	20	35	
LEED - Materials and Resources																
MRp1	**Mandat ory** 3(g)	Tech MR Goal 1	Storage and Collection of Recyclables	Divert waste from landfills.	Easily access. dedicated area for collection & storage of recylables.				Arch	D	Yes				Req'd	Yes
MRc1.1 / **RP**		Tech MR Goal 2	Building Reuse - Maintain Exg. Walls, Floors & Roof - 55%	Extend exg. bldg life-cycle-conserve re-sources/reduce waste.	Maintain exg. Building structure and envelope	N/A					0			1	1	
"	4(d)1 75%		Building Reuse - 75%	Extend exg. bldg life-cycle		N/A					0			1	1	0
"	4(d)2 95%		Building Reuse - 95%	Extend exg. bldg life-cycle		N/A					0			1	1	0
MRc1.2	4(d)3		Building Reuse - Maintain 50% Interior Nonstruc. Elements	Extend exg. bldg life-cycle-conserve re-sources/reduce waste.		N/A					0			1	1	0
LEED Credit	CT HPS Section	UCONN SDG	Credit / Goal	Intent	Criteria & Metrics - Standards	Implementation Strategies	Challenge to Implementation	Action Required	Assigned	Design / Constr.	Certain	Likely	Not Likely	Not Possible	LEED Points Avail.	CT HPS Strate-gies
LEED - Materials and Resources - continued																

MRc2 / E	4(d)4 50%	Tech MR Goal 2	Construction Waste Mgmt - 50% Recycled or Salvaged	Divert construction and demolition debris from landfills.					Arch / GC	C	1				1	1
"	4(d)5 75%		CWM - 75% Recyded or Salvaged	Divert construc. / demo debris from landfills.	E = 95%				Arch / GC	C	1				1	
MRc3 / E	4(d)6	Tech MR Goal 3	Materials Reuse - 5%	Reduce demand for new mtls & for waste.	Use salvaged, refurbished or reused materials.	N/A				C	0			1	1	0
"	4(d)7		Materials Reuse - 10%		E = 15%	N/A				C	0			1	1	0
MRc4 / E	4(d)8		Recycled Content - 10%	Reduce impacts from extraction & mfr of new materials.					Arch / GC	C	1				1	1
"	4(d)9	Tech MR Goal 3	Recycled Content - 20%		E = 30%				Arch / GC	C	1				1	1
MRc5 / E	4(d)10	Tech MR Goal 3 (extr., mfr)	Regional Material-10%	Reduce impacts from tranportation of mtls.	Mtls extracted & mfr'd w/in 500 miles of site				Arch / GC	C	1				1	1
"	4(d)11	Tech MR Goal 3 (mfr)	Regional Material-20%		E = 30%				Arch / GC	C	1				1	1
MRc6 / E	4(d)12	Tech MR Goal 3	Rapidly Renewable Materials - 2.5%	Reduce use and depletion of finite mtls.	Mtls from agricultural products w/ short cycle	N/A				C	0			1	1	
MRc7 / E	4(d)13	Tech MR Goal 4	Certified Wood - 50%	Encourage environ. responsible forest mgmt.	50% of wood FSC certified (w/ proof of change of custody); E = 95%	Lab casework will be FSC certified, and be included in MR credit tallies.			Arch / GC	C	1				1	1
										SUBTOTAL - MATERIALS & RESOURCES	7	0	0	7	14	
LEED - Indoor Environmental Quality (IEQ)																
IEQp1	**Mandatory** 3(l)		Minimum Indoor Air Quality Performance	Enhance indoor air quality in buildings.	Mech. and natural ventilation systems designed using ASHRAE 62.1-2007				Mech Engr.	D	Yes				Req'd	Yes
IEQp2	**Mandatory** 3(i)	IEQ Goal 1	Environmental Tobacco Smoke (ETS) Control	Min. smoke exposure to bldg occupants and vent. air distribu. sys.	No smoking campus; signage			1/15 - TH to provide UCONN Smoking Policy	UCONN	D	Yes				Req'd	Yes
IEQc1	4(b)1	Tech EE Goal 1, IEQ Goal 1	Outdoor Air Delivery Monitoring	Provide ventilation system monitoring.	Include CO2 monitoring				Mech Engr.	D	1				1	1
IEQc2	4(b)2	IEQ Goal 1	Increased Ventilation	Provide add'l outdoor air ventilation to improve air quality.	Increase vent. rates to occupied spaces by 30%	N/A					0			1	1	1
IEQc3.1	**Mandatory** 3(e)	IEQ Goal 1	Construction Indoor Air Quality Mgmt Plan - During Construction	Reduce IAQ problems resulting from construction.	Develop IAQ Mgmt Plan for stored on-site mtls; meet SMACNA req'ts for stored and installed ductwork	GC may not use installed AHUs during construction			Mech Engr. / GC	C	1				1	Yes
IEQc3.2	4(b)3	IEQ Goal 1	Construction Indoor Air Quality Mgmt Plan - Before Occupancy	Reduce IAQ problems resulting from construction.	Building Flush Out				Mech Engr. / GC	C	1				1	1
IEQc4.1	4(b)4	IEQ Goal 1	Low-emitting Mtls - Adhesives & Sealants	Reduce qty of indoor air contaminants.	Must comply with South Coast Air Quality Mgmt District (SCAQMD)				Arch / GC	C	1				1	1
IEQc4.2	4(b)5	IEQ Goal 1	Low-emitting Mtls - Paints & Coatings	Reduce qty of indoor air contaminants.	Arch'l paints must comply w/ Green Seal GS-11; Anti-rust paints w/ GS-03; clear wood finishes w/ SCAQMD				Arch / GC	C	1				1	1
IEQc4.3	4(b)6 v2.2	IEQ Goal 1	Low-emitting Mtls - Flooring Systems	Reduce qty of indoor air contaminants.	Carpet, cushioning and adhesives, and hard-surface flooring must comply with stds noted				Arch / GC	C	1				1	1

LEED Credit	CT HPS Section	UCONN SDG	Credit / Goal	Intent	Criteria & Metrics - Standards	Implementation Strategies	Challenge to Implementation	Action Required	Assigned	Design / Constr.	Certain	Likely	Not Likely	Not Possible	LEED Points Avail.	CT HPS Strate-gies
LEED - Indoor Environmental Quality (IEQ) - continued																
IEQc4.4	4(b)7	IEQ Goal 1	Low-emitting Mtls - Composite Wood & Agrifiber Products	Reduce quantity of indoor air contaminants.	No added urea-formaldehyde				Arch / GC	C	1				1	
IEQc5	4(b)8, 4(b)14	IEQ Goal 1	Indoor Chemical and Pollutant Source Control	Minimize occupant exposure to potentially hazardous particulates and pollutants	Entryway systems at reg. used entries; exhaust spaces where hazardous mtls are stored	Mat at Loading dock entry			Arch / Mech Engr.	D	1				1	2
IEQc6.1	4(b)9		Controllability of Systems - Lighting	Promote productivity and comfort.	Individual lighting controls for 90% of bldg occupants; controls at shared spaces				Elec. Engr.	D	1				1	1
IEQc6.2	4(b)10	EE Goal 1	Controllability of Systems - Thermal Comfort	Promote productivity and comfort.	Individual comfort controls for min. 50% of bldg occupants; controls at shared spaces	Windows will be operable			Mech Engr.	D	1				1	1
IEQc7.1		IEQ Goal 2	Thermal Comfort Design	Promote productivity and comfort.	Design system to meet ASHRAE 55-2004 or ISO 7730: 2005				Mech Engr.	D	1				1	
IEQc7.2	4(b)11		Thermal Comfort - Verification	Assess bldg occupants' thermal comfort.	Agree to conduct survey w/in 6-18 mos. for bldg occupants; correct areas w/ 20% complaints			1/15 - Survey to occur during Post-occupancy walk-through; SD to provide sample survey	UCONN	D	1				1	1
IEQc8.1	4(b)12	Tech EE Goal 1, IEQ Goal 2	Daylight and Views - Daylight	Provide connection between outside & inside.	Daylighting in 75% of regularly occupied spaces	N/A					0			1	1	
IEQc8.2	4(b)13	IEQ Goal 2	Daylight and Views - Views	Provide connection between outside & inside.	Views for 90% of regularly occupied areas	N/A				D	0			1	1	0
										SUBTOTAL - INDOOR ENVIRONMENTAL QUALITY	12	0	0	3	15	
LEED - Innovation in Design																
IDc1.1	**Mandatory** 3(a)? (req'd)		Innovation or Exemplary Perf.	Building Envelope Commissioning?	Exemplary - EAc3 - Comprehensive BECx		Extent of svcs to be provided may not qualify for LEED credit	1/15 - BECx to be provided; testing costs to be investigated; credit will be attempted	BECxA	C		0	1		1	
IDc1.2	**Mandatory** 3(b) (req'd)	Tech EE Goal 1	Innovation or Exemplary Perf.	Integrated Design Process	Innovation Credit - follow prescribed req'ts for HPS			Energy Model (Mech Engr)	Team	D	1				1	Yes
IDc1.3	**Mandatory** 3(j)? (req'd)		Innovation or Exemplary Perf.	Integrated Pest Management?	Innovation Credit - follow prescribed req'ts for HPS				Arch / UCONN / GC		1				1	Yes
IDc1.4			Innovation or Exemplary Perf.	Exemplary - SSc5.2 - Open Space	Exemplary - Double area of threshold open space				Landsc.	D	1				1	
IDc1.5			Innovation or Exemplary Perf.	Exemplary - SSc7.2 - Heat Island Effect - Roof	Exemplary - 100% high albedo and vegetated roof combo (minus mech equip)			1/15 - Point moved to Certain - credit to be attempted	Arch	D		1			1	
IDc2			LEED Accredited Professional						LEED	C	1				1	
										SUBTOTAL - INNOVATION & DESIGN	4	1	1	0	6	

LEED Credit	CT HPS Section	UCONN SDG	Credit / Goal	Intent	Criteria & Metrics - Standards	Implementation Strategies	Challenge to Implementation	Action Required	Assigned	Design / Constr.	Certain	Likely	Not Likely	Not Possible	LEED Points Avail.	CT HPS Strate-gies
LEED - Regional Priority																
RP1			SSc2	Development Density		N/A				D	0			1	1	
RP2			SSc3	Brownfield Develop.		N/A					0			1	1	
RP3			SSc6.2	SW Design - Quality					Civil	D	1				1	
RP4			WEc2	Innovative Wastewater Technologies		N/A					0			1	1	
RP5			EAc2	On-Site Renewable Energy - 1%						D	0			1	1	
RP6			MRc1.1	Building Reuse - 75%		N/A				C	0			1	1	
										SUBTOTAL - ENERGY & ATMOSPHERE	1	0	0	3	4	
CT HPS Strategies not covered by LEED																
	Mandatory 3(d)	EE Goal 1	ENERGY STAR Products	Specify ENERGY STAR products in ES category.	In construction contract and by Owner; there will be no vending machines					Mech / UCONN						Yes
	4(e)14	EE Goal 1	Orient Building for Daylighting & Energy Performance	Orient bldg so E/W glazing min.; S shaded; glare controlled.												
	4(e)15	SS Goal 1	Sustainable Site Development	Impervious surfaces built consistent w/ State Conservation & Development Plan.												
	4(f)3		Metering of Buildings													
LEED - TOTAL POINTS											**62**	1	1	46	110	

Certified 40-49 points; Silver 50-59 points; Gold 60-79 points; Platinum 80 or more points

Certain Likely Not Likely Not Poss.

SECTION 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Construction Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council.

B. The CT High Performance Building Standard (CT HPS) mandates compliance with twelve specific sustainable strategies, in addition to compliance with 26 additional HPS strategies or achievement of LEED Silver certification. This Project is slated to comply with the CT HPS mandatory requirements and requirements for LEED Silver certification.

1. General requirements and procedures for compliance with CT HPS for State Funded Buildings (HPB).

    a. All HPS Mandatory requirements must be met to achieve compliance and may depend on product selections that may not be specifically identified as requirements.
    b. Compliance with Mandatory Requirements may be used as one criterion to evaluate substitution requests and comparable product requests.
    c. Compliance with some Mandatory requirements may depend on Architect's design and other aspects of the Project that are not part of the Work of the Contract.
    d. Specific requirements are also included in other Sections.

2. General requirements and procedures for compliance with USGBC LEED prerequisites and credits needed for Project to obtain LEED Silver certification based on LEED Reference Guide for Green Building Design and Construction, 2009 (version 3.0) for New Construction and Major Renovations. Work must comply with all related Addenda issued prior to the date of project registration with the USGBC.

    a. LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not specifically be identified as requirements.
    b. Some LEED prerequisites and credits needed obtain the indicated LEED certification depend on the Architect's design and other aspects of the Project that are not part of the Work of the Contract.
    c. Specific requirements are also included in other Sections.

d. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests.
e. Refer to the LEED Scorecard Summary attached at the end of this Section for required credits.
   1. LEED Certification goal is Silver.
   2. A Silver Rating is obtained for buildings that earn between 50 and 59 of the available 110 points.
   3. All LEED credits on the LEED Scorecard will be attempted except those in the "Not Possible" or "No" columns.
f. The project was registered on August 11, 2014 to pursue LEED certification.
g. The Owner will pay USGBC costs for Credit Interpretation Requests (CIR), if required, Certification Applications, and other administrative fees.
h. Additional information regarding LEED compliance is available from:
   - US Green Building Council (USGBC), Tel.: 800-795-1747 and http://www.usgbc.org
   - Green Building Certification Institute (GBCI), Tel.: 800-795-1746 and http://www.gbci.org.
i. It is anticipated that (3) of the (5) LEED Innovation and Design Credits will pursue the Exemplary path (achieving the next incremental threshold) from the following credits:

SSc5.2	MRc2	MRc5
SSc7.2	MRc4	MRc7
EAc3		

3. Related Requirements:

a. The following items are not included in this Section and are specified under the designated Sections: Divisions 1 through 33 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED. It will be the contractor's responsibility to procure materials that will meet the goals indicated in the LEED Scorecard.
b. Contractor is responsible for completion and transmittal of all documentation required for LEED certification according to USGBC/GBCI requirements submitted in both electronic format and hard copy, provided and organized per credit. This includes manufacturer's documentation highlighting LEED requirements of material and products submitted for acceptance during normal shop drawing / submittal process."

C. A copy of the LEED/CT HPB Project checklist is attached at the end of this Section for information only.

1.3 DEFINITIONS

A. LEED: USGBC's "LEED 2009 for New Construction & Major Renovations."

1. Definitions that are a part of "LEED 2009 for New Construction and Major Renovations" apply to this Section.

B. CT HPS: Connecticut High Performance Building Standard.

C. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

D. FSC: Forest Stewardship Council.

E. HPB: High Performance Building Standard.

F. LEED: Leadership in Energy and Environmental Design; USGBC's LEED 2009 for New Construction and Major Renovations."

G. LEED Project Boundary (LPB): The portion of the Site disturbed by the work, and submitted for LEED certification.

H. Rapidly Renewables: Materials made from agricultural products that are typically harvested within a 10-year or shorter cycle. Rapidly renewable materials include products made from cork, bamboo, wheat, cotton, flax, jute, straw, sunflower seeds hulls, vegetable oils or wool."

I. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

J. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Postconsumer" material is waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Preconsumer" material is material diverted from the waste stream during the manufacturing process. Reutilization of materials (such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it) is excluded.

K. Solar Reflective Index (SRI): a measure of the constructed surface's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is 0 and a standard white (reflectance 0.80, emittance 0.90) is 100. To calculate the SRI for a given material, obtain the reflectance value and emittance value for the material. SRI is calculated according to ASTM E 1980. Reflectance is measure according to ASTM E

903, ASTM E 1918, or ASTM C 1549. Emittance is measured according to ASTM E 408 or ASTM C 1371."

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Review LEED/HPB requirements and action plans for complying with requirements.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Submit documentation to USGBC and respond to questions and requests from USGBC about LEED prerequisites and credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until USGBC has made its determination on Project's LEED certification application.

1. Document correspondence with USGBC as informational submittals.

1.6 ACTION SUBMITTALS

A. General: Submit additional sustainable design submittals required by other Specification Sections.

B. Sustainable design submittals are in addition to other submittals.

1. If submitted item is identical to that submitted to comply with other requirements, include an additional copy with other submittal as a record copy of compliance with indicated LEED/HPB requirements instead of separate sustainable design submittal. Mark additional copy "Sustainable design submittal."

2. With each submittal the contractor will include a completed **LEED CREDITS DOCUMENTATION SHEET** that confirms if and how the product complies with the requirements of applicable LEED credits.

3. A copy of the LEED CREDITS DOCUMENTATION SHEET is attached at the end of this Section.

C. Sustainable Design Documentation Submittals for LEED:

1. Credit SSp1: Documentation of Sedimentation and Erosion Control in the form of date-stamped photos, logs (inspection and action), update to plan, etc.

2. Credit SSc7.2: Product Data for roofing materials indicating compliance with LEED requirements, including solar reflectance index (SRI) values."

3. Credit EAc5: Product Data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-consumption performance over time.
4. Credit MRc2: Comply with Section 017419 "Construction Waste Management and Disposal."
5. Credit MRc4: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycling content. Include statement indicating costs for each product having recycled content.
6. Credit MRc5: Product data indicating location of materials manufacturer for regional materials. Include statement indicating cost for each regional material.

    a. Include statement indicating location of and distance from Project (as a crow flies) to point of extraction, harvest, or recovery for each raw material used in regional materials.
    b. Include statement indicating distance from manufacturer to Project (as a crow flies) for each regionally manufactured material.
    c. Include statement indicating percentage by weight of regional materials for each regionally manufactured product.

7. Credit MRc7: Product data and FSC chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product and its FSC type (Pure or FSC Mixed with percentage). Include statement indicating total cost for wood-based materials used for Project, and provide invoices for all wood products, certified, and non-certified, permanently installed in Project. FSC certified wood invoices must include vendor's Chain of Custody (COC) certificate number. Invoices or manufacturer's letter must state whether FSC products are FSC Pure, FSC Mixed with percentage.
8. Credit IEQc3.1:

    a. Construction indoor-air-quality management plan.
    b. Product Data for temporary filtration media.
    c. Product Data for filtration media used during occupancy.
    d. Construction Documentation: Six photographs at each of three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

9. Credit IEQc3.2:

    a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
    b. Product Data for filtration media used during flush-out and during occupancy.

10. Credit IEQc4.1: Product Data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Include a summary table comparing credit requirements and actual VOC levels for each product.

11. Credit IEQc4.2: Product data for paints and coatings used inside the weatherproofing system and applied on-site indicating VOC content of each product used. Include a summary table comparing credit requirements and actual VOC levels for each product. Indicate VOC content in g/L calculated according to the following:

    a. Architectural Paints and Coatings (applied to interior walls and ceilings): Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993.
    b. Anti-Corrosive and Anti-Rust Paints (applied to interior ferrous metal substrates): Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997.
    c. Clear Wood Finishes, Floor coatings, Stains, Primers, and Shellacs: South Coast Air Quality Management District (SCAQMD), Rule #1113, Architectural Coatings", rules in effect on January 1, 2004.

12. Credit IEQc4.3:

    a. Product data for carpet and carpet cushion indicating documentation that products meet the requirements of the Carpet and Rug Institute (CRI) Green Label Plus program.
    b. Product data for carpet adhesives indicating VOC content of each product used. Indicate VOC content in g/L calculated according to South Coast Air Quality Management District (SCAQMD) Rule #1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005.
    c. Product data for hard surface flooring products indicating documentation that products are compliant with the FloorScore standards.
    d. Product data for interior concrete, wood, bamboo and cork floor finishes indicating VOC content of each product used. Indicate VOC content in g/L calculated according to South Coast Air Quality Management District (SCAQMD) Rule #1113, Architectural Coatings, requirements in effect on January 1, 2004.
    e. Product data for interior floor tile setting adhesives indicating VOC content of each product used. Indicate VOC content in g/L calculated according to South Coast Air Quality Management District (SCAQMD) Rule #1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005.

13. Credit IEQc4.4: Product Data for products containing composite wood, agrifiber products, and laminating adhesives indicating that they do not contain added urea-formaldehyde resin. Include statement indicating adhesives and binders used for each product.

D. Sustainable Design Submittals for HPB:

1. Mandatory 3(d): Product Data for products indicating that they are Energy Star Compliant.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For LEED/HPB coordinator.

B. Project Materials Cost Data: Provide statement indicating total cost for materials (excluding labor and equipment) without mechanical, electrical, and plumbing components, and specialty items such as elevators and equipment.

1. Include statement indicating total cost for materials used for Project by both of the following methods, for review by Architect:

   a. Default materials cost (45% of project budget) for the LEED project, as calculated from project construction costs.
   b. Actual materials cost, excluding labor and equipment (hard costs for Divisions 3-10, Division 31 Foundations and Division 32 Sections for Paving, Site Improvements and Plantings; Laboratory Casework is optional).

2. Provide the value of all permanently installed wood-based construction materials:

   a. Value for all wood-based materials (including Laboratory Casework if included above).
   b. Value for all FSC certified wood-based materials (Include Laboratory Casework if included above, and if applicable).

C. Sustainable Design Action Plans: Provide preliminary submittals within 30 days of date established for the Notice to Proceed indicating how the following requirements will be met:

1. Credit SSc7.2: Product Data for roofing materials indicating compliance with LEED requirements, including solar reflectance index (SRI) values.
2. Credit MRc2: Waste management plan complying with Section 017419 "Construction Waste Management and Disposal."
3. Credit MRc4: List of proposed materials with recycled content. Indicate cost, postconsumer recycled content, and preconsumer recycled content for each product having recycled content.
4. Credit MRc5: List of proposed regionally extracted, processed and manufactured materials. Indicate each product containing regional materials, including its source, cost, and percentage by weight of regional materials. Determine distances to project site from both harvest location and place of manufacture as a crow flies.
5. Credit MRc7: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products. Provide list of all proposed wood to determine percent to certified wood.
6. Credit IEQc3.1: Construction indoor-air-quality management plan. Refer to Section 015150."
7. Credit IDc1.3: Integrated Pest Management Plan." Refer to Section 015013

D. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED Action Plans for the following:

1. MRc2: Waste reduction progress reports complying with Section 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
2. MRc4: Recycled Content.

3. MRc5: Regionally extracted, processed and manufactured materials.
4. MRc7: Certified wood products.
5. IEQc3.1: Construction IAQ Management Plan – during construction.
6. IDc1.3: Integrated Pest Management Plan.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED/HPB credits required in this Section. Although other Sections may specify some requirements that contribute to these LEED/HPB credits, Contractor shall provide additional materials and procedures necessary to obtain LEED/HPB credits indicated.

2.2 RECYCLED CONTENT OF MATERIALS

A. Credit MRc4: Building materials shall have recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content for Project constitutes a minimum of 20 percent, or 30 percent if this credit is to be pursued as Exemplary, of cost of materials used for Project.

1. Cost of postconsumer recycled content plus one-half of preconsumer recycled content of an item shall be determined by dividing weight of postconsumer recycled content plus one-half of preconsumer recycled content in the item by total weight of the item and multiplying by cost of the item.
2. Do not include plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

2.3 REGIONAL MATERIALS

A. Credit MRc5: Not less than 20 percent, or 30 percent if this credit is to be pursued as Exemplary, of building materials (by cost) shall be regional materials.

2.4 CERTIFIED WOOD

A. Credit MRc7: Not less than 50 percent (by cost) of wood-based materials, or 95 percent if this credit is to be pursued as Exemplary, shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:

a. Rough carpentry.
b. Miscellaneous carpentry.
c. Finish carpentry.
d. Architectural woodwork.
e. Wood cabinets.

2.5 LOW-EMITTING MATERIALS

A. Credit IEQc4.1: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005, and the following VOC content limits:

1. Wood Glues: 30 g/L.
2. Metal-to-Metal Adhesives: 30 g/L.
3. Adhesives for Porous Materials (except Wood): 50 g/L.
4. Subfloor Adhesives: 50 g/L.
5. Plastic Foam Adhesives: 50 g/L.
6. Carpet Adhesives: 50 g/L.
7. Carpet Pad Adhesives: 50 g/L.
8. VCT and Asphalt Tile Adhesives: 50 g/L.
9. Cove Base Adhesives: 50 g/L.
10. Gypsum Board and Panel Adhesives: 50 g/L.
11. Rubber Floor Adhesives: 60 g/L.
12. Ceramic Tile Adhesives: 65 g/L.
13. Multipurpose Construction Adhesives: 70 g/L.
14. Fiberglass Adhesives: 80 g/L.
15. Contact Adhesive: 80 g/L.
16. Structural Glazing Adhesives: 100 g/L.
17. Wood Flooring Adhesive: 100 g/L.
18. Structural Wood Member Adhesive: 140 g/L.
19. Special-Purpose Contact Adhesive (Contact Adhesive That Is Used to Bond Melamine-Covered Board, Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch or Less in Thickness to Any Surface): 250 g/L.
20. Top and Trim Adhesive: 250 g/L.
21. Plastic Cement Welding Compounds: 250 g/L.
22. ABS Welding Compounds: 325 g/L.
23. CPVC Welding Compounds: 490 g/L.
24. PVC Welding Compounds: 510 g/L.
25. Adhesive Primer for Plastic: 550 g/L.
26. Sheet-Applied Rubber Lining Adhesive: 850 g/L.
27. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
28. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
29. Special-Purpose Aerosol Adhesive (All Types): 70 percent by weight.
30. Architectural Sealants: 250 g/L.
31. Architectural Sealant Primers, Non-Porous: 250 g/L.
32. Architectural Sealant Primers, Porous: 775 g/L.

33. Other Sealant Primers: 750 g/L.
34. Roadway Sealants: 250 g/L.
35. Other Sealants: 420 g/L.
36. Architectural Sealant Primers for Nonporous Substrates: 250 g/L.
37. Architectural Sealant Primers for Porous Substrates: 775 g/L.
38. Roadway Sealants: 250 g/L.
39. Other Sealant Primers: 750 g/L.

B. Credit IEQc4.2: For field applications that are inside the weatherproofing system, use paints and coatings that comply with the following limits for VOC when calculated according to the following:

Table 1. Applicable VOC Limits:

Product Type	**Reference Standard**	**VOC Limit g/L minus water**
Interior Flat Coating	Green Seal GS-11, 1993	50
Interior Non-Flat Coating	Green Seal GS-11, 1993	150
Anti-Corrosive/Anti-Rust Paint	Green Seal GC-03, 2nd Edition, 1997	250
Clear Wood Finish: Lacquer	SCAQMD Rule 1113, 2004	550
Clear Wood Finish: Sanding Sealer	SCAQMD Rule 1113, 2004	350
Clear Wood Finish: Varnish	SCAQMD Rule 1113, 2004	350
Clear Brushing Lacquer	SCAQMD Rule 1113, 2004	680
Floor Coatings	SCAQMD Rule 1113, 2004	100
Primers, Sealers and Undercoaters	SCAQMD Rule 1113, 2004	200
Shellac: Clear	SCAQMD Rule 1113, 2004	730
Shellac, Pigmented	SCAQMD Rule 1113, 2004	550
Stain	SCAQMD Rule 1113, 2004	250
Concrete Curing Compounds	SCAQMD Rule 1113, 2004	350
Japans/ Faux Finishing Coatings	SCAQMD Rule 1113, 2004	350
Magnesite Cement Coatings	SCAQMD Rule 1113, 2004	450
Pigmented Lacquer	SCAQMD Rule 1113, 2004	550
Waterproofing Sealers	SCAQMD Rule 1113, 2004	250
Waterproofing Concrete/Masonry Sealers	SCAQMD Rule 1113, 2004	400
Wood Preservatives	SCAQMD Rule 1113, 2004	350
Low-Solids Coatings	SCAQMD Rule 1113, 2004	120*

*Note: VOC levels for Low-Solids Coatings are measured in grams of VOC per liter of material, including water."

C. Credit IEQc4.3: For flooring systems installed in the building interior, use products that comply with the following:

1. Carpet and Carpet Cushion: Carpet and Rug Institute (CRI) Green Label program.
2. Carpet Adhesives: 50 g/L.
3. Hard Surface Flooring: FloorScore standards.
4. Concrete, Wood, Bamboo and Cork Floor Finishes:

   a. Floor Coatings: 100 g/L.
   b. Sealers:

      1) Waterproofing Sealers: 250 g/L.
      2) Sanding Sealers: 275 g/L.
      3) Other sealers: 200 g/L.

   c. Stains: 250 g/L.

5. Floor Tile Setting Adhesives: 65 g/L.

C. Credit IEQc4.4: Composite wood, agrifiber products, and laminating adhesives shall not contain added urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 NONSMOKING BUILDING

A. Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

3.2 MEASUREMENT AND VERIFICATION

A. Credit EA 5: Implement measurement and verification plan consistent with the EVO's International Performance Measurement and Verification Protocol (IPMVP), "Volume III: Concepts and Options for Determining Energy Savings in New Construction," and as further defined by the design team plan submitted for credit.

3.3 CONSTRUCTION WASTE MANAGEMENT

A. Credit MR 2: Comply with Section 017419 "Construction Waste Management and Disposal."

3.4 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Credit IEQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 015000 "Temporary Control," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace air filters immediately prior to occupancy.

3.5 INDOOR-AIR-QUALITY ASSESSMENT

A. Flush-Out:

1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14,000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity no higher than 60 percent.

    a. Coordinate operating procedures and duration with the Mechanical Engineer and Commissioning Agent.

2. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. of outside air or the design minimum outside air rate determined in Prerequisite IEQ 1, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cu. ft./sq. ft. of outside air has been delivered to the space.

    a. Coordinate operating procedures and duration with the Mechanical Engineer and Commissioning Agent.

3.6 LEED SCORECARD

A. Comply with requirements of Scorecard Summary attached to this Section. All credits in the columns “Certain”, “Likely”, and “Not Likely” will be attempted.”

3.7 LEED CREDITS DOCUMENTATION SHEET

A. Documentation Sheet: Provide Documentation for each material requested for LEED Documentation as follows:

END OF SECTION 018113.13

SECTION 01 9110 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for commissioning the HVAC, Plumbing, Electrical, Control Systems and Building Envelope.

B. Related Sections:

Division 1 Section 01 9110 "General Commissioning Requirements"
Division 1 Section 01 9115 “Facility Exterior Envelope Commissioning Requirements”
Division 22 Section 22 0800 "Plumbing System Commissioning Requirements”
Division 23 Section 23 0800 “HVAC System Commissioning Requirements”
Division 23 Section 23 9010 "Building Control Systems Commissioning Requirements”
Division 26 Section 26 0800 “Electrical System Commissioning Requirements”

1.2 DEFINITIONS

A. Commissioning Terms

1. Acceptance - A formal action, taken by a person with appropriate provider (which may or may not be contractually defined) to declare that some aspect of the project meets defined requirements, thus permitting subsequent activities to proceed.
2. Approval - Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the contract documents.
3. Basis of Design - A document that records the concepts, calculations, decisions, and product selections used to meet the owner’s project requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
4. Checklists - Verification checklists that are developed and used during all phases of the commissioning process to verify that the owner’s project requirements are being achieved. This includes checklists for general verification, plus testing, training, and other specific requirements.
5. Commissioning Authority (CxA) - The entity identified by the owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process.
6. Commissioning Plan - An overall plan developed by the commissioning agent that provides the structure, schedule and coordination planning for the commissioning process.
7. Commissioning Process - A quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirements.

8. Commissioning Process Activities - Components of the commissioning process.
9. Commissioning Process Progress Report - A written document that details activities completed as part of the commissioning process and significant findings from those activities that is continuously updated during the course of a project. Usually it is incorporated into the commissioning plan as an ongoing appendix.
10. Commissioning Team - The individuals who through coordinated actions are responsible for implementing the commissioning process.
11. Construction Checklist - A form used by the contractor to verify that appropriate components are on-site, ready for installation, correctly installed, FULLY programmed, and FULLY functional. Also see Checklists.
12. Construction Documents - This includes a wide range of documents, which pertain to this project, with the owner's needs and with regulations, laws, and countries. Construction documents typically include the project manual (specifications), plans (drawings) and general terms and conditions of the contract.
13. Construction Manager (CM) - The entity identified by the owner who leads, plans, schedules, and coordinates the construction team to implement the materials & equipment procurement, construction, start-up, turnover, and warranty process. The CM coordinates schedules, subcontractors and resources so that the commissioning process is integrated into the overall construction program.
14. Contract Documents - This includes a wide range of documents, which will vary from project to project, with the owner's needs and with regulations, laws, and countries. Contract documents frequently include price agreements, construction management process, sub-contractor agreements or requirements, requirements and procedures for submittals, changes, and other construction requirements, timeline for completion, and the construction documents.
15. Coordination Drawings - Drawings showing the work of all trades to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances.
16. Control system - A component of environmental, HVAC, security, and fire systems for reporting/monitoring and issuing of commands to/from field devices.
17. Data logging -The monitoring and recording of flows, currents, status, pressures, etc., of equipment using stand-alone data recorders separate from the control system or the trending capabilities of control systems.
18. Deferred Performance Tests (DPTs) - Performance tests that are performed, at the discretion of the CxA, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design, or other site conditions that disallow the test from being performed.
19. Deficiency - A condition in the installation or function of a component, piece of equipment, or system that is not in compliance with the contract documents or the commissioning requirements.
20. Factory Testing - Testing of equipment on-site or at the factory, by factory personnel, with or without an owner's representative present.
21. Issues Log - A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the commissioning team during the course of the commissioning process.

22. Owner's Construction Manager (OCM) - The OCM is the owner's employee who will be on the construction site assisting the OPM and facilitating the CM's compliance with College policies and procedures, coordinating construction activities with College operational requirements and ensuring compliance with the contract documents.
23. Owner's Project Manager (OPM) - The OPM is responsible for the overall management of project components and for initial approval of all related invoices. Responsibilities of the OPM for a Project component(s) include, but are not limited to, monitoring the performance by the CM according to terms and conditions of the CM Contract; acting as the owner representative in charge of work at the site; ensuring compliance with CM Contract requirements concerning the work; and advising the owner of any factors that may cause delay in performance of the work.
24. Owner's Project Requirements - A written document that details the functional requirements of a project and the expectations of how it will be used and operated. This includes project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. (The term "Project Intent" is used by some owners for their commissioning process owner's project requirements or design.)
25. Phased Commissioning - Commissioning that is completed in phases as required by the phasing plan as approved for the project and other scheduling issues.
26. Quality Based Sampling - A process for evaluating a sub-set (sample) of the total population. The sample is based upon a known or estimated probability distribution of expected values; an assumed statistical distribution based upon data from a similar product, assembly, or system; or a random sampling that has scientific statistical basis.
27. Seasonal Performance Tests - Performance tests that are deferred until the system(s) will experience conditions closer to their design conditions based on weather conditions.
28. Simulated Condition - Condition that is created for the purpose of testing the response of a system (e.g., raising/lowering the setpoint of a thermostat to see the response in a VAV box).
29. Simulated Signal - Disconnecting a sensor and using a signal generator to simulate a sensor value for the purpose of testing a full range of conditions.
30. Startup - The initial starting or activating of dynamic equipment, including completing construction checklists.
31. Systems Manual - A system-focused composite document that includes the operation manual, maintenance manual, and additional information of use to the owner during the occupancy and operations phase.
32. Test Procedure - A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems. The test procedures are specified in the Technical Specifications sections of the contract documents. Performance testing covers the dynamic functions and operations of equipment and systems using manual or monitoring methods. Performance testing is the dynamic testing of systems under full operation. Systems are tested under various modes, such as during low cooling loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to respond as the sequences state.
33. Training Plan - A written document that details the expectations, schedule, budget, and deliverables of commissioning process activities related to training of project operating and maintenance personnel, users, and occupants.

34. Verification - The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the owner's Project Requirements.
35. Trending – The monitoring, by a building management system or other electronic data gathering equipment, and analyzing of the data gathered over a period of time.
36. Vendor - Supplier of equipment.

B. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 COMMISSIONING PROCESS DESCRIPTION

A. Commissioning is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies so that they meet the defined objectives and criteria. The Commissioning process begins at project inception (during the pre-design phase) and continues through turnover and operation of the facility. The commissioning process includes specific tasks to be conducted during each phase in order to verify that design, construction, and training meets the owner's project requirements.

B. The members of the commissioning team consist of the commissioning agent (CxA), the owner's project manager(s) (PM), the construction manager (CM), the general contractor (GC), the architect and design engineers (A/E), the mechanical contractor (MC), the electrical contractor (EC), the testing and balancing (TAB) contractor, the controls contractor (CC), the facility operating staff, and any other installing subcontractors or suppliers of equipment. The commissioning agent is hired directly by the owner. The CxA defines and coordinates the project commissioning activities and the reports to the owner. All team members work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.

C. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

1.4 COMMISSIONING PROGRAM OBJECTIVES

A. The purpose of commissioning is to verify that:

1. Equipment and systems are installed in a good workmanship manner, and in accordance with the project design documents.
2. Equipment has been cleaned, flushed, adjusted, lubricated and tested by qualified personnel, prior to start-up.
3. Equipment has been serviced, adjusted, tested and started-up by qualified personnel, prior to overall system start-up

4. All systems operate in the manner that they are intended to, for all modes of operation.
5. The building envelope is free from water leakage/infiltration and air leakage from the building envelope meets the specified requirements.
6. All equipment and system discrepancies have been resolved to the owner's satisfaction.
7. Operations and maintenance training has been completed to the owner's satisfaction.
8. All operational and warranty issues have been resolved to the owner's satisfaction.

1.5 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

B. Owner's Project Requirements and Basis of Design, issued by the Architect and Engineer, and approved by the owner.

C. ASHRAE Standard 202-2013 – "Commissioning Process for Buildings and Systems"

D. ASHRAE Guideline 0-2013 – "The Commissioning Process".

E. ASHRAE Guideline 1.1-2007 - HVAC&R Technical Requirements for The Commissioning Process

F. US Green Building Council - LEED Reference Guidelines

G. Building Commissioning Association - The Building Commissioning Handbook, Second Edition.

H. NEBB (National Environmental Balancing Bureau) Environmental Systems Technology Handbook

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required performance testing shall be provided by the contractor for the equipment being tested. This includes, but is not limited to, two-way radios, meters, and tools.

B. Special equipment, tools, and instruments required for testing equipment according to the contract documents shall be included in the contractor's base bid price and shall be turned over to the owner at Project close-out.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the tolerances specified in the specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration to NIST traceable standards within the past year to an accuracy of 0.5 degree F and a resolution of + or - 0.1 degree F. Pressure sensors shall have an accuracy of

+ or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 COMMISSIONING COORDINATION

A. Project Commissioning Team - The members of the project commissioning team will consist of the commissioning authority and any support personnel, the construction manager, the owner's facility staff or designee, the general contractor, subcontractors and/or vendors as required, and the architect/ engineer (A/E).

B. Management - The CxA coordinates the commissioning activities through the owner or the construction manager. All members shall work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.

C. Scheduling - The CxA, through the owner or CM, will provide sufficient notice to the contractor for scheduling commissioning activities with respect to the owner's participation. The contractor will integrate all commissioning activities into the overall project schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

3.2 COMMISSIONING PLAN

A. The CxA will develop the commissioning plan which shall be included in the project schedule when approved by the owner. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with an initial commissioning meeting conducted by the CxA where the commissioning process is reviewed with the project commissioning team members.
2. Additional meetings will be required throughout construction, scheduled by the CxA, through the owner or CM, with necessary parties attending to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation is submitted to the CxA, through the owner or CM, during normal submittals, including detailed startup procedures.
4. The construction checklists will be developed by the CxA, and completed by the contractor (or their subcontractors), before and during the startup process. The CxA and the contractors shall coordinate the format of their respective checklists in order to ensure thoroughness, while avoiding duplication of effort.
5. Construction checklists, TAB and startup must be completed before performance testing can begin.
6. Items of non-compliance in material, installation, or setup shall be corrected in accordance with the contract documents.

7. The contractor ensures that the subcontractors' construction checklists are executed and documented and that startup and initial checkouts are performed. The CxA verifies that the TAB, construction checklists and startup were completed according to the approved plans.
8. The CxA develops and implements equipment and system performance test procedures. The forms and procedures are approved by the owner, CM and A/E.
9. The performance tests are executed by the contractor under the direction of the CxA with the assistance of the facility staff. All documentation is by the CxA. Any testing failure is to be corrected at no additional cost to the owner, and a re-test is to be performed, observed, and documented.
10. The CxA reviews the O&M documentation for completeness and provides the commissioning record for the O&M manuals.
11. Commissioning should be completed before project turnover is complete.
12. The CxA reviews, and witnesses the training provided by the contractor.
13. Deferred testing is conducted as specified or required.
14. Seasonal testing is conducted to verify that the systems function correctly in opposite seasons.

3.3 COMMISSIONING TEAM

A. Members appointed by contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each contractor, including project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members appointed by owner:

1. The CxA designated by the owner, works with the owner and the CM to lead, plan, schedule, and coordinate the commissioning team to implement the commissioning process. The owner will engage the CxA under a separate contract.
2. Representatives of the facility user's operation and maintenance personnel participate in the commissioning process, as designated by the owner.
3. Architect and engineering design professionals.

3.4 RELATED REQUIREMENTS

A. Other drawings, specifications and submittals, as defined in the construction documents, shall apply to this commissioning program

3.5 RESPONSIBILITIES

A. The general responsibilities of various parties in the commissioning process are provided in this sub-section. The specific responsibilities are in the Technical Specifications.

B. All Parties

1. Follow the commissioning plan.
2. Attend initial commissioning meeting and additional meetings as necessary.
3. Participate in commissioning related activities, as described below.

C. Architect

1. Construction Phase

a. Attend the commissioning scoping meeting and selected commissioning team meetings.
b. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.
c. Provide any design narrative documentation requested by the CxA.
d. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
e. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.

D. Mechanical and Electrical Designers/Engineers (of the A/E)

1. Construction Phase

a. Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. On-site observation should be completed just prior to system startup.
b. Provide any design narrative and sequences documentation requested by the CxA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
c. Attend commissioning scoping meetings and other selected commissioning team meetings.
d. Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.
e. Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
f. From the contractor's red-line drawings, edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as shop drawings for the systems identified in the commissioning scope of work.
g. Provide a presentation at one of the training sessions for the owner's personnel.
h. Review and approve the performance test procedure forms for major pieces of equipment for sufficiency prior to their use.
i. Witness testing of selected pieces of equipment and systems

2. Occupancy and Operations Phase

a. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning during warranty-period commissioning.

E. Commissioning Authority (CxA)

1. The CxA will verify the execution of commissioning process activities using 100 percent sampling. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When testing does not meet the requirements, the CxA will document the failure in the "Commissioning Issues Log."
2. Construction Phase

a. The CxA will work with the owner and CM to coordinate and direct the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
b. Coordinate the commissioning work with the CM and owner, and help integrate commissioning activities into the master schedule.
c. Update the Commissioning Plan as necessary.
d. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
e. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor startup and checkout procedures.
f. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
g. Review and approve normal contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
h. The CxA will provide the contractor with a list submittals which are to be included in the commissioning submittal review.
i. Write and distribute construction checklists. Prepare and maintain completed construction checklist log.
j. Develop an initial systems checkout plan with subcontractors.
k. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
l. Approve construction checklist completion by selected site observation and spot checking.
m. Recommend approval of systems startup by reviewing startup reports and by selected site observation.
n. Review the TAB execution plan.

o. Recommend approval of air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
p. With necessary assistance and review from installing contractors, write the performance test procedures for equipment and systems, including energy management control system trending, stand-alone data logger monitoring or manual performance testing.
q. Analyze any performance trend logs and monitoring data to verify performance.
r. Coordinate, witness, and recommend approval of manual performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved
s. Maintain a master Issues Log and a separate testing record. Provide the owner/ CM with written progress reports and test results with recommended actions.
t. Review equipment warranties to ensure that the owner's responsibilities are clearly defined.
u. Verify training is completed.
v. Compile and maintain a commissioning record and building systems book(s).
w. Review and approve the preparation of the O&M manuals, if required.
x. Provide a final commissioning report (as described in this section).
y. Participate in the development of a systems manual.

3. Occupancy and Operations Phase

a. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
b. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

F. Owner or Owner's Representative (CM)

1. Construction and Acceptance Phase

a. Provide the OPR documentation to the CxA and applicable contractors for information and use.
b. Provide the BOD documents, prepared by Architect and approved by owner, to the CxA and applicable contractors for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.
c. Facilitate the coordination of the commissioning work by the CxA, and, with the CM and CxA, ensure that commissioning activities are being scheduled into the master schedule.
d. Review and approve the final Commissioning Plan.
e. Attend a commissioning scoping meeting and other commissioning team meetings.

f. Review the contractor submittals.
g. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CxA.
h. Review and approve the performance test procedures submitted by the CxA, prior to testing.
i. When necessary, observe and witness startup and performance testing of selected equipment.
j. Review commissioning progress and deficiency reports.
k. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
l. Sign-off (final approval) on individual commissioning tests as completed and passing. Recommend completion of the commissioning process to the Project Manager.
m. Assist the CM in coordinating the training of owner personnel.
n. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

2. Occupancy and Operations Phase

a. Assist the CxA as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.

G. Owner's Project Manager (OPM)

1. Construction Phase

a. Manage the contract of the A/E and of the CM.
b. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions.
c. Provide final approval for the completion of the commissioning work.

2. Occupancy and Operations Phase

a. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

H. Contractor. Each contractor and their subcontractors and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Construction Phase

a. Facilitate the coordination of the commissioning and incorporate commissioning activities (the Commissioning Plan) into the Overall Project Schedule.
b. Provide detailed startup procedures
c. Include the cost of commissioning in the total contract price.

d. Ensure that all subcontractors and vendors execute their commissioning responsibilities according to the contract documents
e. Provide copies of all required submittals.
f. Attend and participate in commissioning team meetings, which will be coordinated with the construction meetings.
g. No later than 60 days prior to startup of the first piece of major equipment, meet with the CxA, CM, A/E, and CM and owner to finalize the detailed commissioning procedures/ schedule.
h. Provide the training of owner personnel.
i. Review and accept construction checklists provided by the commissioning authority.
j. Complete construction checklists as work is completed and provide completed documents to the CxA.
k. Approve that systems have been properly installed, tested, programmed and checked out and are ready for performance testing by the CxA.
l. Support CxA in executing commissioning process test procedures.
m. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
n. Cooperate with the CxA for resolution of issues recorded in the “Issues Log”.
o. Prepare O&M manuals, according to the contract documents, including clarifying and updating the original sequences of operation to as-built/as-tested conditions.
p. Provide redlines as necessary for any as-built changes.
q. Review and approve the construction checklists for major pieces of equipment for sufficiency prior to their use.
r. Execute commissioning checklists.
s. The contractors will provide all tools or the use of tools to start, check-out and test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CxA

2. Occupancy and Operations Phase

a. Ensure that subcontractors provide assistance for seasonal or deferred performance testing, performed by the CxA, according to the specifications.
b. Ensure that subcontractors correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.
c. Perform all guarantee work for materials furnished under the contract for the time specified in the contract, including all warranties and curing all latent defects within the time period provided in the contract.

I. Vendors/Subcontractors

1. Provide all requested submittal data, including detailed startup procedures and specific responsibilities of the owner to keep warranties in force.
2. Assist in equipment testing per agreements with subcontractors and/or contractor.

3. Include cost of all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing, operating, and maintaining equipment according to these contract documents in the base bid price to the contractor.
4. Analyze specified products and verify that the A/E has specified the newest, most current equipment reasonable for this project's scope and budget.
5. Provide requested information regarding equipment sequence of operation and testing procedures.
6. Review construction checklists and test procedures for equipment installed by factory representatives.

3.6 COMMISSIONING LEED REQUIREMENTS

A. This project is pursuing LEED certification. Commissioning activities that will support LEED requirements include:

1. Review of the owner project requirements and basis of design
2. Review of construction documents
3. Review applicable contractor submittals
4. Review owner training
5. Develop the systems manual
6. Conduct 10-month building performance review and seasonal testing

3.7 EQUIPMENT & SYSTEMS TO BE COMMISSIONED

A. The following equipment/systems will be commissioned in this project:

1. All Mechanical HVAC Systems, Equipment, Devices, and Components
2. Fans, pumps, controls, piping, valves, insulation, chemical treatment, air handlers, fan filter units, chillers, terminal boxes, converters, etc.
3. Lighting Controls
4. Control Systems, including Graphics, Displays, Trending & Alarming Equipment
5. Occupancy sensors, time clocks, daylight responsive lighting, digitally controlled lighting systems
6. Central Heating and Cooling Equipment
7. Electrical Power Distribution
8. Emergency Power System, including Automatic Transfer switches.
9. Renewable energy systems (if applicable)
10. Facility Exterior Envelope

3.8 MEETINGS

A. Initial Meeting. Within 90 days of the Notice to Proceed (NTP), the CxA, through the owner/CM, will schedule, plan and conduct an initial commissioning meeting. The contractor and its responsible parties are required to attend.

B. Subsequent Meetings. Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution, and planning issues.

3.9 STARTUP, CONSTRUCTION CHECKLISTS, AND INITIAL CHECKOUT

A. General. Construction checklists are important to verify that the equipment and systems are fully connected and operational. It ensures that performance testing (in-depth system checkout) may proceed without unnecessary delays. The construction checklists for a given system must be successfully completed and approved prior to startup and formal performance testing of equipment or subsystems of the given system. The contractors are responsible for non-compliance and failed performance tests as a result of inaccurate construction checklists.

B. Startup and Checkout Plan. The CxA will assist the project commissioning team members responsible for startup of any equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures has been completed. The CxA shall provide construction checklists and startup shall be identified in the commissioning scoping meeting and on the checklist forms.

C. The construction checklists are provided by the CxA. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.

D. The contractor shall determine which trade is responsible for executing and documenting each of the line item tasks and transmit the checklists to the responsible subcontractors. Each form may have more than one trade responsible for its execution.

E. The contractor/subcontractor responsible for the purchase of the equipment shall develop the full startup plan by combining the manufacturer's detailed startup and checkout procedures and the construction checklists.

F. The contractor will transmit the full startup plan to the subcontractors for their review and use.

G. Sensor and Actuator Calibration. All field-installed temperature, relative humidity, CO, CO2, refrigerant, O2, and/or pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated. Verify that all locations are appropriate and away from causes of erratic operation. All test instruments shall have had a certified calibration within the last 6 months to NIST traceable standards, and comply with all local, state and/or federal requirements/certifications, as required. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

H. Valve and Damper Stroke Setup and Check the Control System Readout- Verify 100% valve and damper operations. For all valve and damper actuator positions, verify the actual position against the Building Automation System (BAS) readout. Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command the valve or damper to a few intermediate

positions. If the actual valve or damper position doesn't reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Closure for heating coil valves (NO) - Set the heating setpoint 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set the heating setpoint to 20°F below room temperature. Observe the valve close. For pneumatics, by override in the BAS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

J. Closure for cooling coil valves (NC)- Set the cooling setpoint 20°F above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set the cooling setpoint to 20°F below room temperature. Observe valve open. For pneumatics, by override in the BAS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

3.10 EXECUTION OF CONSTRUCTION CHECKLISTS AND STARTUP.

A. The Contractor shall maintain an ongoing, current project schedule to provide a thirty (30) day look-ahead of key project milestones to all project team members, including the CxA.

B. At least (10) working days prior to the scheduled startup, the contractor shall coordinate startup and checkout with the CM, A/E, and CxA. The execution and approval of the construction checklists, startup, and checkout shall be directed and performed by the contractor, subcontractor or vendor. Signatures are required of the applicable subcontractors for verification of completion of their work.

C. The subcontractors and vendors shall execute startup and provide the CxA and A/E, through the owner/CM, with a signed and dated copy of the completed startup and construction checklists.

D. Only individuals of the contractor (technicians, engineers, tradesmen, vendors, etc.) who have direct knowledge and witnessed that a line item task on the construction checklist was actually performed shall check off that item. It is not acceptable for witnessing supervisors to fill out these forms.

E. Construction checklists must be completed, signed and dated prior to the CxA commencing functional testing.

3.11 DEFICIENCIES, NON-CONFORMANCE AND APPROVAL IN CHECKLISTS AND STARTUP (MASTER ISSUES LOG).

A. The contractor shall ensure that the subcontractors clearly list any outstanding items of the initial startup and construction checklist procedures that were not completed successfully, on an attached sheet. The form and any outstanding deficiencies shall be provided, through the owner/CM, to the CxA within two days of test completion.

B. The CxA will review the report and issue either a non-compliance report or an approval form, through the CM, to the contractor. The installing subcontractors or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, shall notify the owner/CM as soon as outstanding items have been corrected, and resubmit an updated startup report with a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CxA will recommend approval of the execution of the checklists and startup of each system.

C. Items left incomplete, which later cause deficiencies or delays during performance may result in backcharges to the contractor.

3.12 SUBMITTALS

A. The CxA will provide appropriate contractors with a specific request for the types of submittal documentation the CxA requires for the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed startup procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the commissioning authority. All documentation requested by the CxA will be included by the subcontractors in their O&M manual contributions.

B. The CxA will review submittals related to the commissioned equipment for conformance to the contract documents as it relates to the commissioning process, to the performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of performance procedures and only secondarily to verify compliance with equipment specifications. The commissioning authority will notify the owner/CM, PM or A/E as requested, of items missing or areas that are not in conformance with contract documents and which require resubmission.

C. The CxA may request additional design narrative from the A/E and controls contractor, depending on the completeness of the OPR documentation and sequences provided with the specifications.

D. These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the contractor, though the CxA will review and approve them.

3.13 PHASED COMMISSIONING (IF REQUIRED)

A. If the project requires TAB, startup and performance testing to be executed in phases. Phasing shall be coordinated with the owner/CM, CxA, and A/E and be reflected in the overall project schedule and commissioning schedule by the contractor. Final performance testing of all systems will be as required by the phasing plan. The performance testing of the "systems as a whole" will be performed before final turnover of the entire project.

3.14 PERFORMANCE TESTING

A. Requirements. The performance testing shall demonstrate that each system is operating according to the documented design intent and contract documents. Performance testing facilitates bringing the systems from a state of individual substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems. Performance testing only commences after the contractors have declared the systems and sequence of operations have been started, programmed, tested and checked out. Signing of the construction checklist is the declaration that the systems are ready for performance testing by the CxA.

B. Coordination and Scheduling. The contractor shall provide sufficient notice, regarding their completion schedule for the construction checklists and startup of all equipment and systems to allow the performance testing to be scheduled. The commissioning team shall oversee, witness, and document the performance all equipment and systems. The CxA in association with the contractor/subcontractors and facility staff shall execute the tests. Performance testing shall be conducted after the construction checklists, and startup has been satisfactorily completed. The control system shall be sufficiently tested and approved by the CxA before it is used, to verify performance of other components or systems. The air balancing and water balancing shall be completed before performance testing of air or water-related equipment or systems. Testing proceeds from components to sub-systems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems shall be checked.

C. Development of Test Procedures. Before test procedures are finalized, the contractor shall provide to the A/E and the CxA all requested documentation and a current list of changes affecting equipment or systems, including an updated points list, program code, control sequences, and testing parameters. Using the testing parameters and requirements in the technical specifications, the CxA shall update/develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each contractor/subcontractor or vendor, as appropriate, shall provide assistance to the CxA in developing the final procedures. Prior to finalization, the A/E shall review and concur with the test procedure.

3.15 TEST METHODS.

A. Performance testing and verification may be achieved by manual testing or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The CxA may substitute specified methods or require an additional method to be executed other than what was specified, with the approval of the A/E and owner/CM. The CxA will determine which method is most appropriate for tests that do not have a specified method.

B. Simulated Conditions. Simulating conditions shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.

C. Overridden Values. Overriding sensor values to simulate a condition, such as overriding the outside air temperature reading in a control system to be something other than it really is, is acceptable.

D. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overridden values.

E. Altering Setpoints. Rather than overriding sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable.

F. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the test parameters, that the indirect readings through the control system represent actual conditions and responses.

G. Setup. Each performance test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The contractor/subcontractor(s) assisting the CxA in executing the test shall provide all necessary materials, system modifications, etc., to produce the necessary flows, pressures, temperatures, etc., necessary to execute the test according to the specified conditions. At completion of the test, the contractor/subcontractor(s) shall return all affected equipment and systems to their approved operating settings.

H. Test Equipment. Refer to Part 2 for test equipment requirements.

I. Problem Solving. The burden of responsibility to solve, correct, and retest malfunctions/failures is with the contractor, with A/E approval as required.

3.16 DOCUMENTATION AND APPROVAL OF PERFORMANCE TESTS

A. Documentation. The CxA shall witness and verify/pre-approve the documentation of the results of all performance tests. The CxA shall complete all documentation for performance testing.

B. Non-Conformance.

1. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form or on an attached sheet.
2. As tests progress and deficiencies are identified, the CxA shall discuss the issue with the commissioning team, and the contractor.
3. When there is no dispute on the deficiency and the contractor accepts responsibility to correct it.
4. The CxA will document the deficiency and the contractor's response and intentions. After the day's work, the CxA will submit the non-compliance reports to the CM. The contractor corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CxA.

5. If the failure rate of a similar family of equipment or devices is greater than 10%, then the owner shall be notified. The matter shall be addressed by the owner, CM, CxA, and other applicable parties. The failure issue shall be resolved to the owner's satisfaction.
6. The contractor shall reschedule the test; and the test repeated.
7. If there is a dispute about a deficiency, regarding whether or not it is a deficiency:

    a. The dispute shall be documented on the non-compliance form with the contractor's response.
    b. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the construction manager.
    c. The CxA documents the resolution process.
    d. Once the interpretation and resolution have been decided, the contractor corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CxA, through the CM. The contractor shall reschedule the test and the test repeated until satisfactory performance is achieved.

8. Cost of retesting a performance test is the contractor's.
9. The contractor shall submit in writing to the CM at least as often as commissioning meetings are being scheduled, the status of each outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreement and proposals for their resolutions.
10. The CxA retains the original non-conformance forms until the end of the project.
11. Retesting shall not be considered a justified reason for a claim of delay or for a time extension by the contractor.

C. Failure Due to Manufacturer Defect.

1. The majority of manufacture defects are expected to be identified by the contractor during start-up and checkout. If 10% (or three, whichever is greater) of identical pieces of equipment fail to perform to the contract documents (mechanically or substantively) due to a manufacturing defect, not allowing it to meet its submitted performance specification, all identical units may be considered unacceptable by the A/E or CxA. In such case, the contractor shall provide the owner with the following:
2. Within one week of notification from the owner/CM, the contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CM within two weeks of the original notice.
3. Within two weeks of the original notification, the contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc., and all proposed solutions. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
4. The A/E will determine whether a replacement of all identical units or a repair is acceptable.
5. Two examples, where applicable, of the proposed solution shall be installed by the contractor and the A/E shall be allowed to test the installations for up to one week, upon which the A/E will decide whether to accept the solution.

6. Upon acceptance, the contractor and/or manufacturer shall replace or repair all identical items, at their expense. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
7. Approval. The CxA notes each satisfactorily demonstrated function on the test form. Final approval of the performance test by the owner is made after review by the CxA and CM, following recommendations by the A/E.

3.17 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the project completion level, required occupancy condition or other deficiency, execution of checklists and performance testing may be delayed upon approval of the CxA and CM. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of the required parties will be negotiated with the owner's approval.

B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity through the owner/CM. Tests will be executed, documented by the CxA and deficiencies should be corrected by the appropriate contractor/ subcontractors with the CxA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing shall be made by the contractor.

3.18 TRAINING OF OWNER PERSONNEL

A. The contractor shall provide training coordination, scheduling of subcontractors, and ensure that training is completed. All training shall be coordinated, through the CM, with the CxA witnessing activities.

B. The contractor shall ensure that each subcontractor and vendor shall have the following responsibilities:

1. Contractors shall provide through the CM, a training plan sixty days before the planned training covering the following elements:

a. Equipment

1) Intended audience
2) Location of training
3) Objectives
4) Subjects covered (description, duration of discussion, special methods, etc.)
5) Duration of training on each subject
6) Instructor for each subject
7) Methods (classroom lecture, manufacturer's quality video, site walk-through, actual operational demonstrations, written handouts, etc.).

b. Provide designated owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment that makes up the system.
c. Training shall normally start with classroom sessions followed by hands-on demonstration/training on each piece of equipment.
d. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated at another scheduled time, if necessary.
e. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.
f. The controls contractor shall attend sessions other than the controls training, as specified, to discuss the interaction of the controls system as it relates to the equipment being discussed.
g. The training sessions shall follow the outline in the table of contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

2. Training shall include:

a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include startup, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.
c. Discussion of relevant health and safety issues and concerns.
d. Discussion of warranties and guarantees.
e. Common troubleshooting problems and solutions.
f. Explanatory information included in the O&M manuals.
g. Discussion of any peculiarities of equipment installation or operation.
h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.
i. Hands-on training shall include startup, operation in all modes possible, including manual, shut-down, alarms, power failure and any emergency procedures, and preventative maintenance for all pieces of equipment.

3. The contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls not controlled by the central control system.
4. At the discretion of the CxA, training may occur before performance testing is complete if required by the facility operators to assist the CxA in the performance testing.
5. If the owner requires videotaping of the training sessions, to be provided by the contractor and added to the O&M manuals. In addition, factory training videos

identifying key troubleshooting, repair, service and/or replacement techniques shall be provided and reviewed with the owner.

3.19 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. The commissioning process requires detailed O&M documentation as identified in this section and technical specifications.

B. Contractor shall submit two draft copies of the complete operating and maintenance manual to the CM for review by the architect/engineer and CxA within 60 calendar days after review of equipment shop drawings. One copy will be returned to the contractor within 30 days after receipt by the A/E.

C. Contractor shall submit corrected final approved manuals prior to substantial completion. Prior to final submittal, the CxA shall review the O&M manuals (in addition to the initial draft O&M manual), and documentation, with redline as-builts, for systems that were commissioned to verify compliance with the specifications. The CxA will communicate, through the CM, deficiencies in the manuals to the contractor or A/E, as requested. Upon a successful review of the corrections, the CxA will recommend approval and acceptance of these sections of the O&M manuals to the CM. The CxA will also review each equipment warranty and verify that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.

D. The contractor shall compile O&M manuals for every piece of equipment and building operating or electrical system being commissioned in accordance with the project general requirements.

E. Commissioning Record.

1. The CxA shall provide the owner with a Final Commissioning Report in both hard-copy and electronic format.

END OF SECTION 019110

SECTION 019115 – FACILITY EXTERIOR ENVELOPE COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1. SUMMARY

A. Related Sections

In addition to the drawings and general provisions of the contract, commissioning requirements are defined in the following sections:

1. Section 01 9110 – General Commissioning Requirements
2. Section 01 9115 – Facility Exterior Envelope Commissioning Requirements
3. Section 22 0800 – Plumbing System Commissioning Requirements
4. Section 23 0800 – HVAC System Commissioning Requirements
5. Section 23 0910 – Building Control System Commissioning Requirements
6. Section 26 0800 – Electrical System Commissioning Requirements

B. This Section includes exterior envelope commissioning procedures, including substructure, superstructure, exterior envelope, and roofing construction that protects climate-controlled interior spaces from unconditioned spaces and the exterior environment, as follows:

1. Below-grade construction including foundations, basements, and slab-on-grade that functions as part of the exterior envelope system but excluding structural systems and components.
2. Superstructure floor and roof construction that functions as part of the exterior envelope system.
3. Exterior envelope construction, above grade, including exterior opaque walls, windows, and doors including sheathing, framing, and insulation, and interior finish materials attached to the exterior wall.
4. Roofing, including roofing system, roofing insulation, and skylights, hatches, and other roof openings.

C. Related Sections:

1. Division 01 Section "General Commissioning Requirements" for general requirements for commissioning including definitions, commissioning team membership, Owner’s responsibilities, Contractor’s responsibilities, and Commissioning Authority’s responsibilities.
2. Division 03 through 14 Sections for facility exterior envelope commissioning requirements specific to the Work of each Section.

2. CONTRACTOR'S RESPONSIBILITIES

A. Attend construction-phase coordination meetings.

B. Provide schedule of field quality control tests and inspections required by the

Contract Documents to Commissioning Authority.

1. Update schedule as required throughout the construction period.

C. Submit field quality control testing and inspection reports on exterior envelope construction to the Commissioning Authority.

D. Submit operation and maintenance data for systems, subsystems, and components to the Commissioning Authority.

E. Participate in testing-procedures meetings.

F. Participate in testing of installed systems, subsystems, and construction.

G. Provide test data, inspection reports, and certificates to Commissioning Authority.

H. Participate in maintenance orientation and inspection.

I. Participate in operation and maintenance training sessions.

J. Participate in final review at acceptance meeting.

K. Provide input for final commissioning documentation.

3. COMMISSIONING AUTHORITY'S RESPONSIBILITIES

A. Provide Project-specific construction checklists and commissioning process test procedures.

B. Witness systems, assemblies, equipment, and component startup.

C. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning process report.

4. COMMISSIONING DOCUMENTATION

A. Provide the following information to Commissioning Authority for inclusion in the Commissioning Record:

1. Submittals, information for systems manuals, and other required documents and reports.
2. Identification of installed exterior envelope components, assemblies, systems, and equipment, including design changes that occurred during the construction phase.
3. Certificate of completion, certifying that exterior envelope assemblies, systems, equipment, and associated controls are complete and ready for testing.
4. Test and inspection reports and certificates.
5. Corrective action documents.

5. PRECONSTRUCTION TESTING

A. Preconstruction Mockup Testing: Refer to requirements in the individual specification sections in Divisions 3 through 9.

6. COMMISSIONING SUBMITTALS

A. Submit commissioning submittals to Commissioning Authority. Submittals requiring Architect's action will be returned to by Construction Manager, through Architect.

7. QUALITY ASSURANCE

A. Quality Assurance and Control: Specific commissioning quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Specified commissioning tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

B. Preconstruction Commissioning Conference: Commissioning Authority will schedule a preconstruction commissioning conference before construction of the exterior envelope starts, at a time convenient to Owner**,** Construction Manager**,** Subcontractors, and Architect. Allow for the conference to be held at the Project site. The Commissioning Authority will conduct the meeting to review commissioning responsibilities and personnel assignments.

1. Refer to Section 019110 General Commissioning Requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 VERIFICATION

A. Certify that building exterior envelope systems, subsystems, and construction have been completed according to the Contract Documents.

B. Commissioning Authority will witness selected field quality-control tests and inspections performed by the Contractor.

1. Verify that field quality-control testing of building exterior envelope has been completed and approved, that discrepancies have been corrected, and corrective work approved.

C. Annotate checklist or data sheet when a deficiency is observed.

D. Deferred Testing:

1. If tests cannot be completed because of a deficiency outside the scope of the Building Exterior Envelope, the deficiency shall be documented and reported to Owner. Deficiencies shall be resolved and corrected by Contractor and tests rescheduled.
2. If the testing plan indicates specific seasonal testing, appropriate initial performance

tests shall be completed and documented and additional tests scheduled.

E. ALTERNATE: Building Envelope Air Leakage Testing

1. Conduct an Orifice Blower Door Test, utilizing an independent, third party testing firm certified by the NEBB, or an approved equivalent, in accordance with:
   a. ASTM E1827 *Standard Test Methods for Determining Air Tightness of a Building Using an Orifice Blower Door* including all referenced test standards as applicable.
2. Submit a written Test Plan for review and approval prior to execution of the test.
3. Attend a pre-test execution planning meeting with the Owner**,** Construction Manager**,** Subcontractors, and Architect.
4. Furnish a written Test Report in accordance with requirements of this specification.
5. Test Acceptance Criteria: The air leakage rate of the completed building envelope shall not exceed 0.40 cfm/ft^2 at a pressure differential of 0.3 inches water gauge (2.0 L/s • m^2 at 75 Pa) in accordance with ASTM E 779.
   a. If the building envelope fails to meet the Test Acceptance Criteria, the test shall be repeated, after all deficiencies have been corrected, until the Test Acceptance Criteria have been met. Any repeat tests shall be performed at the expense of the Contractor.

F. Test Reports:

1. Reports shall include measured data, data sheets, and a comprehensive summary describing the building exterior envelope systems at the time of testing.
2. Prepare a preliminary test report and submit for review. Deficiencies will be evaluated by Architect to determine corrective action. Deficiencies shall be corrected and test repeated.
3. Prepare a final test report and submit for review and approval.

END OF SECTION 019119

SECTION 030000 - CONCRETE

PART 1 - GENERAL

1.1 Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specification.

1.2 Sustainable Design Intent: comply with project requirements intended to achieve sustainable design, measured and documented according to the CT high Performance Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED scorecard. Attempt to specify products in each specification section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.3 SECTION INCLUDES

A. Cast-in-place concrete foundation walls and footings.

B. Floors and slabs on grade.

C. Control, expansion and contraction joint devices associated with concrete work.

1.4 REFERENCES

D. ACI 301 - Structural Concrete for Buildings.

E. ACI 302 - Guide for Concrete Floor and Slab Construction.

C. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

D. ACI 305R - Hot Weather Concreting.

E. ACI 306R - Cold Weather Concreting.

F. ACI 308 - Standard Practice for Curing Concrete.

G. ACI 318 - Building Code Requirements for Reinforced Concrete.

H. ANSI/ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type).

I. ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

J. ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

K. ASTM C33 - Concrete Aggregates.

L. ASTM C94 - Ready-Mixed Concrete.

M. ASTM C150 - Portland Cement.

N. ASTM C260 - Air Entraining Admixtures for Concrete.

O. ASTM C330 - Light Weight Aggregates For Structural Concrete.

P. ASTM C494 - Chemicals Admixtures for Concrete.

Q. ASTM C618 - Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

1.5 SUBMITTALS

A. Submit under provisions of Section 013300.

A. Product Data: Provide data on joint devices, attachment accessories and admixtures.

B. Samples: Submit two inch long samples of expansion/contraction joint and control joint.

C. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent Work.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Maintain one copy of each document on site.

C. Acquire cement and aggregate from same source for all work.

D. Conform to ACI 305R when concreting during hot weather.

E. Conform to ACI 306R when concreting during cold weather.

1.7 COORDINATION

F. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal, Type IA - Air Entraining.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Chemical: ASTM C494 Type A - Water Reducing.
ASTM C494 Type B – Retarding.
ASTM C494 Type C – Accelerating.
ASTM C494 Type D - Water Reducing and Retarding.
ASTM C494 Type E - Water Reducing and Accelerating.
ASTM C494Type F - Water Reducing, High Range.
ASTM 494 C Type G - Water Reducing, High Range and Retarding.

2.3 ACCESSORIES

A. Bonding Agent: Non-solvent two component polysulfide epoxy.

B. Vapor Barrier: 10 mil thick clear polyethylene film, type recommended for below grade application.

C. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

D. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber water stops for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricated corners, intersections, and directional changes.
1. Profile: Ribbed without center bulb.
2. Dimensions: 6 inches by 3/16 inch thick (150 mm by 4.75 mm thick); non-tapered.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler ASTM D1751; Asphalt impregnated fiberboard or felt, 1/4 inch thick; tongue and groove profile.

B. Construction Joint Devices: Integral formed to tongue and groove profile.

C. Expansion and Contraction Joint Devices: ASTM B221.

2.5 CONCRETE MIX

A. Mix concrete in accordance with ACI 304. Deliver concrete in accordance with ASTM C94.

B. Select proportions for normal weight concrete in accordance with ACI 301.

C. Select aggregate proportions for light weight concrete in accordance with ACI 301[ACI 318].

D. Provide concrete to the following criteria:
Unit Measurement
Compressive Strength (28 day) - 4,000 psi
Water/Cement Ratio (maximum) - 0.42 by weight
Aggregate Size (maximum) - 3/4 inch
Air Entrained - 6 (max) percent
Slump - Plus or minus 1 inch 4 inches

E. Use accelerating admixtures in cold weather only when approved by Engineer. Use of admixtures will not relax cold weather placement requirements.

F. Use calcium chloride not allowed.

G. Use set retarding admixtures during hot weather only when approved by Engineer.

H. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

I. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1.2 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

B. In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 304.

B. Notify Engineer minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

D. Install vapor barrier under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by taping edges and ends.

E. Repair vapor barrier damaged during placement of concrete reinforcing. Repair with vapor barrier material; lap over damaged areas minimum 6 inches and seal watertight.

F. Separate slabs on grade from vertical surfaces with 1/4 inch thick joint filler.

G. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

H. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface.

I. Install joint devices in accordance with manufacturer's instructions.

J. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

K. Install joint device anchors. Maintain correct position to allow joint cover to be flush with floor finish.

L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

M. Place concrete continuously between predetermined expansion, control, and construction joints.

N. Do not interrupt successive placement; do not permit cold joints to occur.

O. Place floor slabs in saw cut pattern indicated.

P. Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

Q. Screed floors and slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

3.4 CONCRETE FINISHING

A. Provide formed concrete surfaces to be left exposed with smooth rubbed finish.

B. Finish concrete floor surfaces in accordance with ACI 301.

C. Wood-float surfaces which will receive ceramic tile with full bed setting system.

D. Steel trowel surfaces which will receive carpeting, resilient flooring.

E. Steel trowel surfaces which are scheduled to be exposed.

F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1/8 inch per foot nominal as indicated on drawings.

3.5 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure floor surfaces in accordance with ACI 308.

3.6 FIELD QUALITY CONTROL

R. Field inspection and testing will be performed under provisions of Division 1.

S. Project is subject to "Special Inspections" under provisions of the State of Connecticut Building Code. Selection of the Special Inspector and Independent Testing Laboratory shall be made by Owner.

T. Inspections and tests are to be performed in accordance with methods and procedures of referenced standards and as specified below.

U. Defects found in materials and workmanship not in conformance with Contract Documents will be cause for rejection and replacement of work at no additional cost to Owner. Contractor shall bear costs of additional testing and inspection services caused by failure of Contractor to provide materials and workmanship in conformance with requirements.

V. Special Inspections to be performed by Special Inspector and Testing Laboratory shall include:
   1. Special Inspector shall review all proposed mix designs of each class of concrete for specification compliance.
   2. Testing Laboratory shall obtain three concrete test cylinders for every 50 or less cu yds of each class of concrete placed per day. Testing Laboratory shall perform standard cylinder compression tests (ASTM C39), 1@7 days, 2@28 days. Review transit mix delivery ticket ensure concrete delivered is in conformance for type concrete to be placed.
   3. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.
   4. One slump test will be taken for each set of test cylinders taken. Slumps shall be taken before and after addition field added admixtures. Record any addition of field added materials. Concrete for slump tests is to be taken directly from the transit truck and, additionally, from pump discharge (if used).
   5. Record entrained air for each set of test cylinders for all concrete whether air entrainment is specified or not.
   6. Record air temperature and concrete temperature for each set of test cylinders taken.
   7. Record the location and type concrete for each set of cylinders taken.
   8. Testing Laboratory shall provide field inspection of concrete mixing and placing procedures for 100% of each type concrete placed for conformance with specifications and ACI reference standards.

W. Concrete failing to meet required specifications will be remedied by Contractor at no additional expense to Owner in the following order of precedence subject to approval by Architect/Engineer:
   1. Testing of hardened concrete in accordance with ASTM C42.
   2. Load tests in accordance with the requirements of ACI 318.
   3. Reinforcing and strengthening.
   4. Removal and replacement.

X. Contractor responsibilities shall include:
   1. Provide ready access to the Work for Special Inspector and Testing Laboratory personnel and equipment. Make arrangements for fabrication plant inspections.

2. Furnishing Special Inspector and Testing Laboratory copies of approved shop drawings and submittals.
3. Provide specified test sample items/materials to Testing Laboratory in quantities specified by Engineer.
4. Provide labor and assistance for site storage and weather protection of samples and to transfer samples to Testing Laboratory vehicles.
5. Notify Special Inspector and Testing Laboratory not less than 24 hours in advance of construction operations requiring inspection or obtaining of samples.

3.7 PATCHING

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.

C. Patch imperfections in accordance with ACI 301.

3.8 DEFECTIVE CONCRETE

Y. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

Z. Repair or replacement of defective concrete will be determined by the Architect/Engineer.

END OF SECTION

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units.
2. Face brick.
3. Building (common) brick.
4. Mortar and grout.
5. Reinforcing steel.
6. Masonry joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.
10. Cavity-wall insulation.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section “Quality Control” for additional requirements related to mockup.
4. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
5. Division 03 Section “Cast in Place Concrete”.
6. Division 05 Section “Structural Steel Framing”.
7. Division 07 Section “Modified Bituminous Sheet Air Barriers”.
8. Division 07 Section "Fluid Applied Membrane Air Barriers".
9. Division 07 Section “Thermal Insulation”.
10. Division 07 Section "Sheet Metal Flashing and Trim".

11. Division 07 Section "Penetration Firestopping".
12. Division 07 Section “Joint Sealants”.
13. Division 08 Section “Hollow Metal Doors and Frames”.
14. Division 08 Section “Access Doors and Frames“.
15. Division 08 Section "Louvers and Vents".

D. Products furnished, but not installed, under this Section include the following:

1. Dovetail slots for masonry anchors, installed under Division 3 Section "Cast in Place Concrete."
2. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel Framing."

E. Products installed, but not furnished, under this Section include the following:

1. Steel lintels and shelf angles for unit masonry.
2. Hollow-metal frames in unit masonry openings.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit (s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.

B. Determine net-area compressive strength (f'_m) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

C. Determine net-area compressive strength (f'_m) of masonry by testing masonry prisms according to ASTM C 1314.

1.5 LEED SUBMITTALS

A. MRc4: “Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: “Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include

statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

D. IEQc4.2: "Manufacturer's product data for paints and coatings, including printed statement of VOC content."

1.6 SUBMITTALS

A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection: For the following:

1. Colored mortar Samples showing the full range of colors available.

D. Samples for Verification: For the following:

1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
2. Colored mortar Samples for each color required, showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
3. Weep holes/vents in color to match mortar color.
4. Accessories embedded in the masonry.

E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents, unless such deviations are specifically brought to the attention of the Architect and approved in writing.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

G. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units.

   a. Include material test reports substantiating compliance with requirements.
   b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.
   c. For exposed brick, include material test report for efflorescence according to ASTM C 67.
   d. For masonry units include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

H. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

I. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

J. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Preconstruction Testing Service: Engage a qualified independent testing agency to perform the following preconstruction testing:

1. Clay Masonry Unit Test: For each clay masonry unit indicated, per ASTM C 67.
2. Concrete Masonry Unit Test: For each concrete masonry unit indicated, per ASTM C 140.
3. Prism Test: For each type of wall construction indicated, per ASTM C 1314.
4. Mortar Test: For mortar properties per ASTM C 270.
5. Grout Test: For compressive strength per ASTM C 1019.

E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

F. Sample Panels: Before installing unit masonry, build sample panels, using materials indicated for the completed Work, to verify selections made under sample Submittals and to demonstrate aesthetic effects. Build sample panels for each type of exposed unit masonry assembly in sizes approximately 48 inches long by 48 inches high by full thickness.

1. Locate panels in the locations indicated or, if not indicated, as directed by Architect.
2. Clean exposed faces of panels with masonry cleaner indicated.
3. Protect approved sample panels from the elements with weather-resistant membrane.
4. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

    a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels, unless such deviations are specifically approved by Architect in writing.

6. Demolish and remove sample panels when directed.

G. Mockups: Before installing unit masonry, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Locate mockups in the locations indicated or, if not indicated, as directed by Architect.
2. Build mockups for the exterior cavity wall approximately 60 inches long by 60 inches high by full thickness, including face and backup withes, air barriers, cavity wall insulation, and accessories. Include the following:

    a. A sealant-filled joint at least 16 inches long in each mockup.
    b. Lower corner of window opening with window corner frame.
    c. Flashing installed at perimeter of window opening.
    d. Flashing installed full length at bottom with a 12-inch length of flashing left exposed to view (omit masonry above 12 " length of flashing).

3. Clean exposed faces of mockups with masonry cleaner as indicated.
4. Notify Architect seven days in advance of dates and times when mockups will be constructed.
5. Protect accepted mockups from the elements with weather-resistant membrane.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

    a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.

8. Demolish and remove mockups when directed.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

    1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 and the Connecticut State Building Code.

1. The following cold weather procedures shall be implemented when either the ambient temperature falls below 40 degrees F, or the temperature of masonry units is below 40 degrees F:

a. Temperatures of masonry units shall not be less than 20 degrees F when laid in the masonry. Visible ice on masonry units shall be removed before the unit is laid in the masonry.

b. Mortar sand or mixing water shall be heated to produce mortar temperatures between 40 degrees F and 120 degrees F at the time of mixing. Mortar shall be maintained above freezing until used in masonry.

c. Heat sources shall be used where ambient temperatures are between 20 degrees F and 25 degrees F on both sides of the masonry under construction and wind breaks shall be installed when wind velocity is in excess of 15 mph.

d. Where ambient temperatures are below 20 degrees F, an enclosure for the masonry under construction shall be provided and heat sources shall be used to maintain temperatures above 32 degrees F within the enclosure.

e. Where mean daily temperatures are between 32 degrees F and 40 degrees F, completed masonry shall be protected from rain or snow by covering with a weather resistant membrane for 24 hours after construction.

f. Where mean daily temperatures are between 25 degrees F and 32 degrees F, completed masonry shall be completely covered with a weather resistant membrane for 24 hours after construction.

g. Where mean daily temperatures are between 20 degrees F and 25 degrees F, completed masonry shall be completely covered with insulating blankets or equal protection for 24 hours after construction.

h. Where mean daily temperatures are below 20 degrees F, masonry temperature shall be maintained above 32 degrees F for 24 hours after construction by enclosure with supplementary heat, by electric heating blankets, by infrared heat lamps or by other approved methods.

2. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.

1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

F. Wetting of Brick: Brick at the time of laying shall require wetting if the unit's initial rate of water absorption exceeds 30 grams per 30 square inches per minute or 0.035 ounces per square inch, as determined by ASTM C67.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. General: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
2. Provide squared-edge units for outside corners, unless otherwise indicated.

C. Concrete Masonry Units: ASTM C 90 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Weight Classification: Normal weight.
3. Provide Type I, moisture-controlled units.
4. Size (Width): Manufactured to the following dimensions:

a. 4 inches nominal; 3-5/8 inches actual.
b. 6 inches nominal; 5-5/8 inches actual.
c. 8 inches nominal; 7-5/8 inches actual.
d. 10 inches nominal; 9-5/8 inches actual.
e. 12 inches nominal; 11-5/8 inches actual.

5. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

a. Where units are to be left exposed, provide color and texture matching the range represented by Architect's sample.

2.3 M ASONRY LINTELS

A. General: Provide the following:

B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 BRICK

A. Regional Materials: Brick shall be manufactured within 500 miles of Project site from aggregates that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. General: Provide shapes indicated and as follows for each form of brick required:

1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.

C. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.

1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

D. Face Brick: ASTM C 216, Grade SW, Type FBS, and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi.
2. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
3. Size: Manufactured to the following actual dimensions:

   a. Modular: 3-1/2 to 3-5/8 inches wide by 2-1/4 inches high by 7-1/2 to 7-5/8 inches long.

4. Application: Use where brick is exposed, unless otherwise indicated.
5. Products: Subject to compliance with requirements, provide one of the following:

   a. Bowerston Shale Company, Irish Gold, Modular.
   b. Glen-Gery Brick, Molded Series, 53-DD Spec Sand, Modular.
   c. Watsontown Brick Company, Atlantic Series, Burtonfield (M), Type 2 Modular.

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207], Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.

D. M ortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.

E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

1. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

F. Aggregate for Grout: ASTM C 404.

G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.

I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

J. Water: Potable.

K. Products: Subject to compliance with requirements, provide one of the following:

1. Mortar Pigments:

a. True Tone Mortar Colors; Davis Colors.
b. Bayferrox Iron Oxide Pigments; Lanxess Corporation.
c. Centurion Pigments; Lafarge Corporation.
d. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.

2. Cold-Weather Admixture:

a. Accelguard 80; Euclid Chemical Co.

b. Morseled; W. R. Grace & Co., Construction Products Division.
c. Trimix-NCA; Sonneborn, Div. of ChemRex, Inc.

3. Water-Repellent Admixture:

a. Mortar Tite; Addiment Inc.
b. Dry-Block Mortar Admixture; W. R. Grace & Co., Construction Products Division.
c. Rheopel; Master Builders.

2.6 REINFORCING STEEL

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60.

B. Epoxy-Coated Reinforcing Steel: ASTM A 615/A 615M, Grade 60; epoxy coated to comply with ASTM A 775/A 775M.

2.7 MASONRY JOINT REINFORCEMENT

A. General: ASTM A 951 and as follows:

1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
2. Wire Size for Side Rods: W2.8 or 0.188-inch diameter.
3. Wire Size for Cross Rods: W2.8 or 0.188-inch diameter.
4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.

B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches o.c.

C. For multiwythe masonry, provide types as follows:

1. Ladder type with perpendicular cross rods spaced not more than 16 inches o.c. and 1 side rod for each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod for each wythe of masonry 4 inches or less in width.

2. Adjustable (2-piece) type, ladder design, with one side rod at each face shell of backing wythe, cross ties spaced not more than 16 inches o.c., and with separate adjustable veneer ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face

a. Use where horizontal joints of facing wythe do not align with those of backup wythe.
b. Use where facing wythe is of different material than backup wythe.

2.8 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.

B. RECYCLED CONTENT

1. LMF Criteria:: Ties and Anchors shall contain a minimum of 60% recycled content by weight, calculated by adding the post-consumer recycled content percentage to one-half of the pre-consumer recycled content percentage.

C. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.

D. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.

E. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.9 BENT WIRE TIES

A. General: Rectangular units with closed ends and not less than 4 inches wide. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.

1. Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face.
2. Where coursing between wythes does not align, use adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches.
3. Where wythes are of different materials, use adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches.

B. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.

2.10 ADJUSTABLE ANCHORS FOR CONNECTING TO STEEL FRAME

A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire anchor section for welding to steel.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.1875-inch- diameter, hot-dip galvanized steel wire.

2.11 ANCHORS FOR CONNECTING TO CONCRETE

A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section: Dovetail anchor section formed from 0.0966-inch- thick, steel sheet, galvanized after fabrication.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.1875-inch- diameter, hot-dip galvanized steel wire.

2.12 RIGID ANCHORS

A. General: Fabricate from steel bars as follows:

1. 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.
2. As indicated.
3. Finish: Hot-dip galvanized to comply with ASTM A 153.

2.13 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.

B. Dovetail Slots: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.0336-inch, galvanized steel sheet.

C. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:

1. Headed bolts.
2. Nonheaded bolts, bent in manner indicated.

D. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Type: Chemical anchors.
2. Type: Expansion anchors.
3. Type: Undercut anchors.
4. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
5. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.
6. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
7. For Postinstalled Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

2.14 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

B. Flexible Flashing:

1. Copper-Laminated Flashing: Manufacturer's standard laminated flashing consisting of 7-oz./sq. ft. sheet copper bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

   a. Available Products:

      1) Advanced Building Products Inc.; Copper Sealtite 2000.
      2) Hoffmann & Barnard, Inc. Sandell Moisture Protection Systems: Copper-Tuff.
      3) York Manufacturing, Inc.; York Multi-Flash 500.

C. Application: Unless otherwise indicated provide the following:

1. Where flashing receives counterflashing: Use metal Flashing.
2. Where flashing is partly exposed to the exterior: Use metal flashing.
3. Where flashing terminates at the face of wall: Use flexible flashing with a metal drip edge.
4. Where flashing is fully concealed: Use flexible flashing.

D. Solder and Sealants for Sheet Metal Flashings:

1. Elastomeric Sealant: ASTM C 920, chemically curing sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.

F. Termination Bar for Flashings: Minimum 1” wide, .075” thick stainless steel, pre-punched 8” o.c.

2.15 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
2. PVC: ASTM D 2287, Type PVC-65406.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Mortar Net Weep Vents: 2 ½" x 4" x .5" polyester mesh, by Sandell Manufacturing Company Inc. or equal.

E. Cavity Drainage Material: 2-inch- thick x 10" high, free-draining mesh; made from polyethylene strands and shaped to avoid being clogged by mortar droppings.

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.187-inch steel wire, hot-dip galvanized after fabrication.

1. Provide units with either two loops or four loops as needed for number of bars indicated.

G. Products: Subject to compliance with requirements, provide one of the following:

1. Cavity Drainage Material:

a. Hohmann & Barnard; Mortar Trap.
b. Mortar Break II; Advanced Building Products, Inc.
c. Wall Defender; Mortar Net Solutions.

2. Reinforcing Bar Positioners:

a. D/A 811; Dur-O-Wal, Inc.
b. D/A 816; Dur-O-Wal, Inc.
c. No. 376 Rebar Positioner; Heckman Building Products, Inc.
d. #RB Rebar Positioner; Hohmann & Barnard, Inc.
e. #RB-Twin Rebar Positioner; Hohmann & Barnard, Inc.
f. Double O-Ring Rebar Positioner; Masonry Reinforcing Corporation of America.
g. O-Ring Rebar Positioner; Masonry Reinforcing Corporation of America.

2.16 CAVITY-WALL INSULATION

A. Foil-faced Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 1 or 2 of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1. Available Manufacturers:

   a. Carlisle Coatings and Waterproofings.
   b. Dow Chemical Company (The).
   c. Johns Manville.

2. Minimum Compressive Strength per ASTM D1621: 20 psi.

3. Minimum R-value:

   a. 1” = R 6.
   b. 2” = R 13.
   c. 3” = R 19.

B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

C. Joint Sealer: Type recommended by insulation board manufacturer for application indicated.

2.17 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.18 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime mortar unless otherwise indicated.
   3. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.

   1. Extended-Life Mortar for Unit Masonry: Mortar complying with ASTM C 1142 may be used instead of mortar specified above, at Contractor's option.
   2. Limit cementitious materials in mortar to portland cement and lime.
   3. For masonry below grade, in contact with earth, and where indicated, use Type S.

4. For reinforced masonry and where indicated, use Type S.
5. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

D. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit pigments to the following percentages of cement content by weight:

1. For mineral-oxide pigments and portland cement-lime mortar, not more than 10 percent.
2. For carbon-black pigment and portland cement-lime mortar, not more than 2 percent.

E. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

3.3 CONSTRUCTION TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping."

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.6 BONDING OF MULTIWYTHE MASONRY

A. At new veneer over New Masonry Backup: Use masonry joint reinforcement installed in horizontal mortar joints to bond wythes together.

B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated "L" units as well as masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide individual metal ties not more than 16 inches o.c.
2. Provide continuity with masonry joint reinforcement by using prefabricated "T" units.

3.7 CAVITIES

A. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

B. Coat cavity face of backup wythe to comply with Division 7 Section "Modified Bituminous Sheet Air & Vapor Barriers".

C. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation, air barrier and masonry.

2. Seal all edges with crack sealer compatible with insulation, air barrier and masonry.

3.8 MASONRY JOINT REINFORCEMENT

A. General: Provide continuous masonry joint reinforcement. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

   a. Reinforcement above is in addition to continuous reinforcement.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.10 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten each anchor section through sheathing to wall framing or to concrete and masonry backup with two metal fasteners of type indicated.
2. Insert anchor sections in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.
3. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
4. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
5. Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around the perimeter.

3.11 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake joints in exposed faces.
2. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake joint.
3. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete.

C. Form expansion joints in brick made from clay or shale as follows:

1. Form open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Keep joint free and clear of mortar.

D. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants."

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.12 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

1. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.13 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

C. Install flashing as follows:

1. At multiwythe masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up a minimum of 12 inches, and secured with a stainless steel termination bar. Seal at termination bar.
2. At masonry-veneer walls, extend flashing from exterior face of veneer, through veneer, up face of sheathing at least 8 inches, and behind air-infiltration barrier.

3. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn flashing up not less than 2 inches to form a pan.
4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.
5. Where shown, install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.

D. Install weep vents in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes
2. Space weep vents 24 inches o.c.
3. Place cavity drainage material immediately above flashing in cavities.

E. Install vents in vertical head joints at the top of each continuous cavity at spacing indicated. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

F. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.14 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.15 FIELD QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform field quality-control testing indicated below.

   1. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.

C. Mortar properties will be tested per ASTM C 780.

D. Grout will be sampled and tested for compressive strength per ASTM C 1019.

E. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.

F. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

G. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM C 1314, and as follows:

   1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

3.16 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

3.17 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, dispose of waste in accordance with the project waste management plan.

END OF SECTION 042000

SECTION 051000 - STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specification.

1.2 Sustainable Design Intent: comply with project requirements intended to achieve sustainable design, measured and documented according to the CT high Performance Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED scorecard. Attempt to specify products in each specification section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.3 SECTION INCLUDES

A. Structural steel framing members.

B. Base plates.

C. Grouting under base plates.

1.4 RELATED SECTIONS

A. Section 030000 - Cast In Place Concrete: Supply of anchor bolts for casting into concrete.

B. Section 053100 - Steel Roof Deck: Support framing for small openings in roof deck.

1.5 REFERENCES

A. AISC - Code of Standard Practice - Manual of Steel Construction - Allowable Stress Design (ASD).

B. ASTM A36 - Structural Steel.

C. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.

D. ASTM A123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.

E. ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.

F. ASTM A325 - High Strength Bolts for Structural Steel Joints.

G. ASTM A490 - Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints.

H. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

I. AWS D1.1 - Structural Welding Code.

J. AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

K. SSPC (Steel Structures Painting Council) - Painting Manual.

1.6 SUBMITTALS FOR REVIEW

A. Shop Drawings:
1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments and fasteners.
2. Connections.
3. Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths.

1.7 SUBMITTALS FOR INFORMATION

A. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

B. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.8 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC Code of Standard Practice.

B. Fabricator: Company specializing in performing the work of this Section with minimum five years experience.

C. Erector: Company specializing in performing the work of this Section with minimum five years' experience.

D. Design connections not detailed on the Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the place where the Project is located.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel Members: ASTM A36.

B. Structural Tubing: ASTM A500, Grade B.

C. Pipe: ASTM A53, Grade B.

D. Bolts, Nuts, and Washers: ASTM A325, galvanized to ASTM A153 for galvanized members.

E. Anchor Bolts: ASTM A307.

F. Wedge Anchors: Stainless steel stud with stainless steel wedges. Hilti Kwik Bolt II or approved equal.

G. Adhesive Anchors: Threaded A36 anchor rod with nut, washer and vinylester resin. A adhesive anchor or approved

H. Welding Materials: AWS D1.1; type required for materials being welded.

I. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7000 psi at 28 days.

J. Touch-Up Primer: SSPC 15, Type 1, red oxide.

2.2 FABRICATION

A. Framed Connections for Beams and Girders: Connections not otherwise indicated shall be designed as
follows:
1. Minimum end reactions shall be equal to 80 percent of the total load listed in AISC Tables "Allowable Load on Beams," but need not exceed the allowable shear capacity of the member.
2. Bolts shall be 3/4" A325N unless noted otherwise.

3. Minimum framing angles shall be 2L 3-1/2 x 3-1/2 x 5/16 except that in the case of one bolt row, 2L 6 x 4 x 5/16 x 0'-3" shall be used with two bolts in the 6" leg.
4. Framed connections for members framing to webs of supporting girders or to flanges of columns: Unless otherwise noted, all beams framing to webs of girders shall be framed and capable of transferring the beam reactions fully to the girder web. Minimum connections shall require double framing angles with two bolt rows at W6 beams.
5. Member framing to the webs of columns: Unless otherwise noted, members connecting to webs of columns shall be framed by means of stiffened seat connections. Such connections shall conform to AISC requirements. These seated connections shall be capable of developing the minimum end reaction noted and shall employ a minimum top angle 3 x 3 x 5/16 x 0'-3" with 1/4" field fillet welds along toes of angle only.

B. Where stiffener and/or seat plates are in line on opposite sides of a column web, the fillet weld size shall not exceed 1/2 of column web thickness. Thickness of both stiffener plate and horizontal seat plate shall not be less than the supported beam web in thickness with a minimum of 3/8" thickness.

C. Fabricate connections for bolt, nut, and washer connectors.

2.3 FINISH

A. Shop prime structural steel members. Do not prime surfaces that will be field welded, high strength bolted, fireproofed or in contact with concrete.

B. Galvanize structural steel members noted on drawings and locations noted herein to ASTM A123. Provide minimum 1.25 oz/sq ft galvanized coating.

C. Members to receive epoxy or other high performance coatings shall be cleaned and prepared per coating manufacturer's recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Coordination and Meetings: Verify that field conditions are acceptable and are ready to receive work.

3.2 ERECTION

A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

B. Field weld components indicated on Drawings.

C. Field connect members with threaded fasteners; torque to required resistance.

D. Do not field cut or alter structural members without approval of Engineer.

E. After erection, prime welds, abrasions, and surfaces not shop primed [and galvanized], except surfaces to be in contact with concrete.

F. Grout under base plates in accordance with Section 03300. Trowel grouted surface smooth, splay neatly to 45 degrees.

3.3 ERECTION TOLERANCES

A. Maximum variation from plumb: 1/4 inch per story, non-cumulative.

B. Maximum offset from true alignment: 1/4 inch.

3.4 FIELD QUALITY CONTROL

A. Project is subject to "Special Inspections" under provisions of State of Building Code. Selection of the Special Inspector and Independent Testing Laboratory shall be made by Owner.

B. Inspections and tests are to be performed in accordance with methods and procedures of referenced
standards and as specified below.

C. Defects found in materials and workmanship not in conformance with Contract Documents will be cause for rejection and replacement of work at no additional cost to Owner. Contractor shall bear costs of additional testing and inspection services caused by failure of the Contractor to provide materials and workmanship in conformance with requirements.

D. Special Inspections to be performed by Special Inspector and Testing Laboratory shall include:
1. Special Inspector shall inspect Structural Steel Fabricator's quality control program and shop procedures for compliance with AISC standards. Fabrication shops holding current AISC Quality Control.
2. Special Inspector shall make a random inspection of not less than 20% of identification markings of each type material or product provided for conformance with specifications and comparison to mill certificates and certified test reports.
3. The Testing Laboratory shall visually inspect 100% of all welds and bolts for correct size. Visually check that all bolts are "snug tight".
4. Testing Laboratory shall check qualifications of welders for current AWS certifications for the type welds being performed.
5. Testing Laboratory is to measure frame plumbness and alignment for conformance with requirements.
6. Special Inspector is to field review the steel frame and connections to verify compliance with the approved shop drawings.

E. Contractor responsibilities shall include:
   1. Provide ready access to the Work for Special Inspector and Testing Laboratory personnel and equipment. Make arrangements for fabrication plant inspections.
   2. Furnishing Special Inspector and Testing Laboratory copies of approved shop drawings and submittals.
   3. Provide labor and assistance for site storage and weather protection of samples and to transfer samples to Testing Laboratory vehicles.
   4. Notify Special Inspector and Testing Laboratory not less than 24 hours in advance of construction operations requiring inspection or obtaining of samples.

END OF SECTION

SECTION 053100 - STEEL ROOF DECK

PART 1 GENERAL

1.1 Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specification.

1.2 Sustainable Design Intent: comply with project requirements intended to achieve sustainable design, measured and documented according to the CT high Performance Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED scorecard. Attempt to specify products in each specification section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.3 SECTION INCLUDES

A. Steel roof deck and accessories.

B. Formed steel cant strips, eave strips, valley strips.

1.4 RELATED SECTIONS

A. Section 051000 - Structural Steel: Support Framing for openings.

B. Reinforcement pans with roof drain hub assemblies.

1.5 REFERENCES

A. ASTM A36/A36M - Structural Steel.

B. ASTM A446 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip process, Structural (Physical) quality.

C. ASTM A525 - Steel Sheet, Zinc-Coated, Galvanized by the Hot-Dip Process.

D. ASTM A611 - Steel, Cold-Rolled Sheet, Carbon

E. AWS D1.1 - Structural Welding Code.

F. SDI (Steel Deck Institute) - Design Manual for Composite Decks, Form Decks, Roof Deck Cellular, Metal Floor Deck with Electrical Distribution.

G. SSPC (Steel Structures Painting Council) – Painting Manual.

1.6 PERFORMANCE REQUIREMENTS

A. Design metal deck in accordance with SDI Design Manual.

B. Calculate to structural working stress design and maximum vertical deck deflection of 1/240.

1.7 SUBMITTALS FOR REVIEW

A. Shop Drawings: Indicate deck plan, support locations, projections, openings and reinforcement, pertinent details, and accessories.

B. Product Data: Provide deck profile characteristics and dimensions, structural properties, and finishes.

1.8 SUBMITTALS FOR INFORMATION

A. Certificates: Certify that Products meet or exceed specified requirements.

B. Submit manufacturer's installation instructions.

C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.9 QUALITY ASSURANCE

A. Installer: Company specializing in performing the work of this Section with minimum 5 years documented experience.

B. Design deck layout, spans, fastening, and joints, under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Connecticut.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet Steel: ASTM A611, Grade C, unfinished.

B. Welding Materials: AWS D1.1.

C. Shop and Touch-Up Primer:

2.2.1 Acessories

A. Sump Pans, Eave Strips: Fabricated of metal of same type and finish as deck.

2.3 FABRICATION

A. Metal Deck: Sheet steel, configured as follows:
   1. Span Design: multiple
   2. Minimum Metal Thickness Excluding Finish: 20 gage
   3. Nominal Height: 1-1/2, fluted profile WR
   4. Formed Sheet Width: 24
   5. Side Joints: lapped

B. Related Deck Accessories: Metal closure strips, cover plates, cant strips,20 gage thick sheet steel; of profile and size as indicated.

C. Roof Sump Pan: Fabricate of 14gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

D. Cant Strips: Formed sheet steel, 20 gage thick, 45 degree slope, 3 1/2 inch nominal width and height, flange for attachment.

E. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.

PART 3 EXECUTION

3.1 EXAMINATION

A. Coordination and Meetings: Verification of existing conditions prior to beginning work.

3.2 INSTALLATION

A. Erect metal deck in accordance with SDI Manual and manufacturer's written instructions.

B. Bear deck on steel supports with 1-1/2 inch minimum bearing. Align and level.

C. Fasten [ribbed] deck to steel support members at ends and intermediate supports with fusion welds through weld washers at 12 inches on centers maximum, parallel with the deck flute and at each transverse flute.

D. Weld in accordance with AWS D1.1.

E. Mechanically fasten male/female side laps at 24 inches oc maximum.

F. Install 6 inch minimum wide sheet steel cover plates, of same thickness as deck, where deck changes direction. Fusion weld 12 inches oc maximum.

G. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.

H. Position roof sump pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

I. Place metal cant strips in position and fusion weld or mechanically attach

J. Immediately after welding deck and other metal components in position, coat welds, burned areas,and damaged surface coating, with touch-up prime paint.

END OF SECTION

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Exterior non-loadbearing wall framing..
2. Interior wall framing where wall height exceeds 14’-0”.
3. Miscellaneous exterior framing not specified in other Sections.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 05 Section "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections.
4. Division 07 Section “Thermal Insulation” for insulation used to fill spaces that are inaccessible after installing exterior wall framing.
5. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on the drawings.

2. Deflection Limits: Design framing systems to withstand design loads as indicated on the drawings without deflections greater than the following:

   a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
   b. Interior Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

   a. Upward and downward movement of L/300 for floors and L/200 for roofs.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 LEED SUBMITTALS

A. MRc4: “Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: “Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional.”

C. IEQc4.2: “Manufacturer’s product data for paints and coatings, including printed statement of VOC content.”

1.5 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer.

E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

F. Research/Evaluation Reports of the model code organization acceptable to authorities having jurisdiction, that evidence cold-formed metal framings' compliance with building code in effect for the project.

1.6 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

1. Consolidated Fabricators Corp.; Building Products Division.
2. Dietrich Metal Framing; a Worthington Industries Company.
3. MarinoWare; a division of Ware Industries.
4. United Metal Products, Inc.

2.2 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G90.

B. Steel Sheet for Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G90.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0359 inch.
2. Flange Width: 1-5/8 inches minimum.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.

C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Dietrich Metal Framing; a Worthington Industries Company.
b. MarinoWare, a division of Ware Industries.
c. SCAFCO Corporation
d. The Steel Network, Inc.

2.4 INTERIOR WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-1/4 inches.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches.

D. Steel Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Top Flange Width: 1-5/8 inches.

2.5 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-5/8 inches minimum.

2.6 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Anchor clips.
4. End clips.
5. Foundation clips.
6. Gusset plates.
7. Stud kickers, knee braces, and girts.
8. Hole reinforcing plates.
9. Backer plates.

2.7 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.8 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

B. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

C. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.9 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding or screw fastening as standard with fabricator. Wire tying of framing members is not permitted.

   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

F. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

G. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

I. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing:

a. 16 inches minimum and as required by structural performance.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
1. Connect vertical deflection clips to studs and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.4 INTERIOR WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: To match stud spacing.

B. Squarely seat studs against top and bottom tracks with gap not exceeding 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches minimum and as required by structural performance.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

E. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

F. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

G. Install horizontal bridging in stud system, spaced as indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

H. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Steel framing and supports for applications where framing and supports are not specified in other Sections, including but not limited to:

   a. Steel framing and supports for mechanical and electrical equipment.
   b. Loose bearing and leveling plates.
   c. Loose steel lintels.
   d. Miscellaneous steel trim including edge angles and channels.
   e. Alternating Tread Steel Stairs.
   f. Abrasive metal nosings.

C. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.

D. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 03 Section "Cast-in-Place Concrete" for installing items indicated to be cast into concrete.
4. Division 04 Section "Unit Masonry" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
5. Division 05 Section "Structural Steel Framing."
6. Division 05 Section "Metal Railings”.

1.3 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

D. IEQc4.2: "Manufacturer's product data for paints and coatings, including printed statement of VOC content."

1.4 SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.
3. Alternating tread stair.
4. Metal nosings.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

E. Steel Tubing: ASTM A 500, cold-formed steel tubing.

F. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

G. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.

1. Size of Channels: 1-5/8 by 1-5/8 inches.

2. Material: Steel complying with ASTM A 1008/A 1008M, structural steel, Grade 33; 0.0677-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

H. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

I. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

J. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 ALUMINUM

A. Aluminum Extrusions: ASTM B 221, alloy 6063-T6.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

D. Machine Screws: ASME B18.6.3.

E. Lag Bolts: ASME B18.2.1.

F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

G. Plain Washers: Round, carbon steel, ASME B18.22.1.

H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.

I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Low- Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Universal Shop Primer: Provide primers that comply with Division 9 painting Sections.

D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 CONCRETE FILL

A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.7 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.8 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

C. Galvanize exterior items.

D. Prime interior items with zinc-rich primer.

2.9 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.10 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates after fabrication.

C. Prime plates with zinc-rich primer.

2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.12 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

D. Prime interior miscellaneous steel trim with zinc-rich primer.

2.13 CAST NOSINGS, TREADS, AND THRESHOLDS

A. F abricate units of metal indicated below in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions. Provide units with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both.

1. Metal: Cast aluminum.

B. Configurations: Provide units in the following configurations, unless otherwise indicated:

1. Nosings: Cross-hatched units, 4 inches wide with 1-inch lip, for casting into concrete steps.

C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

D. Drill for mechanical anchors and countersink. Locate not more than 4 inches from ends and not more than 12 inches o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.

1. Provide two rows of holes for units more than 5 inches wide, with two holes aligned at ends and intermediate holes staggered.

E. Apply bituminous paint to concealed bottoms, sides, and edges of units set into concrete.

F. Provide a plain surface texture, unless fluted or cross-hatched surfaces are indicated.

G. Cast Nosings: Subject to compliance with requirements, provide products by one of the following:

1. American Safety Tread Co., Inc.
2. Balco/Metalines, Inc.
3. Granite State Casting Co.
4. Safe-T-Metal Co.
5. Wooster Products Inc.

2.14 ALTERNATING TREAD STEEL STAIRS

A. Provide alternating tread steel stairs manufactured by Lapere Stair, Inc. or equal products by another manufacturer.

B. Unless otherwise indicated, fabricate stairs from carbon steel as follows:

1. Treads: 13 Gauge AISI 1010/15 HRPO per ASTM A569 / A1011 grade 36 (or higher).

2. Landing & Foot Stampings: 11 Gauge AISI 1010/15 per ASTM A569 / A1011 grade 36 (or higher).

3. Top Landing Support Clips: L2 x 2 x ¼” x 4” lg. with 5/8” Φ round holes and 5/8” x 1” slot holes, ASTM A569/A1011 grade 36 (or higher)

4. Stringers:

   a. 2" x 1 3/4" x 11 Gauge U section; AISI 1010/15 per ASTM A569/A1011 grade 36 (or higher) for 56 degree stairs under 10 vertical feet and for 68 degree stairs under 12 vertical feet.
   b. 3" x 1 3/4" x 11 Gauge U section; AISI 1010/15 per ASTM A569/A1011 grade 36 or higher for 56 degree stairs over 10 vertical feet and for 68 degree stairs over 12 vertical feet.

5. Handrails: 1 1/2" OD x 0.095" AISI 1010/15 CS per ASTM A569/A1011 cold drawn, fully annealed tube per ASTM A513 grade 1008 or higher As-welded tubing or ASTM A500 Grade B.

C. Include manufacturer's standard fasteners and miscellaneous materials required for a complete installation.

D. Finish: Powder coated with Polyester TGIC safety yellow paint.

2.15 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.16 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize all exterior items to comply with applicable standard listed below:

   1. ASTM A 123/A 123M, for galvanizing steel and iron products.
   2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth

C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

   1. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete or masonry, unless otherwise

indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.17 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Satin Finish: No. 6.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.18 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Support steel beams on solid grouted masonry, concrete, or steel pipe columns. Secure beams with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

A. Install with anchorage system indicated to comply with manufacturer's written instructions.

B. Center nosings on tread widths.

C. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055110 - METAL RAILINGS AND GUARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Handrails and guardrails.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

3. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.

1.4 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.2: "Manufacturer's product data for paints and coatings, including printed statement of VOC content."

1.5 SUBMITTALS

A. Product Data: For metal stairs and the following:

1. Paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Provide templates for anchors and bolts specified for installation under other Sections.
2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: For products involving selection of color, texture, or design.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

1. Stairs: Unless otherwise indicated, provide commercial class.

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

D. Professional Engineer Qualification: A professional engineer who is legally qualified to practice in Connecticut and who is experienced in providing engineering services of the kind indicated.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).

C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

D. Iron Castings: Either gray or malleable iron, unless otherwise indicated.

1. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
2. Malleable Iron: ASTM A 47/A 47M.

E. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.

F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

2.4 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Low- Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

D. Shop Primers: Provide primers that comply with Division 9 painting Sections.

E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Welded Wire Fabric: ASTM A 185, 6 by 6 inches--W1.4 by W1.4, unless otherwise indicated.

H. Guardrail Mesh: 4” square welded, non-woven, galvanized mesh.

2.6 FABRICATION, GENERAL

A. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

B. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

C. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

D. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At Stair 2 and 4, weld exposed corners and seams continuously.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.7 HANDRAILS AND GUARDRAILS

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

C. Form changes in direction of railings as follows:

1. As detailed.
2. By bending or by inserting prefabricated elbow fittings.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

E. Close exposed ends of railing members with prefabricated end fittings.

F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.

1. Connect posts to stair framing by direct welding, unless otherwise indicated.
2. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
3. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal railings after assembly.

C. Galvanizing: Hot-dip galvanize all exterior items to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
3. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

2.9 STEEL AND IRON FINISHES

A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed products:

1. Exterior Items (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interior Items (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

B. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 INSTALLING STEEL RAILINGS AND GUARDRAILS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

1. Anchor posts to steel by welding directly to steel supporting members.
2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

B. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
3. For hollow masonry anchorage, use toggle bolts.
4. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 PROTECTION

A. Protect finishes from damage during construction period with temporary protective coverings approved by manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 055110

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Wood blocking and nailers.
2. Wood furring.
3. Plywood backing panels.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 06 Section "Interior Architectural Woodwork" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NHLA: National Hardwood Lumber Association.
3. NLGA: National Lumber Grades Authority.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. MRc7: "Chain-of-Custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for change of custody by an FSC-accredited certification body. Include statement for wood permanently installed on the manufacturer's invoice or letterhead. All invoices for wood products shall be submitted; certified wood invoices shall state percentage pure."

D. IEQc4.4: "For composite wood products, documentation indicating that product contains no added urea formaldehyde."

1.5 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Lumber and plywood shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all miscellaneous carpentry, unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

1. Use treatment that does not promote corrosion of metal fasteners.
2. Use Exterior type for exterior locations and where indicated.
3. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat all miscellaneous carpentry.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.

B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber with 19 percent maximum moisture content of any species.

C. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

1. Provide products that contain no added urea formaldehyde.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, or pressure-preservative treated, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer. Comply with requirements in Division 01 Section “Volatile Organic Compound Limits”.

1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Do not splice structural members between supports, unless otherwise indicated.

C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

D. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

G. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring horizontally at 24 inches o.c.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- size furring vertically at 16 inches o.c.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Wall sheathing.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 06 Section "Miscellaneous Rough Carpentry" for plywood backing panels.
5. Division 07 Section “Modified Bituminous Sheet Air Barriers” for air barrier.

1.3 LEED SUBMITTALS

A. MRc5: “Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional.”

B. MRc7: “Chain-of-Custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for change of custody by an FSC-accredited certification body. Include statement for wood permanently installed on the manufacturer’s invoice or letterhead. All invoices for wood products shall be submitted; certified wood invoices shall state percentage pure.”

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

D. IEQc4.4: "For composite wood products, documentation indicating that product contains no added urea formaldehyde."

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

2.2 WOOD PANEL PRODUCTS, GENERAL

A. Plywood: Either DOC PS 1 or DOC PS 2.

B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

C. Factory mark panels to indicate compliance with applicable standard.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Comply with performance requirements in AWPA C27.

1. Use exterior type treatment that does not promote corrosion of metal fasteners.

B. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Identify fire-retardant-treated plywood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

D. Application: Treat all exterior plywood.

2.4 WALL SHEATHING

A. Plywood Wall Sheathing: Exposure 1 sheathing.

1. Span Rating: Not less than 24/0.
2. Nominal Thickness: Not less than 5/8 inch.

B. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Product: Subject to compliance with requirements, provide "Dens-Glass Gold" by G-P Gypsum Corporation, or equal product from another manufacturer.
2. Type and Thickness: Type X, 5/8 inch thick.
3. Size: 48 by 120 inches for vertical installation.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. For sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

2.6 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Use adhesives that comply with requirements in Division 01 Section VOC Limits for Adhesives, Sealants, Paints, and Coatings."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:

a. Screw to cold-formed metal framing.
b. Space panels 1/8 inch apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.

C. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

D. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Wood cabinets.
2. Countertops.
3. Miscellaneous interior wood items.
4. Shop finishing of interior woodwork.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, recycling, and disposing of non hazardous waste.
3. Division 06 Section "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. MRc7: "Chain-of-Custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for change of custody by an FSC-accredited certification body. Include statement for wood permanently installed on the manufacturer's invoice or letterhead. All invoices for wood products shall be submitted; certified wood invoices shall state percentage pure."

D. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.

E. IEQc4.4: "For composite wood products, documentation indicating that product contains no added urea formaldehyde."

1.5 SUBMITTALS

A. Product Data: For panel products, adhesive for bonding plastic laminate, cabinet hardware and accessories and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for items installed in architectural woodwork.
4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples for Initial Selection:

1. Shop-applied transparent finishes.
2. Edge materials.
3. Solid-surfacing materials.

D. Samples for Verification:

1. Veneer-faced panel products with or for transparent finish, 8 by 10 inches for each species and cut. Include at least one face-veneer seam and finish as specified.
2. Solid-surfacing materials, 6 inches square.
3. Exposed cabinet hardware and accessories, one unit for each type and finish.

E. Product Certificates: For each type of product, signed by product manufacturer.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

E. Forest Certification: Provide interior architectural woodwork produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL WOODWORK, GENERAL

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

1. Provide labels and certificates from AWI certification program indicating that woodwork, including installation**,** complies with requirements of grades specified.
2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.2 MATERIALS

A. Wood Species and Cut for Transparent Finish:

1. White Maple, plain sliced.

B. Wood Products: Comply with the following:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
3. Softwood Plywood: DOC PS 1.
4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

C. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Avonite, Inc.
b. Formica Corporation.
c. Wilsonart International; Div. of Premark International, Inc.

2. Type: Standard type unless Special Purpose type is indicated.
3. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials, where indicated or required, associated with architectural cabinets.

B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.

C. Frameless Concealed Hinges (European Type): For doors 36-inches or less, provide BHMA A156.9, B01602, 135 degrees of opening, self-closing.

D. Wire Pulls: Back mounted, solid stainless steel 4 inches long, 5/16 inch in diameter, 3" long, and 2-1/2 inches deep.

E. Ball Friction Catches: Ball friction catches, BHMA A156.9, B03013.

F. Pressure Catches: mini-latch automatic spring catch Hafele # 245.54.514.

G. Adjustable Shelf Standards and Supports: Double slotted standards and double bracket, series 85 standard and 185 bracket by Outwater Hardware Corporation.

H. Shelf Rests: BHMA A156.9, B04013; metal.

I. Drawer Slides: BHMA A156.9, B05091.

1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
4. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches high and 24 inches wide.
5. Keyboard Slides: Grade 1; for computer keyboard shelves.

J. Door Locks: BHMA A156.11, E07121. Provide at all cabinet doors.

K. Drawer Locks: BHMA A156.11, E07041. Provide at all cabinet drawers.

L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Stainless Steel: BHMA 630.

M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.

D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

2.6 WOOD CABINETS FOR TRANSPARENT FINISH

A. Grade: Custom.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Wood Species and Cut for Exposed Surfaces: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building, unless otherwise indicated.

1. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
2. Matching of Veneer Leaves: Book match.

D. Semi-exposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
2. Drawer Sides and Backs: Thermoset decorative panels.
3. Drawer Bottoms: Thermoset decorative panels.

2.7 SOLID-SURFACING-MATERIAL COUNTERTOPS

A. Grade: Custom.

B. Solid-Surfacing-Material Thickness: 3/4 inch.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:

1. As selected by Architect from manufacturer's full range.

D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

1. Fabricate tops with shop-applied edges of materials and configuration indicated.
2. Fabricate tops with loose backsplashes for field application.

2.8 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.

B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

C. General: Shop finish transparent-finished interior architectural woodwork at fabrication shop as specified in this Section. Refer to Division 09 painting Sections for finishing opaque-finished architectural woodwork.

D. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished items specified to be field finished. Refer to Division 09 painting Sections for material and application requirements.

E. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Back-priming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require back-priming when surfaced with plastic laminate.

F. Transparent Finish:

1. Grade: Custom.
2. AWI Finish System: Catalyzed polyurethane.
3. Staining: Match approved sample for color.
4. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
5. Filled Finish for Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.
6. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and back-priming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.
3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
4. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

H. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

SECTION 067413 - FIBERGLASS REINFORCED GRATINGS

PART 1 - GENERAL

1.1 Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specification.

1.2 Sustainable Design Intent: comply with project requirements intended to achieve sustainable design, measured and documented according to the CT high Performance Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the LEED scorecard. Attempt to specify products in each specification section that meet as many of the credits as Possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.3 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.4 SUMMARY

B. Section includes glass-fiber-reinforced-plastic gratings

1.5 COORDINATION

C. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.6 ACTION SUBMITTALS

D. Product Data: For glass-fiber-reinforced-plastic gratings.

E. Shop Drawings: Include plans, sections, details, and attachments to other work.

F. Delegated-Design Submittal: For gratings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 FIELD CONDITIONS

G. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Grating Pacific or approved equals

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design gratings.

B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Floors: Uniform load of 250 lbf/sq. ft. or concentrated load of 3000 lbf, whichever produces the greater stress.
2. Limit deflection to L/360 or 1/4 inch (6.4 mm), whichever is less.

2.3 GLASS-FIBER-REINFORCED-PLASTIC GRATINGS

A. Pultruded Glass-Fiber-Reinforced Gratings: Bar gratings assembled from components made by simultaneously pulling glass fibers and extruding thermosetting plastic resin through a heated die under pressure to produce a product without voids and with a high glass-fiber content.

1. Configuration: T3320; 2-inch (51-mm) T-bars spaced 1-1/2 inches (38 mm) o.c. (33 percent open) As required to comply with structural performance requirements. Spacing between grates must ADA rated.

2. Color: Gray

3. Traffic Surface: Aluminum oxide grit surface.

2.4 FABRICATION

A. Shop Assembly: Shop fabricate grating sections to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form gratings from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

F. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

2.5 GRATING FRAMES AND SUPPORTS

A. Frames and Supports for Glass-Fiber-Reinforced-Plastic Gratings: Fabricate from glass-fiber-reinforced-plastic shapes of sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.

1. Unless otherwise indicated, use shapes made from same resin as gratings.
2. Equip units indicated to be cast into concrete or built into masonry with integral anchors.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

B. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

C. Fit exposed connections accurately together to form hairline joints.

3.2 INSTALLING GLASS-FIBER-REINFORCED-PLASTIC GRATINGS

A. Comply with manufacturer's written instructions for installing gratings. Use manufacturer's standard stainless-steel anchor clips and hold-down devices for bolted connections.

END OF SECTION 067413

SECTION 071310 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Rubberized-asphalt sheet waterproofing at foundation walls where floor level is below grade- 1 ply application.
2. Rubberized-asphalt sheet waterproofing at fire suppression overflow basin foundation walls - 1 ply application.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 07 Section “Bentonite Waterproofing” for overflow basin slab waterproofing.

1.3 PERFORMANCE REQUIREMENTS

A. Provide waterproofing that prevents the passage of water.

1.4 LEED SUBMITTALS

A. MRc4: “Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: “Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include

statement indicating cost of each regional material and the fraction by weight that is considered regional."

1.5 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For the following products:

1. 8-by-8 inch square of waterproofing and flashing sheet.

D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

E. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.

F. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is authorized waterproofing manufacturer to install manufacturer's products.

B. Source Limitations: Obtain waterproofing materials, protection course, and molded-sheet drainage panels through one source from a single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.9 WARRANTY

A. Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer agreeing to replace waterproofing material that does not comply with requirements or that does not remain watertight during specified warranty period.

1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.
2. Warranty Period: Twenty years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product: The design for Self-Adhering Sheet Waterproofing is based on W. R. Grace Bituthene 3000 Foundation Wall System. Subject to compliance with requirements, provide the named systems or equal self-adhering rubberized sheet waterproofing systems from one of the following:

1. Carlisle Corporation, Carlisle Coatings & Waterproofing Div.
2. T. C. Miradri.
3. Henry Company.
4. Meadows, W. R., Inc.

2.2 RUBBERIZED-ASPHALT SHEET WATERPROOFING

A. Rubberized-Asphalt Sheet: 60-mil- thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil- thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Physical Properties: As follows, measured per standard test methods referenced:

a. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.

c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
f. Hydrostatic-Head Resistance: 150 feet minimum; ASTM D 5385.
g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of sheet waterproofing material.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.

D. Sheet Strips: Self-adhering, rubberized-asphalt composite sheet strips of same material and thickness as sheet waterproofing.

E. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.

F. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.

G. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
2. Detail Strips: 62.5-mil- thick, felt-reinforced self-adhesive strip, 9 inches wide, with release film on adhesive side.

H. Metal Termination Bars: Stainless steel bars, approximately 1 by 1/8 inch thick, with predrilled slotted holes at approximately 6-inch centers.

I. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: 1/4 inch, nominal.
2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

2.4 MOLDED-SHEET DRAINAGE PANELS

A. Molded-Sheet Drainage Panel: Prefabricated, composite drainage panels, manufactured with a permeable geotextile facing laminated to a molded-plastic-sheet drainage core.

1. Drainage Core: Three-dimensional, nonbiodegradable, molded-plastic-sheet material designed to effectively drain water under backfill pressure; complying with the following properties determined according to tests indicated:

   a. Compressive Strength: 10,000 lbf/sq. ft. minimum; ASTM D 1621.
   b. Flow Rate: 2.8 gpm per ft., minimum, at hydraulic gradient of 1.0 and compressive stress of 25 psi; ASTM D 4716.

2. Geotextile: Woven geotextile fabric, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation less than 50 percent; complying with the following properties determined according to AASHTO M 288:

   a. Survivability: Class 2.
   b. Apparent Opening Size: No. 40 sieve, maximum.
   c. Permittivity: 0.5 per second, minimum.

3. Film Backing: Polymeric film bonded to drainage core surface.

2.5 INSULATION

A. Foundation Insulation: 3” (R-15) Extruded-polystyrene board insulation complying with ASTM C 578, square edged; of type, density, and compressive strength indicated below:

1. Type VI, 1.8-lb/cu. ft. minimum density and 40-psi minimum compressive strength.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Dow Chemical Company (The).
   b. Owens Corning.
   c. Tenneco Building Products.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.

2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch or 1/8 inch for modified bituminous deck paving waterproofing.

F. Bridge and cover expansion joints with overlapping sheet strips.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

E. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.

F. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.

G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

H. Install protection course with butted joints over waterproofing membrane immediately.

I. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.4 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels according to manufacturer's written instructions. Use adhesives or mechanical fasteners that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical application install board insulation before installing drainage panels.

3.5 INSULATION INSTALLATION

A. Install one or more layers of board insulation to achieve required thickness over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.

B. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.

C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.6 FIELD QUALITY CONTROL

A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect.

3.7 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed insulation drainage panels from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071310

SECTION 071700 - BENTONITE WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following applications of bentonite waterproofing:

1. Beneath fire suppression overflow basin slabs.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, recycling, and disposing of non hazardous waste.
3. Division 01 Section "Facility Exterior Envelope Commissioning Requirements".
4. Division 07 Section "Self-Adhering Sheet Waterproofing" for waterproofing applied to walls of fire suppression overflow basins.

1.3 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

1.4 SUBMITTALS

A. Product Data: For each material and type of application required. Include product specifications and manufacturer's written installation instructions and recommendations.

B. Shop drawings showing details of installation.

C. Warranty: Specimen of standard waterproofing warranty.

D. Test Report: Manufacturer's test report on water samples taken at Project site along with recommendations resulting from these tests.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has specialized in installing bentonite waterproofing systems similar to those required for this Project and who is licensed by or otherwise acceptable to manufacturer of primary materials.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing a bentonite waterproofing system similar to that indicated for this Project and with a record of successful in-service performance.

C. Single-Source Responsibility: Obtain bentonite waterproofing system through one source from a single manufacturer. Obtain accessory products used in conjunction with bentonite waterproofing from sources acceptable to bentonite waterproofing manufacturer.

D. Preinstallation Conference: Approximately 2 weeks before scheduled start of waterproofing installation, meet at Project site with waterproofing Installer; preparer of substrate to receive waterproofing; installers of other work in and around waterproofing that must precede, follow, or penetrate, or is contiguous to waterproofing (including mechanical and electrical installers as applicable); Architect; Owner; and waterproofing manufacturer's representative to review materials, procedures, schedules, and other requirements and conditions related to installing bentonite waterproofing.

E. Water Samples: Obtain water samples from Project site at approximate locations where waterproofing will be installed and have waterproofing manufacturer test for acids, alkalis, brine, or other contaminants that may inhibit performance of waterproofing materials. Comply with manufacturer's written instructions resulting from these tests.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original unopened and undamaged containers.

B. Store materials in a dry, well-ventilated space.

C. Remove and replace bentonite materials that have been prematurely exposed to moisture.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Do not apply waterproofing materials to surfaces where ice or frost is visible. Bentonite clay products in panel or membrane form may be placed on damp surfaces. Do not apply bentonite waterproofing materials in areas with standing water.

B. Comply with manufacturer's written instructions regarding weather conditions before and during waterproofing installation, condition of the substrate to receive waterproofing, and protection of the installed waterproofing system.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty, signed by manufacturer and applicator, agreeing to repair or replace components of bentonite waterproofing system that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Water penetrating the building or structure.
2. Deteriorated or displaced waterproofing materials.

C. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Products: Subject to compliance with requirements, provide CETCO Volclay CR Type 1C Panels for slabs; or equal product by another manufacturer.

2.2 MATERIALS, GENERAL

A. Granular Bentonite: Sodium bentonite clay containing a minimum of 90 percent montmorillonite (hydrated aluminum silicate), with a minimum of 90 percent passing a 20-mesh sieve.

B. Bentonite Mastic: Trowelable consistency, bentonite compound, specifically formulated for application at joints and penetrations.

C. Preformed Waterstop: Flexible strip of bentonite waterproofing compound in cartridge or coil form, designed specifically for vertical and horizontal joints in concrete construction.

2.3 BENTONITE PANELS

A. Standard Panels: 3/16-inch- thick, corrugated kraft-paper panels with a minimum of 1.0 lb/sq. ft. of bentonite confined in corrugations of boards.

1. Products: Subject to compliance with requirements, provide "Volclay Type 1 Panels" by CETCO.

2.4 INSTALLATION ACCESSORIES

A. Protection Board: Provide products recommended by waterproofing manufacturer to suit Project. Available types include the following:

1. Semirigid board with mineral-reinforced asphaltic core laminated between an asphalt-saturated felt liner on one side and a weather-coated glass-mat liner covered with a bond-breaking film on the other.

a. 1/8 inch thick.

2. 1/16-inch- thick, puncture-resistant, multilayer, water-permeable, flexible board consisting of pressure-bonded cellulose fibers.
3. 1/4-inch- thick sheets of extruded-polystyrene foam core laminated between 2 plastic face sheets.

B. Termination Bar: Extruded- or formed-aluminum bars with upper flange to receive sealant.

C. Plastic Sheets: Polyethylene sheeting complying with ASTM D 4397, thickness as recommended by waterproofing manufacturer to suit application, but at least 6 mils (0.15 mm) thick.

D. Fasteners: Case-hardened nails or hardened-steel, powder-actuated fasteners. Depending on manufacturer's written requirements, provide 1/2- or 1-inch- (13- or 25-mm-) diameter washers under fastener heads.

E. Sealants: As recommended by manufacturer. Comply with requirements specified in Division 7 Section "Joint Sealants."

F. Adhesive: Water-based adhesive used to secure membrane to both vertical and horizontal surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate preparations affecting performance of bentonite waterproofing.

1. For the record, prepare a written report, endorsed by Installer, listing conditions detrimental to performance of bentonite waterproofing.
2. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify that substrate is complete and that all work that will penetrate waterproofing is complete and rigidly installed. Verify locations of waterproofing termination.

3.2 PREPARATION

A. Coordinate work in the vicinity of waterproofing to ensure proper conditions for installing the waterproofing system and to prevent damage to the waterproofing after installation.

3.3 INSTALLATION, GENERAL

A. Install waterproofing and accessories according to manufacturer's written instructions, standard details, and recommended practices.

1. Apply linear joint-sealing tubes, bentonite mastic, or both at changes of plane, construction joints in substrate, projections, and penetrations.
2. Apply granular bentonite around penetrations in horizontal surfaces according to manufacturer's written instructions.

B. Construction Joints: Protect construction joints with bentonite preformed flexible waterstop strips. Either place concrete directly over flexible strips or press strips into preformed cavities. Comply with manufacturer's written instructions for using preformed flexible waterstop strips where joint waterproofing is not otherwise indicated.

C. Install wall-to-footing bentonite continuously at base of wall waterproofing (on footing, against wall) according to manufacturer's written instructions.

D. Protect waterproofing from damage and wetting before and during subsequent construction operations. Repair punctures, tears, and cuts according to manufacturer's written instructions.

E. Apply sealants to comply with requirements specified in Division 7 Section "Joint Sealants" and manufacturer's written instructions.

3.4 BENTONITE PANEL INSTALLATION

A. General: Unless otherwise indicated, install bentonite waterproofing panels with ends and edges lapped a minimum of 1-1/2 inches. Stagger joints in adjoining panel rows.

1. Plastic sheets specified for installation over waterproofing may be omitted if coated panels are used.
2. When subjected to a hydrostatic pressure of 33 feet water column or more, install a double layer of panels, with ends and edges butted instead of lapped and with second layer of joints staggered from first. Staple panels together to hold them in place.

B. Below Structural Slabs-on-Grade: Place plastic sheet on compacted subgrade with joints lapped a minimum of 6 inches.

1. Lay standard panels with ends and edges lapped and stapled. Cover with a lapped course of plastic sheets.
2. Install a continuous layer of waterproofing under footings, grade beams, and pile caps; or continue waterproofing through key joints between footings and foundation walls, and extend a minimum of 8 inches up or beyond perimeter slab forms.

END OF SECTION 071700

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Foam-plastic board insulation.
2. Glass-fiber board insulation.
3. Glass-fiber blanket insulation.
4. Spray polyurethane foam insulation.
5. Foil-faced board insulation.
6. Vapor retarders.

C. Related Sections:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 04 Section "Unit Masonry" for insulation installed in cavity walls.
5. Division 07 Section "Thermoplastic Polyolefin (TPO) Vegetative Roofing System" for installation installed as part of the single ply roofing system.
6. Division 07 Section "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
7. Division 09 Section(s) "Gypsum Board and Gypsum Board Assemblies" for installation in metal-framed assemblies of insulation specified by referencing this Section.

1.3 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

D. IEQc4.2: "Manufacturer's product data for paints and coatings, including printed statement of VOC content."

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

C. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84. Minimum R-Value per inch

1. Available Manufacturers:

   a. DiversiFoam Products.
   b. Dow Chemical Company (The).
   c. Owens Corning.
   d. Pactiv Building Products.

2. Type IV, 25 psi.

   a. Location: Vertical applications.

3. Type VI, 40 psi.

   a. Location: Horizontal applications.

4. Minimum R-Value per inch, ASTM C518: 5.0 @ 75 degrees F mean temperature.

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.2 GLASS-FIBER BOARD INSULATION

A. Available Manufacturers:

1. CertainTeed Corporation.
2. Johns Manville.
3. Knauf Insulation.
4. Owens Corning.

B. Unfaced, Glass-Fiber Board Insulation: ASTM C 612, Type IA; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.

1. Nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.

C. Foil-Faced, Glass-Fiber Board Insulation: ASTM C 612, Type IA; faced on one side with foil-scrim-kraft or foil-scrim-polyethylene vapor retarder, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.

1. Nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.

D. Dark-Surfaced, Glass-Fiber Board Insulation: ASTM C 612, Type IA; faced on one side with black glass-fiber mat or black polymer finish; maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.

1. Nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.3 GLASS-FIBER BLANKET INSULATION

A. Available Manufacturers:

1. CertainTeed Corporation.
2. Guardian Building Products, Inc.
3. Johns Manville.
4. Knauf Insulation.
5. Owens Corning.

A. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

B. Minimum R-Value per inch: 3.0.

2.4 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BASF Corporation.
b. Dow Chemical Company (The).
c. Henry Company.
d. NCFI; Division of Barnhardt Mfg. Co.
e. SWD Urethane Company.
f. Icynene Spray Foam

2. Minimum density of 1.5 lb/cu. ft., thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

3. Location: Miscellaneous voids and cavity spaces.

2.5 FOIL FACED BOARD INSULATION

A. Available Manufacturers:

1. Fibrex Insulations Inc.
2. Owens Corning.
3. Thermafiber.

B. Foil-Faced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612; faced on 1 side with foil-scrim or foil-scrim-polyethylene vapor retarder; with maximum flame-spread and smoke-developed indexes of 25 and 5, respectively; and of the following nominal density and thermal resistivity:

1. Nominal density of 8 lb/cu. ft., Type III, thermal resistivity of 4.35 deg F x h x sq. ft./Btu x in. at 75 deg F.
2. Thickness: Two inches.
3. Fiber Color: Darkened.

2.6 VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, thick, with maximum permeance rating of 0.13 perm.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.7 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

1. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

1. Angle: Formed from 0.030-inch- thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Where exposed protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap.

D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch minimum between face of insulation and substrate to which anchor is attached.

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical footing and foundation wall surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 36 inches below exterior grade line.

B. On horizontal surfaces under slabs, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, provide 2” thick, 4’-0” wide units.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04 Section "Unit Masonry."

3.5 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.6 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated.

3.7 INSTALLATION OF BOARD INSULATION IN STORE-FRONT

A. Install board insulation in store-front construction where indicated on Drawings according to manufacturer's written instructions.

3.8 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.

1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.9 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072420 – DIRECT APPLIED EXTERIOR FINISH SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Direct applied exterior finish system over exterior cement board (also noted on the drawings as “Synthetic Stucco”).

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 7 Section 079200 "Joint Sealants" for sealing joints in system with elastomeric joint sealants.
5. Division 09 Section “Gypsum Board” for exterior soffit panels.

1.3 DEFINITIONS

A. Direct applied exterior finish systems refers to exterior assembly consisting of an inner layer of cement board, an outer layer of a glass-fiber-mesh-reinforced base coat applied directly to board insulation, and a textured protective finish coat. These assemblies are applied to supporting substrates of construction indicated.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide systems that comply with the following performance requirements:

1. Bond Integrity: Free from bond failure within system components or between system and supporting construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
2. Weathertightness: Resistant to water penetration from exterior into system and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of system and assemblies behind it, including substrates, supporting construction, and interior finish.

B. Physical Properties of System: Provide direct applied exterior finish system whose physical properties and structural performance comply with the following when tested per methods referenced:

1. Abrasion Resistance: Sample consisting of direct applied exterior finish system; cured for a minimum of 28 days; and showing no cracking, checking, or loss of film integrity after exposure to 528 quarts of sand when tested per ASTM D 968, Method A.
2. Accelerated Weathering Characteristics: Sample of size suitable for test equipment and consisting of direct applied exterior finish system; cured for 28 days; and showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination after testing for 2000 hours when viewed under five times magnification per the following:

   a. ASTM G 23, Method 1.
   b. ASTM G 53.
   c. Either ASTM G 23, Method 1 or ASTM G 53.

3. Absorption-Freeze Resistance: Sample, 3 by 5 inches in size, consisting of direct applied exterior finish system coated on one side with base and finish coats, including reinforcing mesh; cured for 28 days; and showing no visible change and negligible weight loss when subjected to 50 cycles of 20 hours of freezing at 16 deg F and 4 hours of thawing in water at 75 deg F, plus or minus 10 deg F per ASTM C 67.
4. Mildew Resistance: Sample consisting of finish coat applied to 2-by-2-inch glass slides according to manufacturer's written instructions; cured for 28 days; and showing no growth when tested per DOD MIL-STD 810E, Method 508.4 or per ASTM D 3273.
5. Salt-Spray Resistance: Sample, minimum of 4 by 6 inches in size, consisting of direct applied exterior finish system; cured for 28 days; and showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination after testing for 300 hours per ASTM B 117.
6. Water Penetration: Sample, 24 by 48 inches in size, consisting of direct applied exterior finish system; cured for 28 days; and showing no water penetration when tested per ASTM E 331.
7. Water Resistance: Sample consisting of direct applied exterior finish system; cured for 28 days; and showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination after testing for 14 days per ASTM D 2247.
8. Water-Vapor Transmission of Coating: Sample consisting of protective coating, including base and finish coats plus reinforcing mesh; and showing minimum

permeability greater than that of insulation and a maximum permeability of 18 perms when tested per ASTM E 96, Water Method, Procedure B.

9. Impact Resistance: Sample consisting exterior finish system applied to 1/2-inch- thick gypsum sheathing, when tested per ASTM E 695; and showing no cracking or denting with 12 impacts by 30-lb impact mass, swung as a pendulum, from 6 inches to 6 feet at 6-inch increments.
10. Positive and Negative Wind-Load Performance: Sample assembly, 48 by 48 inches in size, consisting of studs, sheathing, and direct applied exterior finish system; and showing capability to withstand wind loads indicated when tested per ASTM E 330.

1.5 LEED SUBMITTALS

A. M Rc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

1.6 SUBMITTALS

A. Product Data: For each component of direct applied exterior finish system specified.

B. Shop Drawings: Show fabrication and installation of system including plans, elevations, sections, details of components, joint locations and configurations within system and between system and construction penetrating it, termination details, and attachments to construction behind system.

C. Samples for Initial Selection: Manufacturer's color charts and small-scale samples consisting of units or sections of units showing the full range of colors, textures, and patterns available for each finish choice indicated.

1. Submit sealant manufacturer's standard bead samples consisting of strips of actual products showing the full range of colors available.

D. Samples for Verification: 24-inch- square panels for each finish, color, texture, and pattern specified. Prepare samples using same tools and techniques intended for actual work.

1. Incorporate within each sample a typical control joint filled with sealant of color indicated or selected.

E. Installer Certificates: Signed by system manufacturer certifying that installers comply with specified requirements.

F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.

G. Material Certificates: Signed by manufacturers or a third-party agency approved by system manufacturer certifying that each of the following items complies with requirements:

1. Joint sealants.

H. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include joint sealant manufacturer's written interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

I. Product Test Reports: Indicate compliance of proposed direct applied exterior finish system with physical property requirements specified in "Performance Requirements" Article based on comprehensive testing of current products by a qualified testing and inspecting agency.

J. Research/Evaluation Reports: Evidence of compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed systems similar in material, design, and extent to those indicated for this Project and with a record of successful in-service performance.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain materials for system from one source and by a single manufacturer or by manufacturers approved by direct applied exterior finish system manufacturer as compatible with other system components.

D. Fire-Test-Response Characteristics: Provide system assemblies and components with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting agency.

1. Flame Spread: 25 or less when tested individually per ASTM E 84.
2. Smoke Developed: 450 or less when tested individually per ASTM E 84.

3. Fire-Resistance Characteristics: Where indicated, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by testing and inspecting agency acceptable to authorities having jurisdiction.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturer's labels intact and clearly identifying products.

B. Store materials inside and under cover; keep them dry and protected from the weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install system when ambient outdoor air and substrate temperatures are 40 deg and falling unless temporary protection and heat are provided to maintain ambient temperatures above 40 deg F during installation of wet materials and until they have dried thoroughly and become weather resistant, but for at least 24 hours after installation.

1.10 COORDINATION

A. Coordinate installation with related Work specified in other Sections to ensure that assemblies, including sheathing, flashing, trim, joint sealers, windows, and doors, are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind direct applied exterior finish system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Dryvit Systems, Inc.
2. Sto Corp.

2.2 MATERIALS

A. Compatibility: Provide substrates, adhesive, reinforcing meshes, base- and finish-coat materials, sealants, and accessories that are compatible with one another and approved for use by system manufacturer for Project.

B. Colors, Textures, and Patterns of Finish Coat: Comply with the following requirements:

1. Provide Architect's selections from system manufacturer's full range of colors, textures, and patterns for type of finish coat indicated.

C. Exterior Cement Board: As specified in Division 07 Section “Gypsum Board”.

D. Fasteners for Exterior Cement Board: As specified in Division 07 Section “Gypsum Board”.

E. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), unperforated.

F. Reinforcing Mesh: Balanced, alkali-resistant, open-weave glass-fiber mesh treated for compatibility with other system materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) per EIMA 105.01, complying with ASTM D 578 and the following requirements for minimum weight:

1. Not less than 4.2 oz./sq. yd. (142 g/sq. m).

G. Base-Coat Materials: System manufacturer's standard mixture complying with the following requirements for material composition and method of combining materials:

1. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, natural color; clean, washed, silica sand complying with ASTM C 897 and system manufacturer's requirements; alkali-resistant chopped glass fibers; and polymer-emulsion admixture for base-coat use.
2. Factory-blended dry formulation of portland cement, natural sand aggregate, alkaline-resistant chopped glass fibers, and dry polymer admixture to which only water is added at Project site.
3. Either job-mixed or factory-blended formulation indicated above.

H. Polymer-Modified Portland Cement Finish-Coat Materials: Factory-blended formulation of portland cement, lime, natural color or white; natural sand aggregate and system manufacturer's requirements; color-fast mineral pigments; and system manufacturer's standard polymer-emulsion admixture for finish-coat use.

1. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.

I. Water: Potable.

J. Drip Screed: Provide Fry Reglet Corporation #DS-75-V-75, or equal product by another manufacturer.

1. Finish: Manufacturer's standard powder paint 3 coat finish system.
2. Color: As selected by the Architect from manufacturer's full line of standard colors.

K. Vented Soffit Molding: Provide Fry Reglet #WPM-50-V-300, or equal product by another manufacturer.

1. Finish: Manufacturer's standard powder paint 3 coat finish system.
2. Color: As selected by the Architect from manufacturer's full line of standard colors.

M. Miscellaneous Trim and Accessories: Type as designated or required to suit conditions indicated and to comply with system manufacturer's written requirements, manufactured from zinc alloy and complying with ASTM C 1063. Coordinate depth of accessories with thickness of base and finish coats required.

1. Control Joint: Prefabricated, one-piece V profile; designed to relieve stress of movement.

2.3 ELASTOMERIC SEALANTS

A. Elastomeric Sealant Products: Provide system manufacturer's listed and recommended chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials, and complies with requirements in Division 7 Section "Joint Sealants" for products corresponding to description indicated below:

1. Single component, neutral curing, silicone sealant.

B. Sealant Color: Comply with the following requirements:

1. Provide Architect's selections from manufacturer's full range of standard colors for type of sealant indicated.

2.4 MIXING

A. General: Comply with system manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by system manufacturer. Mix materials in clean containers. Use materials within time period specified by system manufacturer or discard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of system. Proceed with installation of system only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of systems. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect system, substrates, and wall construction behind them from inclement weather during installation. Prevent infiltration of moisture behind system and deterioration of substrates.

3.3 INSTALLATION

A. Comply with system manufacturer's written instructions for installation of system as applicable to each type of substrate indicated.

B. Exterior Cement Board: Install on metal framing to comply with cement board manufacturer's written instructions. Install board with steel drill screws spaced no more than 8 inches o.c. along framing with perimeter fasteners at least 3/8 inch but less than 5/8 inch from edges of boards.

1. Cover exterior cement board with a layer of asphalt-saturated organic felt.

C. Install control joints at locations indicated.

D. Install trim and accessories at locations indicated. Mechanically fasten accessories to framing members, masonry, or concrete.

1. Corner beads and control joints may be attached to insulation with threaded plastic fasteners when approved by system manufacturer.

E. Cover cement board with reinforcing mesh and fasten through cement board to framing members, masonry, or concrete. Reinforcing mesh is required as part of direct applied exterior finish system.

F. Apply base coat over and into reinforcing mesh in thickness specified by system manufacturer to produce a flush, uniform surface with mesh fully embedded and prepared to receive finish coat.

G. Apply finish coat over dry base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by system manufacturer to produce a uniform finish of color and texture matching approved sample.

1. Embed aggregate in finish coat according to system manufacturer's written instructions to produce a uniform applied-aggregate finish of color and texture matching approved sample.
2. Apply sealer coat over dry finish coat, in number of coats and thickness required by system manufacturer.

3.4 INSTALLATION OF JOINT SEALANTS

A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements in Division 7 Section "Joint Sealants".

1. Clean surfaces to receive sealants to comply with indicated requirements and system manufacturer's written instructions.
2. Apply primer recommended in writing by sealant manufacturer for surfaces to be sealed.
3. Install sealant backing to control depth and configuration of sealant joint and to prevent sealant from adhering to back of joint.
4. Apply masking tape to protect areas adjacent to sealant joints. Remove tape immediately after tooling joints, without disturbing joint seal.
5. Recess sealant sufficiently from surface of system so an additional sealant application, including backing rod, can be installed without protruding beyond system surface.
6. Apply joint sealants after base coat has cured but before applying finish coat.

3.5 CLEANING AND PROTECTING

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive system coatings.

B. Provide final protection and maintain conditions, in a manner acceptable to Installer and system manufacturer, that ensure system is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 072420

SECTION 072713 - MODIFIED BITUMINOUS SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes self-adhering, air/vapor/water membrane barrier consisting of an SBS rubberized asphalt compound, laminated to high strength polyethelene film, applied at the following locations:

1. Gypsum sheathing.
2. Plywood sheathing.
3. Concealed perimeter frames of windows, doors, and curtain wall.
4. Transition joints between dissimilar materials.
5. Construction joints, changes and gaps in substrate plane.
6. Other locations where shown on the Drawings.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 06 Section "Sheathing".
5. Division 07 Section "Thermal Insulation".
6. Division 07 Section “Fluid-Applied Membrane Air Barriers”.
7. Division 07 Section "Joint Sealants".

1.3 DEFINITIONS

A. ABAA: Air Barrier Association of America.

B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

1.5 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113."

1.6 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counter flashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1. Include details of interfaces with other materials that form part of air barrier.
2. Include details of mockups.

C. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with air barrier; signed by product manufacturer.

D. Qualification Data: For Applicator.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

1.7 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance and who is recognized by the manufacturer as suitable for the execution of the work.

B. Mockups: Before beginning installation of air barrier, build mockups of exterior wall assembly incorporating backup wall construction, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.

1. Include junction with roofing membrane.
2. If Architect and Commissioning Agent determine mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Pre-installation Conference: Conduct conference at Project site.

1. Include installers of other construction connecting to air barrier, such as roofing, waterproofing, architectural precast concrete, masonry, joint sealants, windows, glazed curtain walls, and door frames.
2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Store rolls according to manufacturer's written instructions.

D. Protect stored materials from direct sunlight.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental

conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

B. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

C. Low-Emitting Materials: Air barriers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 SELF-ADHERING SHEET AIR BARRIER

A. Modified Bituminous Sheet: 40-mil- thick, self-adhering sheet consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick, polyethylene film with release liner on adhesive side and formulated for application with low VOC water based primer.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Carlisle Coatings & Waterproofing; CCW-705.
   b. Grace, W. R. & Co.; Perm-A-Barrier.
   c. Henry Company; Blueskin SA.

2. Physical and Performance Properties:

   a. Membrane Air Permeance: Not to exceed 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
   c. Ultimate Elongation: 200 percent minimum; ASTM D 412, Die C, modified.
   d. Low-Temperature Flexibility: Pass at minus 20 deg F ASTM D 1970.
   e. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
   f. Puncture Resistance: 40 lbf minimum; ASTM E 154.
   g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
   h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

2.3 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.

C. Flashing Strip: Modified bituminous 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to a 9-mil- thick, crosslaminated polyethylene film with release liner backing.

D. Termination Mastic: Cold fluid-applied elastomeric liquid; trowel grade.

E. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

F. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

G. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0250 inch thick, and Series 300 stainless-steel fasteners.

H. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft. density; flame spread index of 25 or less according to ASTM E 162; with primer and non-corrosive substrate cleaner recommended by foam sealant manufacturer.

I. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

J. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

K. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Division 07 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.
5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

G. Bridge and cover isolation joints, expansion joints, and discontinuous deck-to-wall and deck-to-deck joints with overlapping modified bituminous strips.

H. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

I. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 INSTALLATION

A. Install modified bituminous sheets according to air barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.

B. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install modified bituminous strips centered over vertical inside corners. Install 3/4-inch fillets of termination mastic on horizontal inside corners.

C. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.

D. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

E. Apply and firmly adhere modified bituminous sheets horizontally over area to receive air barrier sheets. Accurately align sheets and maintain a uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure airtight installation.

1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
2. Roll sheets firmly to enhance adhesion to substrate.

F. Apply continuous modified bituminous sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.

G. Seal exposed edges of sheets at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

H. Install air barrier sheets and auxiliary materials to form a seal with adjacent construction and to maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over both substrates.

I. Connect and seal exterior wall air barrier membrane continuously to adjacent construction used in exterior wall openings using accessory materials according to manufacturer's tested assembly.

J. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip so that a minimum of 3 inches of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.

K. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

L. At end or each working day, seal top edge of membrane to substrate with termination mastic.

M. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

N. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air barrier sheet extending 6 inches) beyond repaired areas in all directions.

O. Do not cover air barrier until it has been inspected by Owner's testing agency.

P. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Remove and replace deficient air barrier components.

3.5 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed to these conditions for more than 30 days.
2. Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.

B. Clean spills, stains, and soiling from adjacent construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 072713

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Fluid-applied membrane air barrier, vapor retarding, applied to the following surfaces:

   a. Exterior face of concrete masonry and concrete backup at cavity wall construction.
   b. Other locations where shown on the Drawings.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Building requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 04 Section "Unit Masonry".
5. Division 07 Section "Thermal Insulation".
6. Division 07 Section "Modified Bituminous Sheet Air Barriers."
7. Division 07 Section "Joint Sealants".

1.3 DEFINITIONS

A. ABAA: Air Barrier Association of America.

B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

1.5 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: F or products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product Certification for Credit MRc5: F or products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13."

1.6 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

B. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1. Include details of interfaces with other materials that form part of air barrier.
2. Include details of mockups.

C. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

D. Qualification Data: For Applicator.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

1.7 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Mockups: Before beginning installation of air barrier, build mockups of exterior wall assembly, 150 sq. ft., to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane.

1. Coordinate construction of mockup to permit inspection by Owner's testing agency before external insulation and cladding is installed.
2. Include top and bottom of wall intersections.
3. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Preinstallation Conference: Conduct conference at Project site.

1. Include installers of other construction connecting to air barrier, including roofing, waterproofing, architectural precast concrete, masonry, sealants, windows, glazed curtain walls, and door frames.
2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Store rolls according to manufacturer's written instructions.

D. Protect stored materials from direct sunlight.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

B. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

C. Low-Emitting Materials: Air barriers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 FLUID-APPLIED MEMBRANE AIR BARRIER

A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Synthetic Polymer Membrane:

1) Grace, W. R. & Co.; Perm-A-Barrier Liquid.
2) Henry Company; Air-Bloc 32.
3) Rubber Polymer Corporation; Rub-R-Wall Airtight.

2. Physical and Performance Properties:

a. Membrane Air Permeance: Not to exceed 0.004 cfm x sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
b. Membrane Vapor Permeance: Not to exceed 0.1 perm ASTM E 96.

2.3 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Primer: Water based low VOC liquid primer recommended for substrate by manufacturer of air barrier material.

C. Counterflashing Strip: Modified bituminous, 40-mil- thick, self-adhering sheet consisting of 31 mils of rubberized asphalt laminated to a 9-mil- thick, crosslaminated polyethylene film with release liner backing.

D. Joint Reinforcing Strip: Air barrier manufacturer's glass-fiber-mesh tape.

E. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

F. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

G. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

H. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

I. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil- thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance of 37 perms.

J. Joint Sealants and Extrusions: Manufacturer’s standard system compatible with air barrier and adjoining surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.
5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of preparation coat strip extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of air barrier membrane and embed a joint reinforcing strip in preparation coat.

3.4 TRANSITION STRIP INSTALLATION

A. Install strips, transition strips, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane, modified bituminous sheet air barriers, and flashings.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, doors, and dissimilar materials. Apply transition strip so that a minimum of 3 inches of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Transition Strip: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, counterflashing strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.5 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane to form a seal with strips and transition strips and to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Re-prime areas exposed for more than 24 hours.

D. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.

1. Vapor-Retarding Membrane Air Barrier: 120-mil wet film thickness.

E. Overlap transition membranes a minimum of 1”.

F. Do not cover air barrier until it has been inspected by Owner's testing agency.

G. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements.

C. Remove and replace deficient air barrier components.

3.7 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed for more than manufacturer's written recommendations.
2. Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 074213 - METAL PLATE WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section includes metal plate wall panels.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.

6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: F or products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.

1. Include Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, tests performed by a qualified testing agency.

B. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal panel assembly including supports, attachments, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weather tight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leak-proof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.12 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft.

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F.

2.2 METAL PLATE WALL PANELS

A. Metal Plate Wall Panels: Provide factory-formed, metal plate wall panels fabricated from single sheets of metal formed into profile for installation method indicated. Include attachment assembly components, panel stiffeners, and accessories required for weather tight system.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Firestone UNA-CLAD SERIES 3000 Aluminum Plate Wall Panel System, or comparable product by another manufacturer

B. Panel Depth: 7/8 inches.

C. Aluminum Sheet: Tension-leveled, smooth aluminum sheet, ASTM B 209 0.125 inch thick.

1. Exterior Finish: Two-coat fluoropolymer.

a. Color: One custom color.

D. Attachment Assembly:

1. Aluminum clip angle.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, end walls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer. Provide sealant types that are compatible with panel materials, are nonstaining, and do not damage panel finish.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. Exposed Finish: Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. (Note that all sides are exposed at roof top and at grade mechanical screens.)
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install sub-framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support metal plate wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

E. Installation: Attach metal plate wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.

1. Wet Seal Systems: Seal horizontal and vertical joints between adjacent metal plate wall panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 079200 "Joint Sealants."

F. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by manufacturer. Attach flanges of metal plate wall panels to panel clips with fasteners as recommended by manufacturer.

1. Seal horizontal and vertical joints between adjacent metal plate wall panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 079200 "Joint Sealants."
2. Seal horizontal and vertical joints between adjacent metal plate wall panels with manufacturer's standard gaskets.

G. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended in writing by metal panel manufacturer.

H. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal plate wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform field tests and inspections.

B. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213

SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) VEGETATIVE ROOF SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Adhered TPO membrane roofing system.
2. Cover board.
3. Roof insulation.
4. Pre-grown modular planting system including containers, growing media, and plants.
5. All accessories required for a complete system.

C. Related Sections:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 01 Section “Alternates”.
5. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
6. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
7. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
8. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

A. TPO: Thermoplastic polyolefin.

B. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7 for wind speed specified.

D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

1. Class 60 field.
2. Class 90 perimeter.
3. Class 120 corners.

E. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

1.5 LEED SUBMITTALS

A. MRc4: “Product data for Credit MRc4: F or products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: “Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional.”

C. IEQc4.1: “Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer’s name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.”

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
2. Roof insulation.
3. Walkway pads or rolls.
4. Metal termination bars.
5. Six insulation fasteners of each type, length, and finish.
6. Six roof cover fasteners of each type, length, and finish.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

D. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

E. Field quality-control reports.

F. Warranties: Sample of special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and FM Approvals approved for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Source Limitations: Obtain all components for membrane roofing system from same manufacturer as membrane roofing.

D. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

E. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.11 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, roofing accessories, roof pavers, planting modules, edge metal, engineered growth medium, and other components of membrane roofing system.
2. Warranty Period: 30 years from date of Substantial Completion.

B. Plant Growth Warranty: Submit roofing Manufacturer's warranty, in which manufacturer agrees to plant additional vegetation to restore plant coverage to 50% of the garden roof area 12 months from the date of installation and 80% of the garden roof 24 months from the date of installation, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC POLYOLEFIN (TPO) VEGETATIVE ROOF SYSTEM

A. Manufacturers: Basis of Design product; subject to compliance with requirements, provide Firestone Skyscape Vegetative Roof System with TPO membrane, or equal products by one of the following:

a. Carlisle SynTec Incorporated.
b. GAF Materials Corporation.
c. GenFlex Roofing Systems.
d. Stevens Roofing Systems; Division of JPS Elastomerics.
e. Versico Incorporated.

2.2 TPO MEMBRANE ROOFING

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible TPO sheet.

1. Thickness: 80 mils, nominal.
2. Exposed Face Color: Tan.

2.3 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

   a. Plastic Foam Adhesives: 50 g/L.
   b. Gypsum Board and Panel Adhesives: 50 g/L.
   c. Multipurpose Construction Adhesives: 70 g/L.
   d. Fiberglass Adhesives: 80 g/L.
   e. Sealant Primers for Nonporous Substrates: 250 g/L.
   f. Sealant Primers for Porous Substrates: 775 g/L.

3. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive for membrane, and base flashings.

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

E. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick prepunched.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 COVER BOARDS

A. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Georgia-Pacific Corporation; Dens Deck.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.5 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2 felt or glass-fiber mat facer on both major surfaces.

   1. R-Value per inch: 6.05.
   2. Minimum thickness and R-Value: 4”, 24.2 R.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches where indicated on the Drawings.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.6 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

2.7 VEGETATIVE ROOF PREGROWN MODULAR SYSTEM (Alternate No. 1)

A. Module: Provide manufacturer’s standard interlocking module, approximately 6” deep, made from recycled high density polyethylene, with perforated sides:

B. Growing Media: Light weight media, meeting German FLL standards, blended to fit the growing conditions at the project site.

C. Plants: Hardy Sedums.

D. Edging: 6” x 3” mill finish aluminum.

E. Maximum system weight after installation (fully wet) not to exceed 32 lbs/sq.ft.

2.8 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and 30” wide of same color as sheet membrane, and acceptable to membrane roofing system manufacturer.

B. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
4. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

   1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

   1. Fasten first layer of insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
   2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
   3. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.

   1. Fasten cover boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
   2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.4 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings.

3.6 VEGETATIVE ROOF PREGROWN MODULAR SYSTEM INSTALLATION

A. Schedule installation after April 15 and before October 15, and when the ambient temperature is between 45 degrees F and 95 degrees F.

B. Proceed with installation only after the final roof inspection has been completed and all punch list items have been addressed. Provide written confirmation from the manufacturer’s technical

representative that inspection and resolution of punch list items are fully completed and installation may commence.

C. Prior to installation, remove all debris, dirt or foreign materials from the membrane surface.

D. Provide a temporary protective layer over all installation traffic areas.

E. Protect roofing membrane from installation tools.

F. Install pre-planted modules the day they are delivered. If this cannot be accomplished, lay individually in a shaded location, and keep moist.

G. Follow manufacturer’s written instructions for installation of inspection chambers, pre-grown modules, and edging.

H. Water thoroughly without soaking.

3.7 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following sheet metal flashing and trim:

1. Manufactured reglets.
2. Custom and site-fabricated roof flashing and trim.
3. Custom and site-fabricated wall flashing and trim.
4. Formed equipment support flashing.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 06 Section "Miscellaneous Rough Carpentry” for wood nailers, curbs, and blocking.
5. Division 07 Section "Metal Plate Wall Panels" for metal wall panels and accessories specified as part of that system.
6. Division 07 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Low slope roof edge and coping attachment cleats shall be tested and approved for compliance with ANSI-SPRI

C. Fabricate and install flashing capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:

1. Wind Zone 1: For velocity pressures of 21 to 30 lbf/sq. ft.

D. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

E. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.4 LEED SUBMITTALS

A. M Rc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

D. IEQ c4.2: "Manufacturer's product data for paints and coatings, including printed statement of VOC content."

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
4. Details of termination points and assemblies, including fixed points.
5. Details of special conditions.

C. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with specified finishes.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12 inches long. Include fasteners, closures, and other attachments.
2. Trim: 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: Full-size Sample.

1.6 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.8 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leak-proof, secure, and non-corrosive installation.

PART 2 - PRODUCTS

2.1 EXPOSED SHEET METALS

A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

b. Color: One custom color.

2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.2 CONCEALED SHEET METALS

A. Stainless-Steel Sheet: ASTM A 167, Type 304, soft annealed, with No. 2D finish (dull, cold rolled), except where harder temper is required for forming or performance; minimum 0.0187 inch thick, unless otherwise indicated.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
c. Henry Company; Blueskin PE200 HT.

4. Accessories: Provide manufacturer’s standard accessories necessary for a complete installation.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Series 300 stainless steel fasteners designed to withstand design loads.

1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
3. Blind Fasteners: High-strength stainless-steel rivets.

C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

D. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight, and complying with requirements of Division 7 Section “Joint Sealants”.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 ROOF SHEET METAL FABRICATIONS

A. Flashing: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long sections. Furnish with 6-inch- wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch- wide, concealed backup plate.
2. Fabricate from the Following Materials:

   a. Aluminum: 0.050 inch thick.

3. Finish: Two-coat fluoropolymer.

   a. Color: One custom color.

B. Counterflashing: Fabricate from the following materials:

1. Aluminum: 0.050 inch thick.

2.6 EMBEDDED METAL FLASHING EXPOSED OR PARTLY EXPOSED TO VIEW

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, at base of masonry walls. Fabricate discontinuous flashings with 2-inch- high, end dams. Flashing to begin with ½-inch upturned leg at face of back-up wall and extend to outside face of wall, turn down with full back bend. Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

B. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Cheney Flashing Company.
   b. Fry Reglet Corporation.
   c. Heckmann Building Products Inc.
   d. Hickman, W. P. Company.
   e. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
   f. Keystone Flashing Company, Inc.
   g. National Sheet Metal Systems, Inc.
   h. Sandell Manufacturing Company, Inc.

2. Material: Stainless Steel: 0.025 inch thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
5. Accessories:

   a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
   b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.7 ROOF-EDGE FASCIAS

A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of metal fascia cover in section lengths not exceeding 12 feet and a continuous formed- or extruded-aluminum anchor bar with integral drip-edge cleat to engage fascia cover. Provide matching corner units.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc; Anchor-Tite Fascia in profiles shown on the Drawings, or comparable product by one of the following:

    a. Hickman Company, W. P.
    b. Johns Manville.
    c. Metal-Fab Manufacturing, LLC.
    d. National Sheet Metal Systems, Inc.
    e. Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.

2. Fascia Cover: Fabricated from the following exposed metal:

    a. Formed Aluminum.

        1) Thickness: 0.040 inch.
        2) Finish: Two-coat fluoropolymer, one custom color.

3. Corners: Factory mitered.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Overhead-Piping Safety Pans: Fabricate from the following materials:

1. Galvanized Steel: 0.040 inch thick.

B. Closure Panels: Fabricate continuous panels to profiles indicated, without joints, from the following materials:

1. Aluminum: 0.032 inch thick.
2. Finish: Two-coat fluoropolymer.

    a. Color: Match Architect's sample.

2.9 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant concealed within joints.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" and FMG Loss Prevention Data Sheet 1-49 for application but not less than thickness of metal being secured.

2.10 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of underlayment.
2. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
3. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or

intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

G. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

H. Seal joints with elastomeric sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

I. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.

1. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.

D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
2. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

E. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

3.4 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing: Installation of through-wall flashing in masonry walls is specified in Division 04 Section "Unit Masonry."

3.5 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07620

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Roof Hatches.
2. Automatic Heat and Smoke Vents.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, recycling, and disposing of non hazardous waste.
3. Division 01 Section "Facility Exterior Envelope Commissioning Requirements".
4. Division 28 Section "Digital Addressable Fire Alarm System" for interconnects to automatically operated heat and smoke vents.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.4 LEED SUBMITTALS

A. MRC4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

1.5 SUBMITTALS

A. Product Data: For each type of roof accessory indicated.

B. Shop Drawings: Show fabrication and installation details for roof accessories.

1.6 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated.

B. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and mill finish.

2.3 ROOF HATCHES

A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated double-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.

1. Manufacturers:

a. Babcock-Davis; a Cierra Products Inc. Company.
b. Bilco Company (The).
c. Milcor Inc.; a Gibraltar Company.
d. Nystrom, Inc.
e. O'Keeffe's Inc.

2. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
3. Type and Size: Single-leaf lid, 36 x 60 inches.
4. Curb and Lid Material: Aluminum sheet, 0.090 inch.

   a. Finish: Mill.

5. Insulation: Manufacturers standard board.
6. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
7. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
8. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
9. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
10. Ladder Safety Post: Manufacturer's standard ladder safety post. Post to lock in place on full extension. Provide release mechanism to return post to closed position.
11. Safety Railing System: Manufacturer's standard complete system including rails, clamps, fasteners, safety barrier at railing opening, and all accessories required for a complete installation.

    a. Test Load: Concentrated load of 200 lbf applied in any direction.
    b. Height: 42 inches above finished roof deck.
    c. Pipe or Tube: 1-1/4-inch ID galvanized pipe or 1-5/8-inch OD galvanized tube.
    d. Flat Bar: 2-inch- high by 3/8-inch- thick galvanized steel.
    e. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
    f. Pipe Ends and Tops: Covered or plugged with weather-resistant material.
    g. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
    h. Fabricate joints that will be exposed to weather in a watertight manner.
    i. Close exposed ends of handrail and railing members with prefabricated end fittings.
    j. Fasteners: Manufacturer's standard.

B. Automatic Heat and Smoke Vents: UL listed automatic smoke vents with insulated double-wall lids and insulated double-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware. Provide self-lifting mechanisms designed to operate automatically with fusible links and tie in to the buildings automatic sprinkler system.

1. Manufacturers:

    a. Babcock-Davis; a Cierra Products Inc. Company.
    b. Bilco Company (The).
    c. Milcor Inc.; a Gibraltar Company.
    d. Nystrom, Inc.
    e. O'Keeffe's Inc.

2. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
3. Type and Size: Double-leaf lid, 1 @ 48 x 72 inches, 1 @ 48” x 90”.
4. Curb and Lid Material: Aluminum sheet, 0.090 inch.

    a. Finish: Mill.

5. Insulation: Manufacturers standard board.
6. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
7. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
8. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
9. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
10. Lifting Mechanism: High performance gas spring operators capable of opening lids against wind and snow loads indicated on structural drawings, automatically locking in fully open position.
11. Heat and Smoke Vent Standard: Provide units that have been tested and listed to comply with UL 793 and are FM Approved.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

E. Seal joints with sealant as required by manufacturer of roof accessories.

F. Roof-Hatch Installation:

1. Install roof hatch so top surface of hatch curb is level.
2. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
3. Attach safety railing system to roof-hatch curb.
4. Attach ladder-assist post according to manufacturer's written instructions.

G. Heat and Smoke Vent Installation:

1. Install heat and smoke vent so top perimeter surfaces are level.
2. Install and test heat and smoke vents and their components for proper operation according to NFPA 204.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Clean exposed surfaces according to manufacturer's written instructions.

C. Clean off excess sealants.

D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078413 - PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:

1. Floors.
2. Roofs.
3. Walls and partitions.
4. Smoke barriers.
5. Construction enclosing compartmentalized areas.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/ CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division0 3 Section “Cast-In Place Concrete” for construction of openings in concrete slabs and walls.
5. Division 04 Section “Unit Masonry” for joint fillers for non-fire-resistive-rated joint sealants.
6. Division 07 "Thermal Insulation" for safing insulation and accessories.
7. Division 07 Section “Joint Sealants” for non-fire-resistive-rated joint sealants.
8. Division 15 Sections specifying duct and piping penetrations.
9. Division 16 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.

1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
3. Fire-resistance-rated floor assemblies.
4. Fire-resistance-rated roof assemblies.

B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

1. Penetrations located outside wall cavities.
2. Penetrations located outside fire-resistive shaft enclosures.
3. Penetrations located in construction containing fire-protection-rated openings.
4. Penetrating items larger than 4-inch- diameter nominal pipe or 16 sq. in overall cross-sectional area.

D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

E. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.4 LEED SUBMITTALS

A. M Rc4: “Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113."

D. IEQc4.2: "Manufacturer's product data for paints and coatings, including printed statement of VOC content."

1.5 SUBMITTALS

A. Product Data: For each type of through-penetration firestop system product indicated.

B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.

E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is qualified by having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A

manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.

B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:

   a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
   b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:

      1) UL in "Fire Resistance Directory."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A/D Fire Protection Systems Inc.
2. DAP Inc.
3. Firestop Systems Inc.
4. Hilti Construction Chemicals, Inc.
5. Isolatek International.
6. RectorSeal Corporation (The).
7. 3M Fire Protection Products.
8. Tremco.
9. United States Gypsum Company.

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:

   a. Slag-/rock-wool-fiber insulation.

b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
c. Fire-rated form board.
d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Intumescent Latex Sealants: Single-component intumescent latex formulation.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: The Owner’s Agent will engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports.

1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.

B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.

C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.5 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Joints in or between fire-resistance-rated constructions.

C. Related Sections:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/ CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.
3. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.3 LEED SUBMITTALS

A. M Rc4: “Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: “Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional.”

C. IEQc4.1: “Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer’s

name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113."

D. IEQc4.2: "Manufacturer's product data for paints and coatings, including printed statement of VOC content."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

C. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.

B. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in

construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:

a. Fire-resistive joint system products bear classification marking of qualified testing agency.
b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:

1) UL in its "Fire Resistance Directory."

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:

1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies, and roofs or roof/ceiling assemblies.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
3. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. A/D Fire Protection Systems Inc.
    b. CEMCO.
    c. Fire Trak Corp.
    d. Grace Construction Products.
    e. Hilti, Inc.
    f. Johns Manville.
    g. Nelson Firestop Products.
    h. NUCO Inc.
    i. Passive Fire Protection Partners.
    j. RectorSeal Corporation.
    k. Specified Technologies Inc.
    l. 3M Fire Protection Products.
    m. Tremco, Inc.; Tremco Fire Protection Systems Group.
    n. USG Corporation.

C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

D. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

E. Low-Emitting Materials: Fire-resistive joint system sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for

the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

G. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with Part 1 “Performance Requirements” Article and manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

B. Floor-to-Floor, Fire-Resistive Joint Systems:

1. UL-Classified Systems: FF-D- 0000-1999.
2. Assembly Rating: Equal to the rating of the adjacent construction.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II.

C. Wall-to-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: WW-D-0000-1999.
2. Assembly Rating: Equal to the rating of the adjacent construction.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II.

D. Floor-to-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: FW- D-0000-1999.
2. Assembly Rating: Equal to the rating of the adjacent construction.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II.

E. Head-of-Wall, Fire-Resistive Joint System:

1. UL-Classified Systems: HW-D-0000-1999.

2. Assembly Rating: Equal to the rating of the wall.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II.

F. Perimeter Fire-Resistive Joint Systems:

1. UL-Classified Perimeter Fire-Containment Systems: CW-D.
1. Assembly Rating: Equal to the rating of the adjacent construction.
2. Nominal Joint Width: As indicated.
3. Movement Capabilities: Class II.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes sealants for the following applications, including those specified by reference to this Section:

C. This Section includes sealants for the following applications:

1. Exterior joints in the following vertical surfaces and non-traffic horizontal surfaces:

   a. Joints between different materials.
   b. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:

   a. Joints between different materials.
   b. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal non-traffic surfaces:

   a. Perimeter joints of exterior openings where indicated.
   b. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
   c. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
   d. Other joints as indicated.

D. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/ CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.

3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 07 Section "Through-Penetration Firestop Systems" for fire-resistant building joint-sealant systems.
5. Division 08 Section "Glazing" for glazing sealants.
6. Division 09 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1. Comply with VOC requirements specified in Division 01 Section “VOC Limits for Adhesives, Sealants, Paints, and Coatings.”

1.4 LEED SUBMITTALS

A. M Rc4: “Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: “Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional.”

C. IEQc4.1: “Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer’s name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.”

D. IEQc4.2: “Manufacturer’s product data for paints and coatings, including printed statement of VOC content.”

1.5 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
3. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified in the sealant schedules at the end of Part 3.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

2.4 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Type C: Closed-cell material with a surface skin.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

E. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.6 ELASTOMERIC JOINT-SEALANT SCHEDULE

A. Single-Component Silicone Sealant: For miscellaneous joints between exterior materials provide:

1. Products:

    a. Dow Corning Corporation; 790.
    b. GE Silicones; SilPruf SCS2000.
    c. Pecora Corporation; 864.
    d. Pecora Corporation; 890.
    e. Polymeric Systems Inc.; PSI-641.
    f. Sonneborn, Division of ChemRex Inc.; Omniseal.
    g. Tremco; Spectrem 3.

2. Type and Grade: S (single component) and NS (non-sag).
3. Class: 50.
4. Use Related to Exposure: NT (non-traffic).
5. Stain-Test-Response Characteristics: Non-staining to porous substrates per ASTM C 1248.

B. Latex Sealant : For miscellaneous joints between interior materials provide:

1. Products:

    a. Bostik Findley; Chem-Calk 600.
    b. Pecora Corporation; AC-20+.
    c. Tremco; Tremflex 834.

2. Type and Grade: P and NF.
3. Use Related to Exposure: NT (nontraffic).

C. Multi-component Pourable Urethane Sealant: For joints in horizontal traffic surfaces provide:

1. Products:

    a. SL 2; Sonneborn Building Products Div., ChemRex Inc.
    b. THC-900; Tremco.
    c. THC-901; Tremco.

2. Type and Grade: M (multi-component) and P (pourable).
3. Class: 25.

D. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant: Interior joints between plumbing fixtures or kitchen equipment and adjoining walls and floors.

1. Available Products:

    a. Pecora Corporation; 898.
    b. Tremco; Tremsil 600 White.

2. Type and Grade: S (single component) and NS (non-sag).
3. Class: 25.
4. Use Related to Exposure: NT (non-traffic).

5. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated, O.

E. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, non-staining latex sealant complying with ASTM C 834 and the following:

1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
2. Available Products:

   a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
   b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

END OF SECTION 079200

SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section includes hollow-metal work.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 04 Section "Unit Masonry" for building anchors into and grouting frames in masonry construction.
5. Division 08 Section “Door Hardware” for door hardware and weather stripping.
6. Division 08 Section "Glazing" for glass in doors and sidelights or borrowed lights.
7. Division 09 Section "Gypsum Board" for steel stud and gypsum board partitions.
8. Division 09 Section "Painting" for field painting primed doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13."

1.6 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, sound and fire-resistance ratings, and finishes for each type of door and frame specified.

B. Shop Drawings: Show fabrication and installation of doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, dimensions of profiles and hardware preparation, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessories.

C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Drawings.

1. Coordinate glazing frames and stops with glass and glazing requirements.

D. Product Certificates: Signed by manufacturers of doors certifying that products furnished comply with or exceed the acceptance criteria of ANSI A250.4 for Level A doors.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing custom steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: Test at atmospheric pressure.

2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
3. Temperature-Rise Rating: If indicated, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.

C. Smoke-Control Door Assemblies: Comply with NFPA 105.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Inspect doors and frames, on delivery, for damage. Minor damage may be repaired provided refinished items match new work and are approved by Architect; otherwise, remove and replace damaged items as directed.

D. Store doors and frames under cover at building site. Place units on minimum 4-inch- high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

1.9 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors and frames that may be incorporated into the Work include, but are not limited to, the following:

1. Steel Doors and Frames:

   a. Amweld Building Products, Inc.
   b. Ceco Door Products.
   c. Kewanee Corporation.
   d. National Custom Hollow Metal Doors & Frames.

e. Pioneer Industries.
f. Steelcraft; a division of Ingersoll-Rand.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A 1011/A 1011M, CS (commercial steel), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Steel Sheets: ASTM A 1008/A 1008M, CS (commercial steel), Type B; suitable for exposed applications.

C. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, CS (commercial steel), Type B; with G60 zinc (galvanized) coating.

D. Frame Anchors: ASTM A 591/A591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.

1. Where items are to be built into exterior walls, steel sheet complying with ASTM A1008/A 1008M or ASTM 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu.ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

H. Glazing: Comply with requirements in Division 8 Section “Glazing”.

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

J. Recycled Content: Provide doors and frames with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 25 % percent by weight

2.3 CUSTOM HOLLOW METAL DOORS

A. General: Provide flush-design doors, 1-3/4 inches thick, of seamless hollow construction, unless otherwise indicated. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or stile edges. Comply with ANSI/NAAMM-HMMA 861.

1. For single-acting swing doors, bevel both vertical edges 1/8 inch in 2 inches.

2. For double-acting swing doors, round vertical edges with 2-1/8-inch radius.

B. Metallic Core Construction: Provide the following core construction welded to both door faces:

1. Steel-Stiffened Core: 0.026-inch steel vertical stiffeners extending full-door height, spaced not more than 6 inches apart and spot welded to face sheets a maximum of 5 inches o.c. Fill spaces between stiffeners with mineral-fiber insulation.

C. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.

D. Astragals: As required by NFPA 80 to provide fire ratings indicated.

E. Top and Bottom Channels: Spot weld closed, continuous metal channel not less than thickness of face sheet to face sheets not more than 6 inches o.c.

1. Reinforce tops and bottoms of doors with inverted horizontal channels of same material as face sheet so flanges of channels are even with bottom and top edges of face sheets.
2. For exterior doors, close bottom edge with metallic-coated steel closing channel and top edge with filler channel of same material, so webs of channels are flush with bottom and top door edges.

F. Hardware Reinforcement: Fabricate reinforcing plates from the same material as door to comply with ANSI/NAAMM-HMMA 861 and the following:

1. Hinges and Pivots: 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Lock Face, Flush Bolts, Closers, and Concealed Holders: 0.093 inch thick.
3. All Other Surface-Mounted Hardware: 0.053 inch thick

G. Interior Doors: Fabricate face sheets of doors from two 0.0478 inch- thick (18-gauge), cold-rolled, stretcher-leveled steel sheets and other metal components from hot- or cold-rolled steel sheets.

H. Exterior Steel Doors: Fabricate face sheets of doors from two 0.0785-inch- thick (14-gauge), stretcher-leveled, metallic-coated steel sheets. Provide weep-hole openings in bottom of doors to permit entrapped moisture to escape. Seal joints in top edges of doors against water penetration.

2.4 PANELS

A. Provide panels of same materials, construction, and finish as specified for doors.

2.5 CUSTOM HOLLOW METAL FRAMES

A. Fabricate frames of full-welded unit construction, with corners mitered, reinforced, and continuously welded full depth and width of frame. Knockdown frames are not acceptable. Comply with ANSI/NAAMM-HMMA 861.

1. For exterior use, form frames from 0.1084 inch- thick (12-gauge), metallic-coated steel sheets.
2. For interior use, form frames from cold-rolled steel sheet of the following thicknesses:

    a. Openings up to and Including 48 Inches Wide: 0.0598 inch (16-gauge).
    b. Openings More Than 48 Inches Wide: 0.067 inch (15-gauge).

B. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 861 from same material as frame.

C. Mullions and Transom Bars: Provide closed or tubular mullions and transom bars where indicated. Fasten mullions and transom bars at crossings and to jambs by butt welding. Reinforce joints between frame members with concealed clip angles or sleeves of same metal and thickness as frame.

    1. Provide false head member to receive lower ceiling where frames extend to finish ceilings of different heights.

D. Head Reinforcement: Where installed in masonry, leave vertical mullions in frames open at top for grouting. Provide minimum 0.093-inch thick steel channel or angle stiffener for full width of opening, welded to back of frame at head, for openings more than 48 inches.

E. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

F. Jamb Anchors: Weld jamb anchors to frames near hinges and directly opposite on strike jamb as required to secure frames to adjacent construction.

    1. Masonry Construction: Adjustable, flat, corrugated, or perforated T-shaped anchors to suit frame size; formed of same material as frame; not less than 0.053 inch thick; with leg not less than 2 inches wide by 10 inches long. Furnish at least the number of anchors per jamb according to the following frame heights:

        a. Two anchors per jamb up to 60 inches in height.
        b. Three anchors per jamb from 60 to 90 inches in height.
        c. Four anchors per jamb from 90 to 96 inches in height.
        d. One additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.

    2. Metal-Stud Partitions: Insert type with notched clip to engage metal stud, welded to back of frames, formed of same material as frame, not less than 0.042 inch thick. Provide at least the number of anchors for each jamb according to the following heights:

        a. Three anchors per jamb up to 60 inches in height.
        b. Four anchors per jamb from 60 to 90 inches in height.
        c. Five anchors per jamb from 90 to 96 inches in height.
        d. One additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.

3. In-Place Concrete or Masonry: Anchor frame jambs with minimum 3/8-inch- diameter concealed bolts into expansion shields or inserts 6 inches from top and bottom and 26 inches o.c., unless otherwise indicated. Reinforce frames at anchor locations. Except for fire-rated openings, apply removable stop to cover anchor bolts, unless otherwise indicated.

G. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, formed of same material as frame, 0.067 inch thick, as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners, welded to bottom of jambs and mullions.
2. Separate Topping Concrete Slabs: Adjustable type with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

H. Head Anchors: Provide 2 head anchors for frames more than 42 inches wide and mounted in steel-stud walls.

I. Head Strut Supports: Provide 3/8-by-2-inch vertical steel struts extending from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.

J. Structural Reinforcing Members: Provide as part of frame assembly, where indicated at mullions, transoms, or other locations to be built into frame.

K. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.

L. Rubber Door Silencers: Except on weather-stripped doors, drill stop in strike jamb to receive three silencers on single-door frames and drill head jamb stop to receive two silencers on double-door frames. Install plastic plugs to keep holes clear during construction.

M. Plaster Guards: Provide 0.016-inch- thick plaster guards or dust-cover boxes of same material as frame, welded to frame at back of hardware cutouts to close off interior of openings and prevent mortar or other materials from obstructing hardware operation.

2.6 STOPS AND MOLDINGS

A. Provide stops and moldings around panels where indicated.

B. Form fixed stops and moldings integral with frame, and a minimum of 5/8 inch high, unless otherwise indicated.

C. Provide removable stops and moldings where indicated or required, formed of 0.032-inch- thick steel sheets matching steel frames. Secure with countersunk flat or oval head machine screws spaced uniformly not more than 12 inches o.c. Form corners with butted hairline joints.

D. Coordinate rabbet width between fixed and removable stops with type of glass or panel and type of installation indicated.

2.7 FABRICATION

A. Fabricate doors and frames rigid, neat in appearance, and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.

1. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/NAAMM-HMMA 861.
2. Fabricate doors to comply with performance level of ANSI A250.4 for a Level A door.

B. For doors with metallic core construction, weld cores to both door face sheets.

C. Exposed Fasteners: Provide countersunk flat or oval heads for exposed screws and bolts, unless otherwise indicated.

D. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors and frames fabricated as thermal-insulating assemblies and tested according to ASTM C 1363.

1. Provide thermal-rated assemblies with U-factor of 0.3 Btu/sq. ft. x h x deg F unless otherwise indicated.

E. Hardware Preparation: Prepare doors and frames to receive hardware, including cutouts, reinforcement, mortising, drilling, and tapping, according to final hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Series specifications for door and frame preparation for hardware.

1. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
2. Locate hardware as indicated or, if not indicated, according to HMMA 830, "Hardware Preparation and Locations for Custom Hollow Metal Doors and Frames."

2.8 FINISHES, GENERAL

A. Apply primer immediately after cleaning and pre-treating.

B. Finish products specified in this Section after fabrication.

2.9 METALLIC-COATED STEEL FINISHES

A. Surface Preparation: Clean surfaces with non-petroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to

be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

B. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, primer complying with ANSI A224.1 acceptance criteria; recommended by primer manufacturer for zinc-coated steel; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

2.10 STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

B. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, corrosion-inhibiting, lead- and chromate-free, universal primer complying with ANSI/SDI A250.10 acceptance criteria; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

a. Comply with Division 01 Section “VOC Limits for Adhesives, Sealants, Paints, and Coatings” for primer applied in the field for touch-up.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install doors and frames according to HMMA 840 and manufacturer's written instructions.

B. Frames: Install steel frames for doors, transoms, sidelights, borrowed lights, and other openings, of size and profile indicated.

1. Set masonry anchorage devices where required for securing frames to in-place concrete or masonry construction.

    a. Set anchorage devices opposite each anchor location according to details on Shop Drawings and anchorage device manufacturer's written instructions. Leave drilled holes rough, not reamed, and free of dust and debris.

2. Floor anchors may be set with powder-actuated fasteners instead of masonry anchorage devices and machine screws, if so indicated on Shop Drawings.
3. Placing Frames: Set frames accurately in position; plumb; align, and brace securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

    a. At existing concrete or masonry construction, set frames and secure in place with machine screws and masonry anchorage devices.
    b. At fire-rated openings, install frames according to NFPA 80.
    c. Field splice only at approved locations. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.
    d. Remove spreader bars from each frame only after frame is properly set and secured.

4. Fill frames at concrete and masonry walls with grout.
5. Fill frames at metal stud partitions with insulation.

C. Doors: Fit non-fire-rated doors accurately in their respective frames, with the following clearances:

1. Jambs and Head: 3/32 inch.
2. Meeting Edges, Pairs of Doors: 1/8 inch.
3. Bottom: 3/8 inch if no threshold or carpet.
4. Bottom: 1/8 inch at threshold or carpet.

D. Fire-Rated Doors: Install with clearances as specified in NFPA 80.

E. Smoke Control Doors: Install according to NFPA 105.

3.2 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items just before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames that are warped, bowed, or otherwise unacceptable.

B. Prime-Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

END OF SECTION 081113

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Insulated service door at loading dock.

C. Related Sections:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section "Facility Exterior Envelope Commissioning Requirements".
4. Division 05 section "Metal Fabrications" for miscellaneous steel supports.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design overhead coiling doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.

1. Wind Loads:

a. Basic Wind Speed: 100 mph.
b. Importance Factor: 1.15.
c. Exposure Category: B.

2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.

C. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.

D. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.4 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

1.5 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:

1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

D. Delegated-Design Submittal: For overhead coiling doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Summary of forces and loads on walls and jambs.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling door manufacturer.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of overhead door and operator system that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.
b. Faulty operation of doors and door operators.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: 36 months/20,000 cycles on door and operator system.

PART 2 - PRODUCTS

2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch and as required to meet requirements.

2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within slat faces.
3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
4. Gasket Seal: Provide insulated slats with manufacturer's standard continuous gaskets between slats.

B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from manufacturer's standard hot-dip galvanized steel, stainless steel, or aluminum extrusions to match curtain slats and finish.

D. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.2 HOOD

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: 24 ga., hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.
2. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.3 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

B. Chain Lock Keeper (emergency chain-hoist operation): Suitable for padlock.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.4 CURTAIN ACCESSORIES

A. Seals: Equip each service door with gaskets fitted to entire perimeter of door for a tight installation, unless otherwise indicated.

1. At door head, use 1/8-inch- thick, replaceable, continuous sheet secured to inside of hood.
2. At door jambs and bottom bar, use replaceable, adjustable, continuous, flexible, 1/8-inch-thick seals of flexible vinyl, rubber, or neoprene.

B. Push/Pull Handles: Equip each emergency-operated door with lifting handles on each side of door, finished to match door.

2.5 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.6 ELECTRIC DOOR OPERATORS

A. General: Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycle requirements specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc

B. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging chain and sprocket operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

C. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

D. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, ac or dc.

E. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors complying with NEMA MG 1; with overload protection; sized to start, accelerate, and operate door in either direction from any position, at not less than 2/3 fps and not more than 1 fps, without exceeding nameplate ratings or service factor.

F. Operator Controls: Key operated, three-button flush mounted control station with push-button controls labeled "Open," "Close," and "Stop."

G. Obstruction Detection Device: Provide each motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of sensor immediately stops and reverses downward door travel.

1. Sensor Edge: Provide each motorized door with an automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor immediately stops and reverses downward door travel. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

a. Provide electrically actuated automatic bottom bar.

H. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

I. Provide electric operators with ADA-compliant audible alarm and visual indicator lights.

J. Automatic Closure: Operating mechanism shall be disengaged during automatic closing. Automatic closing shall be controlled by a governor with an average closing speed of not less than 6”/sec., or more than 24”/sec.

2.7 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Corporation; Stormtite 625 or comparable product by one of the following:

a. ACME Rolling Doors.
b. Alpine Overhead Doors, Inc.

c. AlumaTek, Inc.
d. C.H.I. Overhead Doors.
e. City-Gates.
f. Cookson Company.
g. Cornell Iron Works, Inc.
h. Dynamic Closures Corp.
i. Lawrence Roll-Up Doors, Inc.
j. Mahon Door Corporation.
k. McKeon Rolling Steel Door Company, Inc.
l. Metro Door.
m. QMI Security Solutions.
n. Raynor.
o. Southwestern Steel Rolling Door Co.
p. Wayne-Dalton Corp.
q. Windsor Door.

B. Operation: Electric motor operator, with emergency chain hoist operation.

C. Operation Cycles: Not less than 20,000.

D. STC Rating: 21 minimum.

E. Curtain R-Value: 7.7.

F. Door Curtain Material: 24 ga. galvanized steel.

G. Door Curtain Slats: Flat profile, insulated.

H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

I. Hood: 24 ga. galvanized steel.

1. Mounting: Face of wall.

J. Locking Devices: Equip door with slide bolt for padlock.

K. Door Finish:

1. PowerGuard Premium Polyester Powder-Coated Finish (Tiger Drylac RAL): Color as selected by Architect from manufacturer's full color selection range. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Perform installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide weathertight fit around entire perimeter.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

SECTION 084113 – ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Manual-swing aluminum doors and frames.
2. Externally glazed, thermal clip aluminum storefront system with operable windows.
3. Butt glazed aluminum storefront ribbon system.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 01 Section “Quality Control” for additional requirements related to mockup.
5. Division 07 Section "Joint Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
6. Division 08 Section "Finish Hardware" for hardware to the extent not specified in this Section.
7. Division 08 Section "Glazing" for glazing requirements to the extent not specified in this Section.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum-framed systems, including anchorage and steel reinforcing (whether or not indicated in the drawings), capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Movements of supporting structure indicated on Drawings including, but not limited to, deflection from uniformly distributed and concentrated live loads.
4. Dimensional tolerances of building frame and other adjacent construction.
5. Failure includes the following:

    a. Deflection exceeding specified limits.
    b. Thermal stresses transferred to building structure.
    c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
    d. Noise or vibration created by wind and thermal and structural movements.
    e. Loosening or weakening of fasteners, attachments, and other components.
    f. Sealant failure.
    g. Failure of operating units to function properly.

B. Structural Loads:

1. Basic Wind Speed and Wind Loads: As indicated on Structural Drawings.
2. Exposure Group: As indicated on Structural Drawings.
3. Importance Factor: As indicated on Structural Drawings.

C. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below to less than 1/8 inch and clearance between members and operable units directly below to less than 1/16 inch.

D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity but not less than 10 seconds.

E. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

a. Test High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
b. Test Low Exterior Ambient-Air Temperature: 0 deg F.
c. Test Interior Ambient-Air Temperature: 75 deg F.

F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.

G. Water Penetration Under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.

H. Water Penetration Under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq.ft.

1. Maximum Water Leakage: No uncontrolled water penetrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.

I. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 55 when tested according to AAMA 1503.

J. Average Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having average U-factor of not more than 0.66 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

1.5 LEED SUBMITTALS

A. MRc4: “Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: “Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point

of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13."

1.6 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details and attachments to other work.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
3. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Glazing.
3. Flashing and drainage.

F. Welding certificates.

G. Qualification Data: For Installer and testing agency.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.

I. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

J. Warranties: Special warranties specified in this Section.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.

1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.

C. Source Limitations: Obtain Aluminum-Framed Entrances and Storefronts, Aluminum Doors, and Aluminum Windows through one source from a single manufacturer.

D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Accessible Entrances: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA-ABA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and ICC/ANSI A117.1.

F. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."

G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Furnish 12" x 12" lower corner of storefront. Install in masonry wall mock-up.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems

without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 WARRANTY

A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Adhesive or cohesive sealant failures.
e. Water leakage through fixed glazing and framing areas.
f. Failure of operating components to function properly.

2. Warranty Period: 2 years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Externally glazed, thermal clip aluminum storefront system with operable windows and manually swing doors and frames.

1. The design for aluminum-framed systems is based on EFCO thermal S-960 Storefront and EFCO D-500 wide style door with optional tall bottom rails. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

a. Kawneer.
b. Moduline Vistawall.
c. Wausau Window and Wall Systems.

B. Basis-of-Design Product: Butt glazed thermal aluminum storefront ribbon system.

1. The design for butt glazed aluminum storefront ribbon system is based on EFCO Quick Set Thermal Storefront Ribbon System, #904-2”x4”. Subject to compliance with

requirements, provide the named product or a comparable product by one of the following:

a. Kawneer.
b. Moduline Vistawall.
c. Wausau Window and Wall Systems.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.
3. Do not use exposed fasteners, except for hardware application.
4. For hardware application, use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing."

B. Glazing Gaskets and Sealants: As specified in Division 8 Section “Glazing”.

C. Glazing Sealants: As recommended by manufacturer.

1. Provide sealants for use inside of the weatherproofing system that comply with Division 1 Section “Sustainable Design Requirements”.

2.5 VENTING ALUMINUM WINDOWS

A. Basis-of-Design Product: The design for venting aluminum windows is based on EFCO WV410 project out awning windows. Subject to compliance with requirements, provide the named product or a comparable product by one of the manufacturers listed in Paragraph 2.1A. Note that the manufacturer of the venting aluminum windows must be the same manufacturer as the Aluminum Framed Entrances and Storefronts.

B. Frames: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.

C. Insulating-Glass Units: Comply with Section 088000 “Glazing.”

D. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.

F. Projected Window Hardware:

1. 4-Bar Arms: Stainless steel complying with AAMA 904.1 requirements. Provide operators that function without requiring the removal of interior screens or using screen wickets.
2. Locking Cam Handles and Keepers: Standard cast white bronze with US25D finish.
3. Limit Devices: Manufacturers standard device designed to restrict sash opening.

    a. Limit clear opening to 6 inches for ventilation; with custodial key release.

G. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

H. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.6 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location: Full, inside for project-out sashes.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.

C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.

1. Wire-Fabric Finish: Charcoal gray.

2.7 DOORS

A. Doors: Glazed doors, for manual swing operation, with design elevations as shown on the drawings.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.

    a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: Wide style, 5 inch nominal width, with optional tall bottom rail.

a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

B. Door Hardware: As specified in Division 8 Section "Door Hardware."

2.8 ACCESSORY MATERIALS

A. Insulating Materials: As specified in Division 7 Section "Building Insulation."

B. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."

C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.9 FABRICATION

A. Form aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).

E. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.

2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

A. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: One color chosen from EFCO’s 20-color Ultrapon Options.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.

4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, without warp or rack.

F. Install glazing as specified in Division 8 Section "Glazing."

G. Entrances: Install to produce smooth operation and tight fit at contact points.

1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install insulation materials as specified in Division 7 Section "Building Insulation."

I. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.

J. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING

A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.

1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

END OF SECTION 084113

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes commercial door hardware for the following:

1. Swinging doors.

C. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware and power supplies.

D. Related Sections:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 08 Section “Hollow Metal Doors and Frames”.
5. Division 08 Section “Flush Wood Doors”.
6. Division 28 Section “Access Control”.

E. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 80 - Fire Doors and Windows.
4. NFPA 101 - Life Safety Code.

5. NFPA 105 - Installation of Smoke Door Assemblies.
6. State Building Codes, Local Amendments.

F. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.

2. Electrical Coordination: Coordinate with related Division 26 Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing both standard and electrified builders hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

D. Source Limitations: Obtain each type and variety of Door Hardware specified in this Section from a single source, qualified supplier unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:

1. NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:

a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
b. Door Closers: Comply with the following maximum opening-force requirements indicated:

1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.

3. NFPA 101: Comply with the following for means of egress doors:

a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.

b. Thresholds: Not more than 1/2 inch high.

4. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 (neutral pressure at 40" above sill) or UL-10C.

a. Test Pressure: Positive pressure labeling.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Five years for exit hardware.
3. Twenty five years for manual surface door closers.
4. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Continuing Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

1. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

a. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

B. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 certified continuous geared hinge with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Provide concealed flush mount (with or without inset), full surface, or half surface, in standard and heavy duty models, as specified in the Hardware Sets. Concealed continuous hinges to be U.L. listed for use on up to and including 90 minute rated door installations and U.L. listed for windstorm components where applicable. Factory cut hinges for door size and provide with removable service power transfer panel where indicated at electrified openings.

1. Acceptable Manufacturers:

    a. Bommer Industries (BO).
    b. McKinney Products (MK).
    c. Pemko Manufacturing (PE).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a 12" removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Acceptable Manufacturers:

    a. Bommer Industries (BO) - SER-QC (# of wires) Option.
    b. McKinney Products (MK) - SER-QC (# wires) Option.
    c. Pemko Manufacturing (PE) - SER-QC (# wires) Option.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified automatic, self-latching, and manual flush bolts and surface bolts. Manual flush bolts to be furnished with top rod of sufficient length to allow bolt location approximately six feet from the floor. Furnish dust proof strikes for bottom bolts. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

1. Acceptable Manufacturers:

    a. Burns Manufacturing (BU).
    b. Rockwood Manufacturing (RO).
    c. Trimco (TC).

B. Door Push Plates and Pulls: ANS/BHMA A156.6 certified door pushes and pulls of type and design specified below or in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

a. Acceptable Manufacturers:

1) Burns Manufacturing (BU).
2) Rockwood Manufacturing (RO).
3) Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
4. Keyway: Match Facility Restricted Keyway.

D. Keying System: Each type of lock and cylinders to be factory keyed. Conduct specified "Keying Conference" to define and document keying system instructions and requirements. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner. Incorporate decisions made in keying conference, and as follows:

1. Existing System: Master key or grand master key locks to Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:

1. All Master Key Levels: Six (6)
2. Change Keys per Cylinder: Four (4)
3. Construction Keys: Ten (10)

F. Construction Keying: Provide construction master keyed cylinders or temporary keyed construction cores where specified. Provide construction master keys in quantity as required by project Contractor. Replace construction cores with permanent cores. Furnish permanent cores for installation as directed under specified "Keying Conference".

G. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Acceptable Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified mortise locksets furnished in the functions as specified in the Hardware Sets. Locksets to be manufactured with a corrosion resistant, stamped 12 gauge minimum formed steel case and be field-reversible for handing without disassembly of the lock body. Lockset trim (including knobs, levers, escutcheons, roses) to be the product of a single manufacturer. Furnish with standard 2 3/4" backset, 3/4" throw anti-friction stainless steel latchbolt, and a full 1" throw stainless steel bolt for deadbolt functions.

1. Acceptable Manufacturers:

a. Sargent Manufacturing (SA) – 8200 Series.
b. Schlage (SC) – L9000 Series.

2.7 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Dustproof Strikes: BHMA A156.16.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is not acceptable except in any case where the door light extends behind the device as in a full glass configuration.

5. Flush End Caps: Provide heavy weight impact resistant flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.

6. Vertical Rod Exit Devices: Provide and install interior surface and concealed vertical rod exit devices as Less Bottom Rod (LBR) unless otherwise indicated.

7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.

8. Rail Sizing: Provide exit device rails factory sized for proper door width application.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Mounting rails to be formed from smooth stainless steel, brass or bronze architectural materials no less than 0.072" thick, with push rails a minimum of 0.062" thickness. Painted or aluminum metal rails are not acceptable. Exit device latch to be investment cast stainless steel, pullman type, with deadlock feature.

1. Acceptable Manufacturers:

a. Sargent Manufacturing (SA) - 80 Series.
b. Von Duprin (VD) - 35A/98 XP Series.

2.9 ELECTROMECHANICAL CONVENTIONAL EXIT DEVICES

A. Electrified Conventional Push Rail Devices (Heavy Duty): Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified below. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.

1. Acceptable Manufacturers:

a. Sargent Manufacturing (SA) - 80 Series.
b. Von Duprin (VD) - 35A/98 Series.

B. Electrified Options: As indicated in hardware sets, provide electrified exit device options including: electric latch retraction , electric dogging, outside door trim control, exit alarm, delayed egress, latchbolt monitoring, lock/unlock status monitoring, touchbar monitoring and request-to-exit signaling. Unless otherwise indicated, provide electrified exit devices standard as fail secure.

2.10 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

2. Standards: Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.

4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

   a. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.
   b. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
   c. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
   d. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics. Provide drop plates or other accessories as required for proper mounting.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and

fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Acceptable Manufacturers:

    a. LCN Closers (LC) - 4040XP Series.
    b. Sargent Manufacturing (SA) - 281 Series.

2.11 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Metal Protection Plates: ANSI/BHMA A156.6 certified metal protection plates (kick, armor, or mop), beveled on four edges (B4E), fabricated from the following:

    a. Stainless Steel: 300 series, 050-inch thick, with countersunk screw holes (CSK).

4. Fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets.

5. Acceptable Manufacturers:

    a. Burns Manufacturing (BU).
    b. Rockwood Manufacturing (RO).
    c. Trimco (TC).

2.12 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Acceptable Manufacturers:

    a. Burns Manufacturing (BU).
    b. Rockwood Manufacturing (RO).
    c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Acceptable Manufacturers:

    a. Rixson Door Controls (RF).
    b. Rockwood Manufacturing (RO).
    c. Sargent Manufacturing (SA).

2.13 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Acceptable Manufacturers:

1. National Guard Products (NG).
2. Pemko Manufacturing (PE).

3. Reese Enterprises, Inc. (RS).

2.14 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.15 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SCHEDULE

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. Manufacturer’s Abbreviations:

1. PE - Pemko
2. MK - McKinney
3. RO - Rockwood
4. SA - Sargent
5. RF - Rixson
6. SU - Securitron

Set: 1.0

1	Transfer Continuous Hinge	CFMSLF-HD1 SER12		PE
1	Frame Wiring Harness	QC-C1500P		MK
1	Door Wiring Harness	QC-As Required		MK
1	Elec Rim Exit (fail secure)	16 21 8876 ETB	US32D	SA
1	Concealed Overhead Stop	6-X36	630	RF
1	Surface Closer	281 P10	EN	SA
1	Threshold	Per Architect's Detail		PE
1	Perimeter Gasket	Section 08 41 13		
1	Door Bottom	Section 08 41 13		
1	Power Supply	AQD6-8F8R		SU

1	Card Reader	Division 28	
1	Audio/Visual Intercom	Division 28	
1	Wiring Diagram		

Notes: Door normally closed and locked. Valid card read, intercom system or mechanical key allows access. Door relocks upon closing. Free egress at all times. Door fails locked.

Power supply powers door 103 also.

Set: 2.0

1	Continuous Hinge	CFMHD1		PE
1	Transfer Continuous Hinge	CFMHD1 SER12		PE
1	Frame Wiring Harness	QC-C1500P		MK
1	Door Wiring Harness	QC-As Required		MK
2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Elec Mortise Exit (fail secure)	16 21 8976 ETB 7/8" LTC Strike	US32D	SA
2	Surface Closer (stop)	281 CPS	EN	SA
2	Armor Plate	K1050 34" 4BE CSK	US32D	RO
1	Threshold	Per Architect's Detail		PE
2	Door Shoe	Per Architect's Detail		PE
1	Astragal	357SP		PE
1	Card Reader	Division 28		
1	Audio/Visual Intercom	Division 28		
1	Wiring Diagram			

Notes: Door normally closed and locked. Valid card read, intercom system or mechanical key allows access. Door relocks upon closing. Free egress at all times. Door fails locked.

Set: 3.0

1	Continuous Hinge	CFMHD1		PE
1	Rim Exit (exit only)	LD 8810	US32D	SA
1	Surface Closer (stop)	281 CPS	EN	SA
1	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Threshold	Per Architect's Detail		PE
1	Door Shoe	Per Architect's Detail		PE

Set: 4.0

1	Continuous Hinge	CFMHD1		PE
1	Rim Exit (storeroom)	16 21 8804 ETB	US32D	SA
1	Surface Closer (stop)	281 CPS	EN	SA
1	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Threshold	Per Architect's Detail		PE
1	Door Shoe	Per Architect's Detail		PE

Set: 5.0

2	Continuous Hinge	CFMHD1		PE
2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Mortise Exit (storeroom)	12 21 8904 ETB 7/8" LTC Strike	US32D	SA
2	Surface Closer (stop)	281 CPS	EN	SA
2	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Perimeter Gasket	S88BL		PE
1	Astragal	357SP		PE

Set: 6.0

1	Continuous Hinge	CFMHD1		PE
1	Push Pull	111x73C/73CL	US32D	RO
1	Surface Closer	281 P10	EN	SA
1	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Wall Stop	401	US26D	RO

Set: 7.0

1	Continuous Hinge	CFMHD1		PE
1	Mortise Lock (passage)	8215 LNB	US26D	SA
1	Surface Closer	281 O	EN	SA
1	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Wall Stop	401	US26D	RO
1	Perimeter Gasket	S88BL		PE

Set: 8.0

1	Continuous Hinge	CFMHD1		PE
1	Mortise Lock (privacy)	49 8266 LNB	US26D	SA
1	Surface Closer	281 O	EN	SA
1	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Wall Stop	401	US26D	RO

Set: 9.0

1	Continuous Hinge	CFMHD1		PE
1	Mortise Lock (classroom)	21 8237 LNB	US26D	SA
1	Surface Closer	281 P10	EN	SA
1	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Wall Stop	401	US26D	RO
1	Perimeter Gasket	S88BL		PE

Set: 10.0

1	Continuous Hinge	CFMHD1		PE
1	Mortise Lock (classroom)	21 8237 LNB	US26D	SA
1	Surface Closer (holder)	281 H	EN	SA

1	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Wall Stop	401	US26D	RO

Set: 11.0

1	Continuous Hinge	CFMHD1		PE
1	Mortise Lock (classroom)	21 8237 LNB	US26D	SA
1	Surface Closer	281 O	EN	SA
1	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Wall Stop	401	US26D	RO
1	Perimeter Gasket	S88BL		PE

Set: 12.0

1	Continuous Hinge	CFMHD1		PE
1	Mortise Lock (classroom)	21 8237 LNB	US26D	SA
1	Surface Closer (stop)	281 CPS	EN	SA
1	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Perimeter Gasket	S88BL		PE

Set: 13.0

2	Continuous Hinge	CFMHD1		PE
1	Coordinator	576	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Constant Latch FB Set	2845	US26D	RO
1	Mortise Lock (storeroom)	21 8204 LNB 7/8" LTC Strike	US26D	SA
2	Surface Closer (stop)	281 CPS	EN	SA
2	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Perimeter Gasket	S88BL		PE
1	Astragal	357SP		PE

Set: 14.0

1	Continuous Hinge	CFMHD1		PE
1	Mortise Lock (storeroom)	21 8204 LNB	US26D	SA
1	Surface Closer	281 O	EN	SA
1	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Perimeter Gasket	S88BL		PE

Set: 15.0

1	Continuous Hinge	CFMHD1		PE
1	Mortise Lock (storeroom)	21 8204 LNB	US26D	SA
1	Surface Closer	281 O	EN	SA
1	Surface Overhead Stop	9-X36	652	RF
1	Kick Plate	K1050 8" 4BE CSK	US32D	RO
1	Perimeter Gasket	S88BL		PE

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Storefront framing.
4. Entrances.
5. Interior borrowed lites.

C. Related Sections:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section “Facility Exterior Envelope Commissioning Requirements”.
4. Division 07 Section “Sealants”.
5. Division 08 Section “Hollow Metal Doors and Frames”.
6. Division 08 Section “Aluminum-Framed Entrances and Storefronts.”

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:

1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.

   a. Wind Design Data: As indicated on Structural Drawings.

2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than four Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13."

1.7 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glazing Accessory Samples: For gaskets, sealants, and spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Qualification Data: For installers, manufacturers, glass testing agency and sealant testing agency.

F. Product Certificates: For glass and glazing products, from manufacturer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

   1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

H. Preconstruction adhesion and compatibility test report.

I. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

E. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

F. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

G. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

H. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

J. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install glazing in mockups specified in other Division 08 Sections to match glazing systems required for Project, including glazing methods.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Tempered Float Glass: ASTM C 1048; Kind FT (fully tempered), Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

C. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other coated glass).If heat soaking of fully tempered glass is needed, insert requirements here.

D. Coated Vision Glass: ASTM C1376 Standard for Pyrolytic and Vacuum Deposition Coatings on Glass.

2.3 LAMINATED SAFETY GLASS

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

2.4 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
2. Spacer: Aluminum with black, color anodic finish.
3. Desiccant: Molecular sieve or silica gel, or blend of both.

B. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article and in "Insulating-Laminated-Glass Types" Article.

2.5 FIRE-PROTECTION-RATED GLASS AND SAFETY GLAZING

A. Fire-Protection-Rated Glass and Safety Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies; and complying with testing requirements in 16 CFR 1201 for Category II materials.

1. Basis of Design Product: Subject to compliance with requirements, provide TGP Pilkington Pyrostop or a comparable product by another manufacturer.

B. Location: All interior glazing in fire rated doors and frames.

2.6 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. EPDM complying with ASTM C 864.
2. Silicone complying with ASTM C 1115.
3. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned EPDM, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.7 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 799.
b. Polymeric Systems, Inc.; PSI-631.
c. Schnee-Morehead, Inc., an ITW company; SM5731 Poly-Glaze Plus.
d. Tremco Incorporated; Tremsil 600.

2. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

a. Use O Glazing Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, and galvanized steel.

C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.11 MONOLITHIC-GLASS TYPES

A. Glass Type: Clear float glass, heat-strengthened float glass, and fully tempered float glass.

1. Thickness: 6.0 mm.
2. Provide safety glazing labeling.

B. Glass Type: Ceramic-coated vision glass, fully tempered float glass.

1. Thickness: 6.0 mm
2. Coating Location: Second surface.

C. Glass Type: Fire-Protection-Rated Glass and Safety Glazing.

1. Thickness: As required by fire rating.
2. Provide safety and fire rating labeling.

2.12 LAMINATED-GLASS TYPES

A. Laminated Glass Type L1: All exterior doors and where noted on the Drawings:

1. Products: Clear laminated glass with two plies of fully tempered float glass, overall thickness ½” nominal.
2. Thickness of Each Glass Ply: 6.0 mm (1/4") minimum thickness.
3. Interlayer Thickness: 0.060 inch.

   a. Interlayer Color: Clear.

4. Provide safety glazing labeling.

B. Laminated Glass Type L2: All interior non-fire rated doors and where noted on the Drawings:

1. Products: Clear laminated glass with two plies of fully tempered float glass, overall thickness 1/4” nominal.
2. Thickness of Each Glass Ply: 3 mm (1/8”) minimum thickness.
3. Interlayer Thickness: 0.060 inch.

a. Interlayer Color: Clear.

4. Provide safety glazing labeling.

2.13 INSULATING-GLASS TYPES

A. Insulating Glass Type 1: Low-E coated clear insulating glass.

Location: Clerestory windows.

1. Products:

a. 1” VE 1-2M by Viracon: Energy values are based on Viracon 1” VE 1-2M. Subject to compliance with requirements, provide Viracon or equal product from another manufacturer.

2. Overall Unit Thickness: 25 mm nominal (1 inch).
3. Thickness of Outdoor Lite: 6.0 mm (1/4").
4. Thickness of Interspace: 13.0 mm (1/2").
5. Thickness of Indoor Light: 6.0 mm (1/4").
6. Outdoor Lite: Type I (transparent glass, flat) float glass, Class 1 (clear) float glass.

a. HS (heat strengthened), typical.
b. Fully tempered, where safety glazing is required by code.

7. Interspace Content: Air.
8. Indoor Lite: Type I (transparent glass, flat) float glass, Class 1 (clear) float glass.

a. HS (heat strengthened), typical.
b. Fully tempered, where safety glazing is required by code.

9. Low-E Coating: Sputtered on second surface.
10. Visible Light Transmittance: 70%.
11. Winter Nighttime U-Factor: 0.29 maximum.
12. Summer Daytime U-Factor: 0.26 maximum.
13. Shading Coefficient: 0.44.
14. Solar Heat Gain Coefficient: 0.38 maximum.
15. Outdoor Visible Reflectance: 11%.

B. Insulating Glass Type 2: Low-e-coated clear insulating glass with laminated outboard lite.

Location: Typical exterior glazing below 8’-0”.

1. Products:

a. 1 1/16” nominal VE 1-2M by Viracon: Energy values are based on Viracon 1 1/16” nominal VE 1-2M. Subject to compliance with requirements, provide Viracon or equal product from another manufacturer.

2. Overall Unit Thickness: 27 mm nominal (1 1/16 inch).
2. Thickness of Outdoor Lite: 8 mm nominal (5/16").
3. Thickness of Interspace: 13.0 mm (1/2").
4. Thickness of Indoor Light: 6.0 mm (1/4").
5. Outdoor Lite: LHS, consisting of two lites of heat-strengthened Type I (transparent glass, flat), Class 1 (clear) float glass.

    a. Kind HS (heat strengthened).
    b. Thickness of each Glass Ply: 3.0 mm (1/8") thick.
    b. Plastic Interlayer: Clear, 1.5 mm (0.060 inch) thick.

6. Interspace Content: Air.
7. Indoor Lite: Type I (transparent glass, flat) float glass, Class 1 (clear) float glass.

    a. HS (heat strengthened), typical.
    b. Fully tempered, where safety glazing is required by code

8. Low-E Coating: Sputtered on #4 (of 6) surface.
9. Visible Light Transmittance: 68%.
10. Winter Nighttime U-Factor: 0.32 maximum.
11. Summer Daytime U-Factor: 0.29 maximum.
12. Shading Coefficient: 0.41.
13. Solar Heat Gain Coefficient: 0.40 maximum.
14. Outdoor Visible Reflectance: 10%.

2.14 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

    1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
    2. Presence and functioning of weep systems.
    3. Minimum required face and edge clearances.
    4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.15 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

2.16 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

2.17 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

2.18 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

2.19 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

2.20 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 089000 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Fixed, extruded-aluminum louvers.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section "Facility Exterior Envelope Commissioning Requirements".
4. Division 07 Section "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.
5. Division 23 Sections for louvers that are a part of mechanical equipment.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act on vertical projection of louvers.

1. Wind Loads: Determine loads based on pressures as indicated on Structural Drawings.

B. Seismic Performance: Provide louvers capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1. Seismic Design Criteria: As indicated on Structural Drawings.

C. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Air-Performance, Water-Penetration, Air-Leakage, and Wind-Driven Rain Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.5 LEED SUBMITTALS

A. MRc4: “Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: “Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional.”

C. IEQc4.1: “Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer’s name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.”

1.6 SUBMITTALS

A. Product Data: For each type of product indicated. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.

1. For installed louvers and vents indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of metal finish required.

E. Qualification Data: For professional engineer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code--Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Louvers:

   a. Airolite Company (The).
   b. Construction Specialties, Inc.
   c. Greenheck.
   d. Industrial Louvers, Inc.

B. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Basis-of-Design Product: The design for each louver is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Aluminum Castings: ASTM B 26/B 26M, alloy 319.

D. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

E. Post-installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern unless horizontal mullions are indicated on the drawings.
2. Horizontal Mullions: Provide horizontal mullions at joints unless continuous vertical assemblies are indicated on the drawings.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel, unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.

1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
2. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
3. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.

G. Provide subsills made of same material as louvers or extended sills for recessed louvers.

H. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:

1. Basis-of-Design Product: Construction Specialties, Inc. Model A4097 with optional 0.125 blade and frame thickness.

2. Louver Depth: 4 inches.
3. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.125 inch for blades and frames.
4. Mullion Type: Fully Recessed.
5. Performance Requirements:

   a. Free Area: Not less than 8.0 sq. ft. for 48-inch- wide by 48-inch- high louver.
   b. Point of Beginning Water Penetration: Not less than 1040 fpm.
   c. Air Performance: Not more than 0.20-inch wg static pressure drop at 0.01 oz. in. H20.

6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.5 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert for securing screen mesh.

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish louvers after assembly.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic-Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Fluoropolymer Three-Coat Coating System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

a. Color and Gloss: One custom color, match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.

B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089000

SECTION 089516 - EXPLOSION VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This section includes the following:

1. FM Approved pressure relief panel system designed for explosion venting.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 01 Section "Facility Exterior Envelope Commissioning Requirements".
4. Division 07 Section "Joint Sealants" for sealants installed in perimeter joints between vent frames and adjoining construction.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide explosion vents capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of wall vent components, noise or metal fatigue, or permanent damage to fasteners and anchors.

1. Wind Loads: Determine loads based on pressures as indicated on Structural Drawings.

B. Seismic Performance: Provide explosion vents capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1. Seismic Design Criteria: As indicated on Structural Drawings.

C. Thermal Movements: Provide explosioin vents that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Air-Performance, Water-Penetration, Air-Leakage, and Wind-Driven Rain Ratings: Provide explosion vents designed to protect the building interior from air and water penetration.

E. Pressure Relief: Design explosion vents to release outward at a maximum pressure of 20 pounds per square foot, but not less than the loads required by the International Building Code.

1.4 LEED SUBMITTALS

A. MR c4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For explosion vents and accessories. Include plans, elevations, sections, details, and attachments to other Work.

1. For installed vents indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Qualification Data: For professional engineer.

C. Product Test Reports: Factory Mutual test data.

D. Samples: For each type of metal finish required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND FABRICATION

A. Basis of Design Manufacturer: Subject to compliance with requirements, provide Explovent ERTIC hinged pressure relief panel system by Construction Specialties Company, or equal product by another manufacturer.

B. Frame Members: Provide one piece extruded aluminum structural members with integral caulking slots.

C. Panels: 2” thick with semi-rigid insulated core laminated between two sheets of minimum .032” thick smooth aluminum alloy sheet.

D. Gaskets: Manufacturer’s standard interior and exterior gasketing designed to mitigate air and water leakage.

E. Release mechanism: Manufacturer’s standard release mechanism, shop calibrated and tested for the specified design loads. Provide a restraint/hold open mechanism designed to cushion the panel’s deceleration as the full open position is reached.

F. Shop calibrate and test each panel for release at specified design loads.

G. Permanently mark each panel with the design release pressure and the maximum static release force.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FINISHES

A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 50 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color: One custom color, match Architect's sample.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and place vents level, plumb, and at indicated alignment with adjacent work.

B. Protect unpainted surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

C. Provide perimeter reveals of uniform width for sealants and joint fillers, where indicated.

D. Use concealed anchorages.

3.2 ADJUSTING AND CLEANING

A. Test operation of explosion vents and adjust as needed to produce fully functioning units that comply with requirements.

B. Clean exposed surfaces of vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

D. Restore vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089516

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/ CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, recycling, and disposing of non hazardous waste Division 05 Section "Cold-Formed Metal Framing".
3. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall joint systems installed with non-load-bearing steel framing.
4. Division 09 Section “Gypsum Board” for gypsum panels.

1.3 LEED SUBMITTALS

A. MRc4: “Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: “Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional.”

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Evaluation Reports: For dimpled steel studs and runners, and firestop tracks, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

B. Hanger Attachments to Concrete:

1. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Hangers: As follows:

1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

2. Hanger Rods: Mild steel and ASTM A 153/A 153M hot dip galvanized
3. Flat and angle hangers: Commercial steel sheet and ASTM A 653/A 653M, G40, hot dip galvanized.

D. Carrying Channels: Cold- minimum 1/2-inch- wide flange, with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.

1. Depth: 1-1/2 inches unless noted otherwise.

E. Furring Channels (Furring Members):

1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

a. Minimum Base Metal Thickness: 0.0179 inch.

2. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical or hat shaped.

F. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; Drywall Furring System.
c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0312 inch.
2. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Where indicated, provide the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width required.

1. Minimum Base-Metal Thickness: 0.0312 inch.

D. Cold-Rolled Channel Bridging: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange.

1. Depth: 1-1/2 inches unless otherwise indicated.
2. Clip Angle: 1-1/2 by 1-1/2 inch, 0.068-inch- thick, galvanized steel.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0312 inch.
2. Depth: 7/8 inch.

F. Z-shaped Furring: With slotted or non-slotted web, face flange of 1 ¼ inches, wall attachment flange of 7/8 inch, minimum bare metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates. Provide low-profile-head type fasteners for all metal to metal connections.

B. Isolation Strip at Exterior Walls: Provide the following:

1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

   a. Size supplemental suspension members and hangers to support ceiling loads.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb, unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly where indicated.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

D. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Interior gypsum board.
2. Exterior soffit panels.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 05 Section "Cold-Formed Metal Framing" for exterior wall steel framing that supports gypsum board.
4. Division 07 Section “Direct Applied Exterior Finish Systems” for finish applied to exterior cementitious backer units.
5. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board.
6. Division 07 Section "Joint Sealants" for acoustical sealant.
7. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board.
8. Division 09 painting Sections for primers applied to gypsum board surfaces.

1.3 LEED SUBMITTALS

A. MRc4: “Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.6 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

B. Indoor Air Quality Management Plan

The following practices shall be implemented in accordance with the Construction Indoor Air Quality Management Plan as required in Division 01, Section Construction IAQ Management.

1. Gypsum wallboard is to be stored per manufacturer's recommendations for allowable temperature and humidity range. Products shall not be allowed to become damp.

2. Where feasible, gypsum wallboard shall be stored separately from materials which have high short-term emissions. Materials with high short-term emissions include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paint, wood preservatives, and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation; and composite or engineered wood products with formaldehyde binders.

3. Where feasible, exposed fiberglass or mineral wool insulations shall not be stored in oc-

cupied spaces, near HVAC diffusers (supply or return), or near fresh air intakes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

B. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

B. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. BPB America Inc.
   b. G-P Gypsum.
   c. National Gypsum Company.
   d. USG Corporation.

B. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

C. High-Impact Type (All interior walls): Manufactured with Type X core, plastic film laminated to back side for greater resistance to through-penetration (impact resistance).

1. Core: 5/8 inch thick, Type X.
2. Plastic-Film Thickness: 0.010 inch.

2.4 EXTERIOR SOFFIT PANELS

A. Cementitious Backer Units: ANSI A118.9.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

   a. Custom Building Products; Wonderboard.
   b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
   c. USG Corporation; DUROCK Cement Board.

3. Thickness: 1/2 inch.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:

   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.

c. L-Bead: L-shaped; exposed long flange receives joint compound.
d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
e. Expansion (control) joint.
f. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Exterior Trim: As specified in Division 07 Section "Direct Applied Exterior Finish Systems".

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
2. Fill Coat: For second coat, use drying-type, all-purpose compound.
3. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Exterior Soffit Panels:

1. As recommended by panel manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Comply with Division 01 Section "VOC Limits for Adhesives, Sealants, Paints and Coatings."

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Fasteners for Exterior Soffit Board: 1-5/8 inches No. 8 wafer-head steel drill screws complying with ASTM C 954, with an organic-polymer coating or other corrosion-protective coating having a salt-spray resistance of more than 500 hours per ASTM B 117.

E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

F. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

G. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Ceiling Type: Ceiling surfaces.
2. High-Impact Type: All wall areas.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

2. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings and according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. Curved-Edge Cornerbead: Use at curved openings.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints**,** rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.

   a. Primer and its application to surfaces are specified in other Division 09 Sections.

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.6 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements

B. This Section includes acoustical panels and exposed suspension systems for ceilings.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, recycling, and disposing of non hazardous waste.

1.3 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.4 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include

statement indicating cost of each regional material and the fraction by weight that is considered regional."

1.5 IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension system members.
2. Method of attaching hangers to building structure.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
4. Minimum Drawing Scale: 1/4 inch = 1 foot.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.

D. Qualification Data: For testing agency.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

F. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.

G. Maintenance Data: For finishes to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply h the following requirements:

1. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

D. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:

1. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

E. Installation Standard: Suspended acoustical ceiling systems shall be installed in accordance with provisions of ASTM C 635 and ASTM C 636.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.10 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.11 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 5.0 percent of quantity installed.
2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.2 RECYCLED CONTENT

A. LMF Criteria:: Mineral Fiber Acoustical Ceiling Panels shall contain a minimum of 30.0% recycled content by weight, calculated by adding the post-consumer recycled content percentage to one-half of the pre-consumer recycled content percentage.

2.3 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING - System #1.

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ultima Beveled Tegular, Fine Texture, #1912HRC or a comparable product by another manufacturer.

B. Classification: Provide Class A panels complying with ASTM E84.

1. Flame Spread: 25 or less.
2. Smoke Developed Index: 50 or less.

C. ASTM E1264 Classification: Type IV, Form 2, Pattern E.

D. Color: White.

E. LR: Not less than .84.

F. NRC: Not less than .70

G. CAC: Not less than 33.

H. Edge/Joint Detail: Tegular for 9/16" grid.

I. Thickness: ¾"

J. Modular Size: 24 by 24 inches.

K. VOC Formaldedehyde: No added formaldehyde, outperforming standards established by the Collaborative for High-Performance Schools (CHPS), following California Specification 01350 testing methods.

L. Anti-Mold & Mildew Treatment: Face and back surfaces treated with a broad-spectrum anti-microbial formulation.

M. Recycled Content: Not less than 70%.

2.4 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING - System #2.

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Health Zone Ultima Square Lay-In, Fine Texture, #1935 or a comparable product by another manufacturer.

B. Classification: Provide Class A panels complying with ASTM E84.

1. Flame Spread: 25 or less.
2. Smoke Developed Index: 50 or less.

C. ASTM E1264 Classification: Type IV, Form 2, Pattern E.

D. Color: White.

E. LR: Not less than .84.

F. NRC: Not less than .70

G. CAC: Not less than 33.

H. Edge/Joint Detail: Square Lat-in for 15/16" grid.

I. Thickness: ¾"

J. Modular Size: 24 by 24 inches.

K. VOC Formaldedehyde: No added formaldehyde, outperforming standards established by the Collaborative for High-Performance Schools (CHPS), following California Specification 01350 testing methods.

L. Anti-Mold & Mildew Treatment: Face and back surfaces treated with a broad-spectrum anti-microbial formulation.

M. Recycled Content: Not less than 70%.

2.5 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.

   a. Type: Post installed.
   b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

2.6 RECYCLED CONTENT

A. LMF Criteria:: Metal Suspension System shall contain a minimum of 25.0% recycled content by weight, calculated by adding the post-consumer recycled content percentage to one-half of the pre-consumer recycled content percentage.

2.7 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING – System #1.

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Suprafine, XL narrow-faced 9/16" exposed grid or a comparable product by another manufacturer:

B. Narrow-Face, Steel-Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished, cold-rolled, 9/16-inch- wide metal caps on flanges.

1. Structural Classification: ASTM C 635 heavy-duty system.
2. Face Design: Flat, exposed flange.
3. Finish: Painted White.

2.8 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING – System #2.

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Prelude XL 15/16" exposed grid or a comparable product by another manufacturer:

B. Standard-Face, Steel-Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished, cold-rolled, 15/16-inch- wide metal caps on flanges.

1. Structural Classification: ASTM C 635 heavy-duty system.
2. Face Design: Flat, exposed flange.
3. Finish: Painted White.

2.9 METAL EDGE MOLDINGS AND TRIM

A. Metal Edge Moldings and Trim: Provide manufacturer's standard painted metal edge moldings and trim of profile indicated, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements. Provide all items necessary for a complete installation.

1. Perimeters: Shadow molding.

2. Other: As indicated on drawings.

2.10 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 635 and 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.

4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
4. Install hold-down clips in areas required by authorities having jurisdiction, space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
5. Protect lighting fixtures and air ducts.

3.4 FIELD QUALITY CONTROL

A. Inspections and Testing: Owner may engage a qualified special inspector or testing agency to perform the following special inspections and prepare reports:

1. Suspended ceiling system.
2. Hangers, anchors and fasteners.

B. Remove and replace acoustical panel ceiling hangers and anchors and fasteners that do not pass tests and inspections. Retesting will be at Contractor's expense.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. SSustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Resilient base.
2. Resilient molding accessories.

C. Related Sections:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 09 Section "Resilient Tile Flooring" for resilient floor tile.
4. Division 09 Section "Carpeting" for carpet tile.

1.3 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's

name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: Manufacturer's standard sample sets consisting of sections of units showing the full range of colors and patterns available for each type of product indicated.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 20 linear feet of each type, color, pattern, and size of resilient product installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain each type and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

C. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.8 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 90 deg F in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 90 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT WALL BASE

A. Resilient Rubber Wall Base:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allstate Rubber Corp.; Stoler Industries.
b. Armstrong World Industries, Inc.
c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
d. Johnsonite.
e. Roppe Corporation, USA.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous) or Group II (layered).
3. Style: Cove (base with toe).

C. Minimum Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Finish: As selected by Architect from manufacturer's full range.

I. Colors and Patterns: Two colors as selected by Architect from full range of industry colors.

2.2 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Allstate Rubber Corp.; Stoler Industries.
   b. Armstrong World Industries, Inc.
   c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
   d. Johnsonite.
   e. Roppe Corporation, USA.

B. Description: Provide accessory moldings where indicated or required. Accessories include, but are not limited to; Carpet edge for glue-down applications, Reducer strip for resilient floor covering, Joiner for tile and carpet, and Transition strips.

C. Material: Rubber.

D. Profile and Dimensions: As indicated.

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Vinyl composition floor tile.

C. Related Sections:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.3 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

D. IEQc4.3: "Manufacturer's product data for interior flooring, documentation including printed statement of VOC content and compliance with the FloorScore Standard.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: Manufacturer's sample boxes consisting of sections of units showing the full range of colors and patterns for each type of floor tile indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.7 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish 1 box of each type, color, and pattern of floor tile installed.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.10 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 90 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore Standard.

B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 VINYL COMPOSITION FLOOR TILE

A. Products: Subject to compliance with requirements, provide one of the following:

1. Armstrong World Industries, Inc.; Standard Excelon Imperial Texture.
2. Congoleum Corporation; Alternatives.
3. Tarkett, Inc.; Expressions.

B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

F. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

1. Adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

   a. VCT Tile Adhesives: Not more than 50 g/L.

2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply two coat(s).

E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096723 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Resinous Flooring Type 1: ¼" nominal thickness cementitious urethane based self-leveling seamless flooring system with fine quartz aggregate broadcast, epoxy broadcast, and urethane topcoat.

   a. Application: Walk-in Refrigerator (Bio-Hazard Waste Storage).

2. Resinous Flooring Type 2: 1/8" nominal thickness urethane based body coat with 2 topcoats of a 100% solids conductive sealer methyl methacrylate (MMA) based, acrylic reactive resin (prevents electrical charge accumulation). System includes vinyl flakes as non-skid aggregate, in the top coats.

   a. Application: Rm. 104 Chemical Waste Storage, 104B Chemical Waste and 104A Chemical Lab.

3. Resinous Flooring Type 3: 16 mil nominal cured thickness, two component, pigmented, epoxy coating over a clear epoxy primer/sealer.

   a. Application: Rms. 103 Centralized Loading/Work Area, 105 General Storage, 106 Radiation Waste Storage, 106A Radiation Lab, 107 Central Supply Storage, 108 Universal Storage.

4. Resinous Flooring Type 4: 16 mil nominal cured thickness (walls) and 8 mil nominal cured thickness (floors), two component, pigmented, epoxy coating over a clear epoxy primer/sealer.

a. Application: Floors and walls of detention basins in Radiation Waste Storage, Chemical Storage, and Chemical Waste Storage.

5. Integral cove base at Resinous Flooring Type 1 and 2.

C. Related Sections:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, recycling, and disposing of non hazardous waste.
3. Section 079200 "Joint Sealants" for sealants installed at joints in resinous flooring systems.

1.3 PERFORMANCE REQUIREMENTS

A. Provide resinous flooring systems that comply with the requirements of the United States Department of Agriculture (USDA), Food and Drug Administration (FDA) and the local Health Department.

B. High Performance Buildings Submittals: Provide documentation including laboratory test reports indicating compliance with California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers" or provide systems that are certified for VOC content by one of the following:

1. Scientific Certifications Systems – Indoor Advantage-Gold.
2. Greenguard Certification Program.

1.4 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

D. IEQc4.3: "Manufacturer's product data for interior flooring, documentation including printed statement of VOC content and compliance with the FloorScore Standard.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of floor system and product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Initial Selection: For each type of exposed finish required.

C. Samples for Verification: 6 inches square, applied to a rigid backing by Installer for this Project. Provide samples representative of color, texture and thickness for each system, and each color, used in project.

1.6 INFORMATIONAL SUBMITTALS

A. Material Test Reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.

1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups for each type of resinous flooring specified, on 48-inch-square floor area selected by Architect.

a. Include 48-inch length of integral cove base with inside and outside corner.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 HIGH-PERFORMANCE RESINOUS FLOORING TYPE 1

A. Basis-of-Design Product: Subject to compliance with requirements, provide Dur-A-Flex; Hybri-Flex EB (with Armor-Top Topcoat) or comparable product by another manufacturer.

B. Resinous Flooring: Abrasion-, impact-, chemical-, slip-, and thermal shock- resistant, high-performance-aggregate-filled, polyurethane resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.

C. System Characteristics:

1. Color and Pattern: As selected by Architect from manufacturer’s full range.
2. Wearing Surface: Manufacturer’s standard wearing surface.
3. Overall System Thickness: ¼ inch.

D. Topping: Dur-A-Flex, Inc. Poly-Crete MD Resin, hardener and SL Aggregate.

1. Resin: Cementitious urethane.
2. Formulation Description: 100 percent solids.
3. Application Method: Self-leveling slurry with broadcast aggregates.
4. Aggregates: Manufacturer's standard natural quartz.

E. Second Broadcast and Grout Coat: Dura-A-Flex, Inc. Flintshot quartz aggregate and Shop Floor 100% solids epoxy.

F. Topcoat: Dura-A Flex Armor-Top aliphatic urethane multi-component resin.

1. Resin: Multi-component aliphatic urethane.
2. Type: Pigmented.

3. Finish: Matte.

G. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 17,500 psi per ASTM D 695.
2. Tensile Strength: 4,000 psi per ASTM D 638.
3. Water Absorption: 0.04% per ASTM D 570.
4. Impact Resistance: >160 in,-lb. per ASTM D 2794.
5. Hardness: 75-80, Shore D per ASTM D 2240.

2.2 HIGH-PERFORMANCE RESINOUS FLOORING TYPE 2

A. Basis-of-Design Product: Subject to compliance with requirements, provide Dur-A-Flex; Hybri-Flex MC with 2 Cryl-A-Stat ESD-401 topcoats and vinyl non-skid aggregate, or comparable product by another manufacturer.

B. Resinous Flooring: Abrasion-, impact-, chemical-, slip-, and thermal shock- resistant, high-performance cementitious urethane monolithic floor surfacing designed to produce a seamless floor and integral cove base. Conductive/static dissipative top coats/sealer: Methyl methacrylate (MMA) based, acrylic with vinyl flake aggregate designed to prevent electrical charge accumulation.

C. System Characteristics:

1. Color and Pattern: Manufacturer’s standard.
2. Wearing Surface: Manufacturer’s standard wearing surface.
3. Overall System Thickness: 3/16 inch.

D. Topping:

1. Resin: Cementitious urethane.
2. Formulation Description: 100 percent solids.
3. Application Method: Self-leveling slurry with broadcast vinyl aggregates.

   a. Thickness of Coats: 1/8 inch.
   b. Number of Coats: One.

4. Aggregates: Manufacturer's standard vinyl.

E. Topcoat:

1. Resin: Acrylate polymers dissolved in methacrylate monomers.
2. Formulation Description: 100 percent solids.
3. Type: Pigmented.
4. Finish: Matte.
5. Number of Coats: Two 15 mil coats.

F. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 8,000 psi per ASTM D 695.
2. Tensile Strength: 3,550 psi per ASTM C 307.

2.3 HIGH-PERFORMANCE RESINOUS FLOORING TYPE 3

A. Basis-of-Design Product: Subject to compliance with requirements, provide Dur-A-Flex; Dur-A-Gard pigmented, two component epoxy coating over Dur-A-Glaze MVP Primer, or comparable system by another manufacturer.

B. Resinous Flooring: Two component, pigmented, epoxy coating over a clear epoxy primer/sealer designed for penetrating and sealing concrete floors, and providing a stain resistant easily cleanable durable surface.

C. System Characteristics:

1. Color: As selected by Architect from manufacturer's full range of tints.
2. Wearing Surface: Manufacturer's standard smooth wearing surface.
3. Application Rates:

a. Primer: 100 SF per gallon.
b. Finish: 100 SF per gallon.

D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Impact Resistance: > Pass per MIL D-3134.
2. Compressive Strength: 16,000 psi per ASTM D-695.
3. Abrasion Resistance, CS17 wheel (1000g load): 35 mg loss per ASTM D-4060, 1000 cycles.

2.4 HIGH-PERFORMANCE RESINOUS FLOORING TYPE 4 – OVERFLOW BASIN FLOORS AND WALLS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Dur-A-Flex; Dur-A-Gard Novolac pigmented , two component epoxy coating over Dur-A-Glaze MVP Primer, or comparable system by another manufacturer.

B. Resinous Flooring: Two component, pigmented, epoxy coating over a clear epoxy primer/sealer designed to provide protection against chemicals, acids, solvents, and high temperatures.

C. System Characteristics:

1. Color: As selected by Architect from manufacturer's full range of tints.

2. Wearing Surface: Manufacturer's standard smooth wearing surface.
3. Application Rates:

   a. Primer: 100 SF per gallon.
   b. Finish/Floor: 100 SF per gallon.
   c. Finish/Walls: 200 SF per gallon. Thicken with NoSag #2 to prevent product from running down vertical surfaces.

D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 14,000 psi per ASTM D-695.
2. Abrasion Resistance, CS10 wheel (1000g load): 0.075 g weight loss per ASTM D-1044, 1000 cycles.

2.5 ACCESSORIES

A. Primer: Type recommended by manufacturer for substrate and body coats indicated.

B. Reinforcing Membrane: Flexible resin formulation that is recommended by manufacturer for substrate and primer and body coats indicated and that prevents substrate cracks from reflecting through resinous flooring.

C. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

D. Flexible Joint at Refrigerator Door: Manufacturer's standard polyurethane sealant equal to Metzger McGuire RS88.

E. Miscellaneous Accessories: Provide all items required for a complete installation.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:

a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.

3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

   a. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level measurement.

4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply reinforcing membrane to substrate cracks.

D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top coating of cove base. Round internal and external corners.

1. Integral Cove Base: 8 inches high.

E. Apply self-leveling slurry body coats in thickness indicated for flooring system.

1. Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.

F. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

G. Sand/buff between top coats to reduce grit on surface while maintaining compliance with ADA for slip resistance.

3.3 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 096723

SECTION 096816 - CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Carpet Tile.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 09 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet.

1.3 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's

name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.

D. IEQc4.3: "Manufacturer's product data for interior flooring, documentation including printed statement of VOC content and compliance with the FloorScore Standard.

1.4 SUBMITTALS

A. Product Data: For the following, including installation recommendations for each type of substrate:

1. Carpet Tile: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpeting type, color, and dye lot.
3. Pattern type, repeat size, location, direction, and starting point.
4. Pile direction.
5. Type, color, and location of edge, transition, and other accessory strips.
6. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- long Samples.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

E. Maintenance Data: For carpeting to include in maintenance manuals. Include the following:

1. Methods for maintaining carpeting, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpeting.

F. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered. Refer to Division 1 Section "Substitutions."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

1.7 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Environmental Limitations: Do not install carpeting until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpeting over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.

1.8 WARRANTY

A. Special Warranty for Carpeting: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpeting installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, wrinkles, and delamination.
3. Warranty Period: Lifetime commercial limited.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 8 percent of amount installed for each type indicated, but not less than 5 sq. yd.

1.10 CARPET TILE

A. Basis of Design Product: Subject to compliance with requirements, provide **Shaw Contract Group Fringe Tile, Style 5T038, One standard color.**. Provide listed product or product by another manufacturer, comparable in quality to named product, and meeting the following requirements. Refer to Division 1 Section "Substitutions" for requirements.

B. Construction: Multi-Level Pattern Loop.

C. Fiber Type: Eco Solution q nylon.

D. Dye Method: 98% solution dyed / 2% yam dyed.

E. Pattern Repeat: None.

F. Tufted Weight: 18.0.

G. Gauge: 1/12”.

H. Stitches per inch: 9.

I. Finished Pile Thickness: 0.100.

J. Total Thickness: 0.255.

K. Average Density: 6480.

L. Product Size: 18” x 36”.

M. Primary Backing: Synthetic.

N. Secondary Backing: Ecoworx Tile.

O. Protective Treatments: SSP Shaw Soil Protection.

P. Performance Characteristics:

1. Critical Radiant Flux Classification: (Class I) Not less than 0.45 W/sq. cm.

2. NBS Smoke: Less than 450.
3. Electrostatic Propensity: Less than 3.5 kv.

Q. Installation Method: Brick.

1.11 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.

B. Adhesives - Releasable: Water-resistant, mildew-resistant, non-staining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tiles and that is recommended by carpeting manufacturer.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 2 - EXECUTION

2.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpeting for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

2.2 PREPARATION

A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpeting manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

2.3 INSTALLATION

A. Comply with CRI 104 and carpeting manufacturer's written installation instructions for the following:

1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."

B. Comply with carpeting manufacturer's written recommendations and Shop Drawings. At doorways, center seams under the door in closed position.

C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpeting manufacturer.

D. Extend carpeting into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

F. Install pattern parallel to walls and borders.

2.4 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.
3. Vacuum carpeting using commercial machine with face-beater element.

B. Protect installed carpeting to comply with CRI 104, Section 16, "Protection of Indoor Installations."

C. Protect carpeting against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpeting manufacturer and carpeting adhesive manufacturer.

END OF SECTION 096816

SECTION 099120 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color or finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

a. Architectural woodwork.
b. Metal toilet enclosures.
c. Metal lockers.
d. Elevator entrance doors and frames.
e. Elevator equipment.
f. Finished mechanical and electrical equipment.
g. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

   a. Foundation spaces.
   b. Furred areas.
   c. Ceiling plenums.
   d. Utility tunnels.
   e. Pipe spaces.
   f. Duct shafts.
   g. Elevator shafts.

3. Finished metal surfaces include the following:

   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper and copper alloys.
   e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:

   a. Valve and damper operators.
   b. Linkages.
   c. Sensing devices.
   d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

E. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/Ct High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 5 Section "Structural Metal Framing" for shop priming structural steel.
4. Division 5 Section “Steel Roof Deck” for shop priming roof deck.
5. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
6. Division 8 Section "Hollow Metal Doors and Frames" for factory priming steel doors and frames.
7. Division 9 Section "Gypsum Board" for surface preparation of gypsum board.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

D. IEQc4.2: "Manufacturer's product data for paints and coatings, including printed statement of VOC content."

1.5 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
3. Certification by the manufacturer that products specified comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Samples for Initial Selection: For each type of finish-coat material indicated.

1. After color selection, Architect will furnish color chips for surfaces to be coated.

C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.

D. Qualification Data: For Applicator.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.

1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.

   a. Wall Surfaces: Provide samples on at least 100 sq. ft.
   b. Small Areas and Items: Architect will designate items or areas required.

2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.

   a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.

3. Final approval of colors will be from benchmark samples.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.

6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.8 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.9 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: Furnish Owner with extra paint materials in quantities indicated below:

a. Exterior, Semi-gloss Acrylic Coating: 1 gal. of each color applied.
b. Interior, Flat Acrylic Paint: 2 gal. of each color applied.
c. Interior, Low-Luster Acrylic Paint: 2 gal. of each color applied.
d. Interior, Semi-gloss Acrylic Paint: 2 gal. of each color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co. (Benjamin Moore).
2. Akzo Nobel Paints, LLC (Glidden Professional).
3. PPG Industries, Inc. (Pittsburgh Paints).
4. Sherwin-Williams Co. (Sherwin-Williams).

B. Products: Products listed in other Part 2 Articles are manufactured by Sherwin-Williams Co. Subject to compliance with requirements, provide the listed product or equal product by one of the named manufacturers.

1. Dry Film Thickness: Paints and coatings proposed as equal to the listed products must meet the specified minimum dry film thicknesses. If the proposed products do not meet the specified minimum dry film thicknesses in a single coat, the contractor may propose additional coats to meet the requirements. Coordinate the number of coats required with the material specifications, and the schedules listed at the end of this Section.

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

Product Type	Reference Standard	VOC Limit g/L minus water
Interior Flat Coating	Green Seal GS-11, 1993	50
Interior Non-Flat Coating	Green Seal GS-11, 1993	150
Anti-Corrosive/Anti-Rust Paint	Green Seal GC-03, 2nd Edition, 1997	250
Clear Wood Finish: Lacquer	SCAQMD Rule 1113, 2004	550
Clear Wood Finish: Sanding Sealer	SCAQMD Rule 1113, 2004	350
Clear Wood Finish: Varnish	SCAQMD Rule 1113, 2004	350

Clear Brushing Lacquer	SCAQMD Rule 1113, 2004	680
Floor Coatings	SCAQMD Rule 1113, 2004	100
Primers, Sealers and Undercoaters	SCAQMD Rule 1113, 2004	200
Shellac: Clear	SCAQMD Rule 1113, 2004	730
Shellac, Pigmented	SCAQMD Rule 1113, 2004	550
Stain	SCAQMD Rule 1113, 2004	250
Concrete Curing Compounds	SCAQMD Rule 1113, 2004	350
Japans/ Faux Finishing Coatings	SCAQMD Rule 1113, 2004	350
Magnesite Cement Coatings	SCAQMD Rule 1113, 2004	450
Pigmented Lacquer	SCAQMD Rule 1113, 2004	550
Waterproofing Sealers	SCAQMD Rule 1113, 2004	250
Waterproofing Concrete/Masonry Sealers	SCAQMD Rule 1113, 2004	400
Wood Preservatives	SCAQMD Rule 1113, 2004	350
Low-Solids Coatings	SCAQMD Rule 1113, 2004	120*

*Note: VOC levels for Low-Solids Coatings are measured in grams of VOC per liter of material, including water."

D. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Colors: Match Architect's samples.

2.3 CONCRETE UNIT MASONRY BLOCK FILLER

A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance vinyl acrylic block filler.

1. Sherwin-Williams; PrepRite Block Filler B25W25. Applied at a dry film thickness of not less than 8.0 mils.

2.4 EXTERIOR PRIMERS

A. Exterior Metal Primer: Factory-formulated rust-inhibitive acrylic metal primer for exterior application.

1. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer B66-310 Series: Applied at a dry film thickness of not less than 3.0 mils.

2.5 INTERIOR PRIMERS

A. Interior Concrete and Masonry Wall Primer: Factory-formulated alkali-resistant interior/exterior latex primer.

1. Sherwin-Williams; PrepRite Block Filler B25W25. Applied at a dry film thickness of not less than 8.0 mils.

B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.

1. Sherwin-Williams; ProMar 200 Zero VOC Latex Primer B28W2600: Applied at a dry film thickness of not less than 1.0 mils.

C. Interior Metal Primer: Factory-formulated rust-inhibitive acrylic metal primer.

1. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer B66-310 Series: Applied at a dry film thickness of not less than 3.0 mils.

2.6 EXTERIOR FINISH COATS

A. Exterior Semi-Gloss Acrylic Coating: Factory-formulated semi-gloss acrylic coating for exterior application.

1. Sherwin-Williams; Pro Industrial 0 VOC Acrylic B66-600 Series: Applied at a dry film thickness of not less than 3.0 mils.

2.7 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint: Factory-formulated flat vinyl acrylic latex paint for interior application.

1. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Flat Paint B30-2600 Series: Applied at a dry film thickness of not less than 1.8 mils.

B. Interior Low-Luster Acrylic Paint: Factory-formulated eggshell vinyl acrylic latex interior paint.

1. Sherwin-Williams; ProMar 200 Interior Latex Eg-Shel B20W2200 Series: Applied at a dry film thickness of not less than 1.6 mils.

C. Interior Semi-gloss Acrylic Paint: Factory-formulated semi-gloss vinyl acrylic latex paint for interior application.

1. Sherwin-Williams; ProMar 200 Interior Latex Semi-Gloss B31-2600 Series: Applied at a dry film thickness of not less than 1.6 mils.

D. Interior Semi-gloss Acrylic Coating: Factory-formulated semi-gloss single component acrylic coating for interior application. Note: Provide number of coats necessary to achieve minimum dry film thickness listed.

1. Sherwin-Williams; Pro Industrial 0 VOC Acrylic B66-600 Series: Applied at a dry film thickness of not less than 3.0 mils.

E. Interior Gloss Epoxy Coating: Factory-formulated two component polyamine epoxy top coat for interior/exterior application. Note: Provide number of coats necessary to achieve minimum dry film thickness listed.

1. Sherwin-Williams; Pro Industrial Water Based Catalyzed Epoxy B73-300 Series: Applied at a dry film thickness of not less than 3.0 mils.

2.8 INTERIOR WOOD STAINS AND VARNISHES

A. Interior Waterborne Clear Satin Varnish: Factory-formulated clear satin acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.

1. Sherwin-Williams; Wood Classics Waterborne Polyurethane Satin, A68 Series.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical

or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
    c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.

    a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
    b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.

2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer, unless greater thickness is specified.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Tanks that do not have factory-applied final finishes.
5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

G. Electrical items to be painted include, but are not limited to, the following:

1. Switchgear.
2. Panelboards.
3. Electrical equipment that is indicated to have a factory-primed finish for field painting.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove non-complying paint from Project site, pay for testing, and repaint surfaces previously coated with the non-complying paint. If necessary, Contractor may be required to remove non-complying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

A. Metal: Provide the following finish systems over exterior metal. Primer is not required on shop-primed items.

1. Semi-Gloss Acrylic Coating: Two finish coats over a rust-inhibitive primer.

a. Primer: Exterior metal primer.
b. Finish Coats: Exterior semi-gloss acrylic coating.

3.8 INTERIOR PAINT SCHEDULE

A. Concrete Walls: Provide the following paint systems over interior concrete wall substrates:

1. Semi-gloss Acrylic Paint: Two finish coats over a primer.

a. Primer: Interior concrete and masonry wall primer.
b. Finish Coats: Interior semi-gloss acrylic paint.

B. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:

1. Semi-gloss Water Based Epoxy Finish: Two finish, or primer and one finish coat over a block filler.

a. Block Filler: Concrete unit masonry block filler for epoxy coating.
b. Primer: Interior concrete and masonry wall primer.
c. Finish Coats: Interior semi-gloss acrylic paint.

C. Gypsum Board: Provide the following finish systems over interior gypsum board ceilings (except Toilet Room ceilings) and soffits:

1. Flat Acrylic Finish: Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior flat acrylic paint.

D. Gypsum Board: Provide the following finish systems over gypsum board ceilings in Toilet Rooms, and gypsum board walls;

1. Low-Luster Acrylic Paint Finish: Two finish coats over a primer.

a. Primer: Interior gypsum board primer.

b. Finish Coats: Interior low-luster acrylic paint.

E. Metals: Provide the following finish systems over metals:

1. Semi-gloss Acrylic Coating: Two finish coats over a primer.

a. Primer: Interior metal primer.
b. Finish Coats: Interior semi-gloss acrylic coating.

F. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:

1. Flat Acrylic Finish: Two finish coats. Add fungicidal agent to render fabric mildew proof.

a. Finish Coats: Interior flat acrylic paint.

END OF SECTION 09912

SECTION 101100 - VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Markerboards.
2. Tackboards.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.

1.3 DEFINITIONS

A. Tackboard: Framed or unframed, tackable, visual display board assembly.

B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes markerboards and tackboards.

C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.4 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

C. IEQc4.4: "For composite wood products, documentation indicating that product contains no added urea formaldehyde."

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of panel joints.
2. Include sections of typical trim members.

C. Samples for Initial Selection: For each type of visual display surface indicated, for units with factory-applied color finishes, and as follows:

1. Actual sections of porcelain-enamel face sheet and tackboard assembly.
2. Plastic-Impregnated Cork Sheet for tack assemblies.
3. Include accessory samples to verify color selected.

D. Qualification Data: For qualified Installer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

F. Operation and Maintenance Data: For visual display surfaces to include in maintenance manuals.

G. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A, 25 or less.
2. Smoke-Developed Index: Class A, 450 or less.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display surfaces completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, pre-fit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display surfaces vertically with packing materials between each unit.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.9 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.
b. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: Life of the building.

B. Special Warranty for tackboards: Manufacturer's standard form in which manufacturer agrees to repair or replace tackboards that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: Manufacturer's standard steel sheet with porcelain-enamel coating fused to steel; uncoated thickness indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Claridge Products and Equipment, Inc.
b. PolyVision Corporation; a Steelcase company.

2. Gloss Finish: Low gloss; dry-erase markers wipe clean with dry cloth or standard eraser. Suitable for use as projection screen.

B. Plastic-Impregnated Cork Sheet: Seamless, homogeneous, self-sealing sheet consisting of granulated cork, linseed oil, resin binders, and dry pigments that are mixed and calendared onto fabric backing; with washable vinyl finish and integral color throughout with surface-burning characteristics indicated.

C. Hardboard: ANSI A135.4, tempered.

D. Particleboard: ANSI A208.1, Grade M-1, made with binder containing no urea formaldehyde.

E. Fiberboard: ASTM C 208.

F. Extruded Aluminum: ASTM B 221, Alloy 6063.

2.2 MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and 0.021-inch-thick, porcelain-enamel face sheet with low-gloss finish.

1. Basis of Design Manufacturer: Claridge Products and Equipment, Inc. Subject to compliance with requirements, provide products by Claridge Products and Equipment, Inc. or equal products by another manufacturer.
2. Particleboard Core: 7/16” with moisture barrier backing.
3. Laminating Adhesive: Moisture-resistant thermoplastic type meeting allowable VOC limits from list identified in 018113.13.

2.3 TACKBOARD ASSEMBLIES

A. Tackboard Assemblies:

1. Basis of Design Manufacturer: Claridge Products and Equipment, Inc. Subject to compliance with requirements, provide products by Claridge Products and Equipment, or equal products by another manufacturer.

B. Plastic-Impregnated-Cork Tackboard: 1/4-inch- thick, plastic-impregnated cork sheet factory laminated to 1/4-inch- thick hardboard backing.

2.4 ACCESSORIES

A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- thick, extruded aluminum; standard size and shape.

1. Field-Applied Trim: Manufacturer's standard, snap-on trim with no visible screws or exposed joints.
2. Factory-Applied Trim: Manufacturer's standard.

B. Chalktray: Manufacturer's standard, continuous.

1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.

2.5 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Visual Display Boards: Field assemble visual display boards unless otherwise indicated.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

C. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
2. Provide manufacturer's standard vertical-joint spline system between abutting sections of markerboards.
3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards of combination units.
4. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by

Architect from manufacturer's standard structural support accessories to suit conditions indicated.

D. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display surfaces.

C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.

D. Prepare recesses for sliding visual display units as required by type and size of unit.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

A. Visual Display Boards: Attach visual display boards to wall surfaces with egg-size adhesive gobs at 16 inches o.c., horizontally and vertically.

1. Field-Applied Aluminum Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at not more than 24 inches o.c.

a. Attach chalktrays to boards with fasteners at not more than 12 inches o.c.

3.5 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 101100

SECTION 101426 - POST AND PANEL/PYLON SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all sections within DIVISION 01- GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

2. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Nonilluminated post and panel signs.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For post and panel/pylon signage.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for signs.

2.2 POST AND PANEL

A. Post and Panel Sign as indicated: Sign of single-panel configuration; with smooth, uniform surfaces and support assembly; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Solid-Sheet Sign Panels Aluminum sheet with finish specified in "Sign-Panel-Face Finish and Applied Graphics" Subparagraph below and as follows:

    a. Surface-Applied Graphics: Applied vinyl film.
    b. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
    c. Inset, Cutout Characters: Sign face routed to receive push-through acrylic graphics.

2. Laminated, Aluminum-Sheet Sign Panels: Aluminum sheet laminated to both sides of core sheet.

    a. Surface-Applied Graphics: Applied vinyl film.

3. Posts: Steel.

    a. Shape: Round.
    b. Size: 2-inch.
    c. Installation Method: Direct burial.
    d. Finish and Color: As selected by Architect from manufacturer's full range.

4. Sign-Panel-Face Finish and Applied Graphics:

    a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.

2.3 MATERIALS

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:

a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

C. Anchoring Materials:

1. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
2. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

a. Water-Resistant Product: At exterior locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Mill joints to tight, hairline fit. Form joints exposed to weather to resist water penetration and retention.
2. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
3. Conceal fasteners and anchors unless indicated to be exposed; locate exposed fasteners where they will be inconspicuous.
4. Internally brace signs for stability and for securing fasteners.

B. Post Fabrication: Fabricate posts designed to withstand wind pressure indicated for Project location and of lengths required for installation method indicated for each sign.

1. Steel Posts: Hot-dip galvanize post assemblies after fabrication according to ASTM A 123/A 123M.
2. Direct Burial: Fabricate posts 36 inches longer than height of sign to permit direct burial or embedment in concrete foundations or concrete-filled postholes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install signs using installation methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to accessibility standard.
3. Before installation, verify that sign components are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 INSTALLING POSTS

A. Direct-Burial Method:

1. Excavation: Excavate posthole to dimensions indicated. Reconstruct subgrade that is not firm, undisturbed, or compacted soil, or that is damaged by freezing temperatures, frost, rain, accumulated water, or construction activities by excavating an additional 12 inches, backfilling with satisfactory soil or well-graded aggregate, and compacting to original subgrade elevation.
2. Setting in Earth: Set post in position, support to prevent movement, and backfill with satisfactory soil or well-graded aggregate as recommended in writing by manufacturer. Place and compact backfill in 6-inch lifts, compacting each lift.
3. Setting in Cast-in-Place Concrete: Set post in position, support to prevent movement, and place concrete in posthole.
4. Setting in Preformed Hole in Concrete Foundation: Form or core drill holes in concrete foundation not less than 3/4 inch larger than outside dimension of post for installing posts in concrete. Set post in position, shim to prevent movement, and fill annular space between post and hole with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.

    a. Cover anchorage joint in concrete foundations with flange of same metal and finish as post, to post after placing anchoring material.

END OF SECTION 101426

SECTION 102800 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Washroom accessories.
2. Warm-air dryers.
3. Custodial accessories.

C. Owner-Furnished Material: Toilet paper dispensers equal to Standard Canter Model No. R4500, Jumbo Roll Dispenser, 12 ½" H x 20 ½" Wide x % %/8" deep. Provide installation and blocking at each toilet.

D. Related Sections:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.

1.3 LEED SUBMITTALS

A. M Rc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.7 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace mirrors that develop visible silver spoilage defects within 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, No. 4 satin finish, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

C. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick, tempered.

2.2 WASHROOM ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

1. American Specialties, Inc.
2. Bobrick Washroom Equipment, Inc.
3. McKinney/Parker.

B. Toilet Tissue Dispensers: Furnished by owner, installed by Contractor.

C. Liquid-Soap Dispenser:

1. Basis-of-Design Product: Bobrick B-2111 ClassicSeries Surface Mounted Soap Dispenser.
2. Description: Designed for dispensing all-purpose hand soap.
3. Mounting: Vertically oriented, surface mounted.
4. Capacity: 40 oz.
5. Materials: Type 304 22-gauge stainless steel with satin finish
6. Refill Indicator: Window type.

D. Grab Bar:

1. Basis-of-Design Product: Bobrick B-5806 Series.
2. Mounting: Flanges with concealed fasteners.
3. Material: 18 gauge, type 304 Stainless steel.

   a. Finish: Satin.

4. Outside Diameter: 1-1/4 inches.
5. Configuration and Length: As indicated on Drawings.

E. Sanitary-Napkin Disposal Units:

1. Basis-of-Design Product: Bobrick B-353 ClassicSeries Recessed (wall) Sanitary Napkin Disposal.
2. Mounting: Recessed and Partition mounted, dual access.
3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Type 304 Stainless steel with satin finish, 22-gauge.
6. Provide one (1) at each women's toilet fixture.

F. Recessed Waste Receptacle

1. Basis-of-Design Product: Bobrick B-364 ClassicSeries Recessed (wall) Waste Receptacle.
2. Mounting: Recessed.
3. Capacity: 12 gallon.
4. Receptacle: Provide optional removable liner.
5. Material and Finish: Type 304 Stainless steel with satin finish, 22-gauge.
6. Provide one (1) at each toilet room.

G. Mirror Unit:

1. Basis-of-Design Product: Bobrick B-2908 Series.
2. Frame: ¾" x ¾" type 304 stainless-steel angle.

   a. Corners: Welded and ground smooth.

3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

   a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

2.3 WARM-AIR DRYERS

A. Warm-Air Dryer (Typical):

1. Basis-of-Design Product: Subject to compliance with requirements, provide Xlerator Hand Dryer, Model No. XL-SB with optional Xlerator Recess Kit to meet ADA Protrusion Requirement of 4"; or equal product by another manufacturer.
2. Mounting: Semirecessed.
3. Operation: Electronic-sensor activated with timed 35 second lockout feature.
4. Drying time: 10 to 15 seconds.
5. Cover Material and Finish: Stainless steel, brushed finish.
6. Electrical Requirements: 1500 watts, 208 volt.
7. Motor: Thermally protected, 5/8 HP/20,000 RPM.
8. Air Velocity at Outlet: 16,000 LFM.
9. Air Temperature at Hands (4 inches below air outlet): 135 degrees F at 72 degrees F room temperature.
10. Listings: UL and GreenSpec.

2.4 CUSTODIAL ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

1. American Specialties, Inc.
2. Bobrick Washroom Equipment, Inc.
3. McKinney/Parker.

B. Utility Shelf :

1. Basis-of-Design Product: Bobrick B-295 Stainless Steel Shelf.
2. Description: With exposed edges turned down not less than 1/2 inch and supported by two triangular brackets welded to shelf underside.
3. Size: 24 inches long by 5 inches deep.
4. Material and Finish: Not less than 18 gauge type 304 stainless steel, satin finish.
5. Provide one (1) at Custodial Room.

C. Mop and Broom Holder :

1. Basis-of-Design Product: Bobrick B-223x24.
2. Description: Mop and Broom Holder.
3. Length: 24”.
4. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
5. Material and Finish: Type 304 Stainless steel, satin finish.
6. Provide one (1) at Custodial Room.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104413 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Portable fire extinguishers.
2. Mounting brackets for fire extinguishers.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.

1.3 LEED SUBMITTALS

A. M Rc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.

1. Fire Extinguishers: Include rating and classification.

B. Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer specified.

2.2 PORTABLE FIRE EXTINGUISHERS

A. Manufacturers: Provide products by Badger Fire Protection.

B. General: Provide fire extinguishers of type, size, and capacity for each mounting bracket indicated.

1. Valves: Manufacturer's standard.
2. Handles and Levers: Manufacturer's standard.
3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

C. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 3-A:40-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

D. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

1. Color: Black.

E. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions where fire extinguishers will be installed.

B. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 104413

SECTION 105113 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Knocked-down corridor lockers.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.

1.3 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of reach regional materials and the fraction by weight that is considered regional."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of metal locker.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.

B. Shop Drawings: For metal lockers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Show locker trim and accessories.
3. Include locker identification system and numbering sequence.
4. Indicate locations of accessible lockers.

C. Samples: For each color specified, in manufacturer's standard size.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

E. Product Schedule: For lockers.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:

a. Identification plates.
b. Hooks.

1.8 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1.

1. Provide hardware that does not require tight grasping, pinching, or twisting of the wrist, and that operates with a force of not more than 5 lbf.

    a. Quantity: Provide compliant handles for 5%, but no fewer than 2, of lockers provided.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.11 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.12 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures.
    b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Metal Lockers: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain metal lockers from single source from single locker manufacturer.

1. Obtain locks from single lock manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: For accessible lockers, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

1. Provide 5 percent, but no fewer than two, of each type of locker.

2.3 KNOCKED-DOWN CORRIDOR LOCKERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. DeBourgh Mfg. Co; Worley S.A.T. Knock-Down.
2. Olympus Lockers & Storage Products, Inc; Heavy Duty Corridor (HDC).
3. Penco Products, Inc; Vanguard.
4. Republic Storage Systems Company; Standard Lockers.

B. Doors: One piece; fabricated from 16 gauge steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
2. Door Style: Vented panel as follows:

a. Louvered Vents: No fewer than six louver openings at top and bottom for single-tier.

C. Body: Assembled by welding body components together. Fabricate from un-perforated steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Sides: 24 gauge thickness.
2. Backs: 24 gauge thickness.
3. Shelves: 24 gauge thickness, with double bend at front and single bend at sides and back.

D. Frames: Channel formed; fabricated from 16 gauge steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Continuous Hinges: Manufacturer's standard, steel, full height.

F. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant, designed to accept a built-in lock or padlock.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic latching and pre-locking.

a. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.105-inch nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

G. Locks: Padlocks supplied by users.

H. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.

I. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

J. Continuous Zee Base: Fabricated from, manufacturer's standard thickness, but not less than 0.060-inch nominal-thickness steel sheet.

1. Height: 4 inches.

K. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.

L. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.

M. Finished end panels: Fabricated from 0.024-inch nominal-thickness steel sheet.

N. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 zinc-iron, alloy (galvannealed) coating designation.

O. Finish: Baked enamel or powder coat.

2.4 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Equipment: Provide each locker with an identification plate and the following equipment:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.

D. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for nominal assembly at Project site.

E. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

F. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.

G. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

1. Sloping-top corner fillers, mitered.

H. Individual Sloping Tops: Fabricated in width to fit one locker frame in lieu of flat locker tops; with integral back; finished to match lockers. Provide wedge-shaped divider panels between lockers.

I. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.

J. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

K. Boxed End Panels: Fabricated with 1-inch- wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.

L. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

2.5 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top and bottom of lockers.

B. Knocked-Down Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.

C. Equipment:

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates:

a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach recess trim to recessed metal lockers with concealed clips.
2. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
3. Attach sloping-top units to metal lockers, with closures at exposed ends.
3. Attach boxed end panels using concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
4. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 108200 – EXTRUDED ALUMINUM SCREENS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Roof-mounted extruded aluminum screens with horizontal airfoil tube-blades.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide screens capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of screen components, noise or metal fatigue caused by screen blade rattle or flutter, or permanent damage to fasteners and anchors.

1. Wind Loads: Determine loads based on pressures as indicated on Structural Drawings.

B. Seismic Performance: Provide screens capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1. Seismic Design Criteria: As indicated on Structural Drawings.

C. Thermal Movements: Provide screens that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other

detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 LEED SUBMITTALS

A. M Rc4: “Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: “Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional.”

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for extruded aluminum screens.

B. Shop Drawings: For extruded aluminum screens and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.

C. Delegated-Design Submittal: For extruded aluminum screens. Include loads, point reactions, and locations for attachment of screens to building's structure.

D. Samples: For units with factory-applied color finishes.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain extruded aluminum screens through one source from a single manufacturer.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code--Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.7 WARRANTY

A. Provide manufacturer’s 5 year warranty against manufacturing defects.

1.8 DELIVERY STORAGE AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer, material, and location of installation.

B. Storage: Store materials in a dry area indoors and protected from damage and in accordance with manufacturer's instructions.

C. Handling: Protect materials and finishes during handling and installation to prevent damage.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product: Drawings and Specification are based on All-Lite Architectural Products HT-401 equipment screen. Subject to compliance with requirements, provide the named product or a comparable product from another manufacturer..

2.2 EXTRUDED ALUMINUM SCREENS

A. Construction:

1. Material: Mill finish 6063-T5 extruded aluminum.
2. Frame: 4" x 1 ½" x 0.081" thick angle.
3. Blades: 0.081 thick airfoil tube style.
4. Mullion: Concealed.

B. Performance Data:

1. Based on testing 48 inch x 48 inch size unit in accordance with AMCA 500L.
2. Free Area: 60.0% nominal
3. Free area size: 9.6 ft^2.

2.3 FABRICATION, GENERAL

A. Assemble screens in factory to greatest extent possible to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal screen blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer.

1. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.

F. Join frame members to each other and to fixed blades with fillet welds, threaded fasteners, or both, as standard with manufacturer, concealed from view, unless otherwise indicated or size of assembly makes bolted connections between frame members necessary.

2.4 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish screens after assembly.

2.5 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic-Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Fluoropolymer Three-Coat Coating System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

a. Color and Gloss: One custom color, match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean opening thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Locate and place screens level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

E. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

3.4 ADJUSTING AND CLEANING

A. Clean exposed surfaces of screens that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore extruded aluminum screens damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 108200

SECTION 111300 - LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Recessed dock levelers.
2. Edge of dock levelers.
3. Dock bumpers.

C. Related Sections:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 03 Section "Concrete" for concrete work for recessed loading dock equipment.
4. Division 05 Section "Metal Fabrications" for curb angles at edges of recessed pits.
5. Division 08 Section "Overhead Coiling Doors" for coiling and other overhead doors electrically interlocked to dock levelers.

1.3 DEFINITIONS

A. Operating Range: Maximum amount of travel above and below the loading dock level.

B. Working Range: Recommended amount of travel above and below the loading dock level for which loading and unloading operations can take place.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for loading dock

equipment. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For loading dock equipment. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Welding certificates.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency; indicate compliance of dock levelers with requirements in MH 30.1 for determining rated capacity, which is based on comprehensive testing within last two years of current products.

1. Submittal Form: According to MH 30.1, Appendix A.

D. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For loading dock equipment to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than one hours' normal travel time from Installer's place of business to Project site.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Preinstallation Conference: Conduct conference at Project site.

1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
2. Review sequence of operation for each type of loading dock equipment.
3. Review required testing, inspecting, and certifying procedures.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of construction contiguous with loading dock equipment by field measurements before fabrication.

1.9 WARRANTY

A. Special Warranty for Dock Levelers: Manufacturer's standard form in which manufacturer agrees to repair or replace dock-leveler components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including cracked or broken structural support members, load-bearing welds, and front and rear hinges.
   b. Faulty operation of operators, control system, or hardware.
   c. Deck plate failures including cracked plate or permanent deformation in excess of 1/4 inch between deck supports.
   d. Hydraulic system failures including failure of hydraulic seals and cylinders.

2. Warranty Period for Structural Assembly: 1 year from date of Substantial Completion.
3. Warranty Period for Hydraulic System: 1 year from date of Substantial Completion.
4. Warranty shall be for unlimited usage of leveler for the specified rated capacity over the term of the warranty.

1.10 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of loading dock equipment Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper loading dock equipment operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM 36/A 36M.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from steel plate complying with ASTM A 572/A 572M, Grade 55.

C. Steel Tubing: ASTM A 500, cold formed.

D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.2 RECESSED DOCK LEVELERS

A. General: Recessed, hinged-lip-type dock levelers designed for permanent installation in concrete pits preformed in the edge of loading platform; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DLM LHD Series Hydraulic Dock Leveler or comparable product by one of the following:

a. Beacon Industries, Inc.
b. McGuire, W. B. Co., Inc.; Division of Overhead Door Corporation.
c. Nordock Inc.
d. Pentalift Equipment Corporation.
e. Pioneer Loading Dock Equipment.
f. Rite-Hite Corporation.

B. Standard: Comply with MH 30.1.

C. Rated Capacity: 12,500 Dynamic, 25,000 Comparative Industry Rating.

D. Platform: Not less than 1/4-inch-thick, nonskid steel plate.

1. Platform Size: 7’ x 6’.
2. Frame: Manufacturer's standard.
3. Toe Guards: Equip open sides of dock leveler over range indicated with metal toe guards.

a. Toe-Guard Range: Full range.

E. Hinged Lip: Not less than 1/2-inch- thick, nonskid steel plate.

1. Hinge: Full width, piano-type hinge with heavy-wall hinge tube, with gussets on lip and ramp for support.
2. Safety Barrier Lip: Designed to protect material-handling equipment from an accidental fall from loading platform edge of the dock leveler when the leveler is not in use.

F. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.

1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:

   a. Above Adjoining Platform: 12 inches.
   b. Below Adjoining Platform: 12 inches.

2. Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed shall compensate automatically for upward or downward movement of truck bed during loading and unloading.
3. Automatic Lateral Compensation: Tilting of ramp with lip extended and resting on truck bed shall compensate automatically for canted truck beds of up to 4 inches over width of ramp.
4. Lip Operation: Manufacturer's standard mechanism that automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck, and automatically retracts lip when truck departs.

   a. Length of Lip Extension: 16 inches.

5. Automatic Ramp Return: Automatic return of unloaded ramp, from raised or lowered positions to stored position, level with platform, as truck departs.
6. Interlock: Leveler will not operate while leveler night lock is engaged.

G. Hydraulic Operating System: Electric control from a remote-control station; fully hydraulic operation. Electric-powered hydraulic raising and hydraulic lowering of ramp. Equip leveler with a packaged unit including a unitized, totally enclosed, non-ventilated electric motor, pump, manifold reservoir, and valve assembly of proper size, type, and operation for capacity of leveler indicated. Include means for lowering ramp below platform level with lip retracted behind dock bumpers. Provide a hydraulic velocity fuse connected to main hydraulic cylinder to limit loaded ramp's free fall to not more than 3 inches.

   1. Remote-Control Station with Emergency Stop: Weatherproof multi-button control station with an UP button of the constant-pressure type and an emergency STOP button of the momentary-contact type, enclosed in NEMA ICS 6, Type 4 box. Ramp raises by depressing and holding UP button; ramp lowers at a controlled rate by releasing UP button. All ramp movement stops, regardless of position of ramp or lip, by depressing STOP button. Normal operation resumes by engaging a manual reset button or by pulling out STOP button.

   2. Independent Lip Operation: Electric-powered hydraulic raising and hydraulic lowering of lip, controlled independent of raising and lowering of ramp.

H. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- or formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.

   1. Cross-Traffic Support: Manufacturer's standard method of supporting ramp at platform level in stored position with lip retracted. Provide a means to release supports to allow ramp to descend below platform level.

2. Maintenance Strut: Integral strut to positively support ramp in up position during maintenance of dock leveler.

I. Integral Laminated-Tread Dock Bumper: Fabricated from 4-1/2-inch-thick, multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two 3/4-inch- diameter, steel supporting rods that are welded at one end to 1/4-inch-thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch of tread plies extending beyond the face of closure angles.

1. Size: 12” high x 13 3/8” wide. Provide 2.

J. Accessories:

1. Curb Angles: 3-by-3-by-1/4-inch galvanized-steel curb angles for edge of recessed leveler pit, with 1/4-inch- thick x 1 inch wide by 6-inch- long concrete anchors welded to angle at 12 inches o.c.
2. Self-Forming Pan: Manufacturer's standard prefabricated, self-forming steel form system for poured-in-place construction of concrete pit.

K. Finish: Hot-dip galvanize dock levelers after assembly and testing. Paint in manufacturer’s standard color.

1. Toe Guards: Paint yellow to comply with ANSI Z535.1.

2.3 EDGE-OF-DOCK LEVELERS

A. General: Surface-mounted, hinged-lip-type, edge-of-dock levelers designed for permanent installation on face of loading dock platform; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DLM NeverLift Series Edge-of Dock Leveler or comparable product by one of the following:

a. Beacon Industries, Inc.
b. McGuire, W. B. Co., Inc.; Division of Overhead Door Corporation.
c. Nordock Inc.
d. Pentalift Equipment Corporation.
e. Pioneer Loading Dock Equipment.
f. Rite-Hite Corporation.

B. Standard: Comply with MH 30.1.

C. Rated Capacity: Capable of supporting total gross load of 20,000 lbs. without permanent deflection or distortion.

D. Platform Ramp Width: 72 inches.

E. Hinged Lip: Not less than 3/8-inch- thick, nonskid steel tread plate.

1. Hinge: Full width, piano-type hinge with heavy-wall hinge tube with gussets on lip and ramp for support.

F. Embed Channel: Recessed galvanized steel anchoring channel C 10x20x length of leveler.

G. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.

1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:

   a. Above Adjoining Platform: 5 inches.
   b. Below Adjoining Platform: 5 inches.

2. Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed shall compensate automatically for upward or downward movement of truck bed during loading and unloading.
3. Automatic Lateral Compensation: Tilting of ramp with lip extended and resting on truck bed shall compensate automatically for canted truck beds of up to 3 inches over width of ramp.
4. Lip Operation: Manufacturer's standard mechanism that automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck, and automatically retracts lip when truck departs.

   a. Length of Lip Extension: 17 inches.

5. Automatic Ramp Return: Automatic return of unloaded ramp, from raised or lowered positions to stored position, level with platform, as truck departs. Leveler shall be capable of retracting to stored position while truck is at loading dock.

H. Mechanical Operating System: Manual control; counterbalance and spring operation. Spring-operated raising and walk-down lowering of unloaded ramp. Equip leveler with a torsion-spring counterbalancing mechanism controlled by a hold-down device.

1. Lever Handle: Self-storing lever handle for raising unloaded ramp with minimal lifting force by pulling lever back to extend lip and pushing lever forward to lower ramp and lip.
2. Removable Lifting Handle: For raising unloaded ramp by lifting action.

I. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- and formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.

1. Cross-Traffic Support: Manufacturer's standard method of supporting ramp at platform level in stored position with lip retracted. Provide a means to release supports to allow ramp to descend below platform level.
2. Maintenance Strut: Integral strut to positively support ramp in up position during maintenance of dock leveler.

J. Integral Laminated-Tread Dock Bumper: Fabricated from 4-1/2-inch-thick, multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two 3/4-inch- diameter, steel supporting rods that are welded at one end to 1/4-inch-thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch of tread plies extending beyond the face of closure angles.

1. Size: 12” high x 13 3/8” wide. Provide 2.

K. Dock-Leveler Finish: Painted in manufacturer's standard color.

2.4 GENERAL FINISH REQUIREMENTS

A. Finish loading dock equipment after assembly and testing.

2.5 STEEL FINISHES

A. Galvanizing: Hot-dip galvanize components as indicated to comply with the following:

1. ASTM A 123/A 123M for iron and steel loading dock equipment.
2. ASTM A 153/A 153M or ASTM F 2329 for iron and steel hardware for loading dock equipment.

B. Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat in manufacturer's standard color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of loading dock equipment.

B. Examine roughing-in for electrical systems for loading dock equipment to verify actual locations of connections before equipment installation.

C. Examine walls and floors of pits for suitable conditions where recessed loading dock equipment is to be installed. Pits shall be plumb and square and properly sloped for drainage from back to front of loading dock.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate size and location of loading dock equipment indicated to be attached to or recessed into concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation.

B. Set curb angles in concrete edges of dock-leveler recessed pits with tops flush with loading platform. Fit exposed connections together to form hairline joints.

C. Set curb angles in concrete edges of truck-leveler recessed pits with tops flush with driveway. Fit exposed connections together to form hairline joints.

D. Place self-forming pan system for levelers in proper relation to loading platform before pouring concrete.

E. Clean recessed pits of debris.

3.3 INSTALLATION

A. General: Install loading dock equipment, including motors, control stations, wiring, safety devices, and accessories as required for a complete installation.

1. Rough-in electrical connections.

B. Recessed Dock Levelers: Attach dock levelers securely to loading dock platform, flush with adjacent loading dock surfaces and square to recessed pit.

C. Edge-of-Dock Levelers: Attach dock levelers to loading dock platform in a manner that complies with requirements indicated for arrangement and position relative to top of platform.

1. Weld anchor holes in contact with continuous embedded loading dock edge channel. Weld or bolt bumper blocks to face of loading dock.

D. Dock Bumpers: Attach dock bumpers to face of loading dock in a manner that complies with requirements indicated for spacing, arrangement, and position relative to top of platform and anchorage.

3.4 ADJUSTING

A. Adjust loading dock equipment to function smoothly and safely, and lubricate as recommended by manufacturer.

B. Test for vertical travel within operating range indicated.

C. After completing installation of exposed, factory-finished loading dock equipment, inspect exposed finishes and repair damaged finishes.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain loading dock equipment.

END OF SECTION 111300

SECTION 114000 – WALK-IN REFRIGERATION EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Walk-in refrigeration equipment.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.

1.3 LEED SUBMITTALS

A. EAc4: "Product certification for Credit EAc4: For refrigerants, that minimize or eliminate the emission of compounds that contribute to ozone depletion and global climate change. Comply with the following formula, which sets a maximum threshold for the combined contribution to ozone depletion and global warming potential."

LCGWP + LCODP x 10 to the 5th power $\leq$ 100

See the LEED REFERENCE GUIDE FOR GREEN BUILDING DESIGN AND CONSTRUCTION for calculation definitions.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Manufacturer's model number.

2. Accessories and components that will be included for Project.
3. Clearance requirements for access and maintenance.
4. Utility service connections; include roughing-in dimensions.

B. Shop Drawings: For fabricated equipment. Include plans, elevations, sections, roughing-in dimensions, fabrication details, utility service requirements, and attachments to other work.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For foodservice facilities.

1. Indicate locations of equipment and connections to utilities.
2. Include plans and elevations; clearance requirements for equipment access and maintenance; details of equipment supports; and utility service characteristics.
3. Include details of seismic bracing for equipment.

B. Warranty: Samples of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For equipment to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Sections, include the following:

1. Manufacturer's name and model number.
2. List of factory-authorized service agencies including addresses and telephone numbers.

1.7 QUALITY ASSURANCE

A. NSF Standards: Provide equipment that bears NSF Certification Mark and UL Classification Mark certifying compliance with applicable NSF standards.

B. UL Certification: Provide equipment and components that are evaluated by UL for fire, electric shock, and casualty hazards according to applicable safety standards, and that are UL certified for compliance and labeled for intended use. Insulated panels to be UL Class 1 rated.

C. Factory Mutual Listing: Provide walk-in refrigeration equipment that is Factory Mutual listed meeting FM Approvals Standard 4880.

D. Regulatory Requirements: Install equipment to comply with the following:

1. ASHRAE 15, "Safety Code for Mechanical Refrigeration."
2. NFPA 70, "National Electrical Code."
3. NSF, “National Sanitary Foundation”.
4. U.L., “Underwriters Laboratory”.

E. Installer Qualifications: Factory authorized installer with minimum 5-years experience with projects of similar scope.

F. Preinstallation Conference: Conduct conference at Project site.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of construction contiguous with foodservice equipment by field measurements before fabrication. Indicate measurements on Coordination Drawings.

1.9 COORDINATION

A. Coordinate equipment layout and installation with other work, including layout and installation of lighting fixtures, HVAC equipment, and fire-suppression system components.

B. Coordinate locations and requirements of utility service connections.

C. Coordinate sizes, locations, and requirements of the following:

1. Equipment bases.
2. Floor depressions.
3. Insulated floors.
4. Roof curbs, equipment supports, and penetrations.

1.10 WARRANTY

A. Mechanical Refrigeration Equipment: Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship for one year from date of Substantial Completion.

1. Failure includes but is not limited to inability to maintain set temperature.
2. Emergency service to be provided on a 24 hour, seven day per week basis.
3. Emergency service to include added refrigerant at no additional expense to the owner.

B. Extended Warranty: The complete refrigeration system (not only the compressor) shall be provided with an additional four year non-prorated parts warranty that commences upon completion of the one year material and workmanship warranty.

1. The complete system includes the compressor, evaporator, and condensing unit.

C. Panel Warrantee: Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail as a result of manufacturing quality defects for a period of ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WALK-IN REFRIGERATION EQUIPMENT

A. Walk-in Refrigeration Units:

1. Basis-of-Design Product: Subject to compliance with requirements, provide products by Bally or comparable products by one of the following:

   a. American Panel.
   b. Thermalrite.
   c. Thermo-Kool.

2. Description: Walk-In Cooler with refrigeration system designed to hold 38 degree F Ambient temperature.

   a. Wall and Ceiling Panels: 4” thick interlocking pour-in-place CFC free urethane insulating panels.

      1) Wall panel accessories: Aluminum diamond plate on exposed exterior walls to 48” high.

   b. Floors: Insulated concrete floor with resinous coating, by general contractor.
   c. Doors:

      1) Size: (1) 42” wide x 84” high, x same thickness as walls.
      2) Hinges: Three, self-closing and spring loaded with chrome finish.
      3) Latch: Edge-mounted, positive-type latch with cylinder lock.
      4) Include quarter turn type safety-release handle that opens door from inside when door is locked.
      5) Closer: Piston style.
      6) Frame: “U” channel steel frame, pre-wired with heater wires. Provide door light, switch, and digital thermometer.

   d. Door Accessories:

      1) Aluminum diamond plate on both sides of door and frame to 48” high.

   e. Lighting Fixtures: Kason 1810 LED lights w/ two bulbs, installed under Division 26.

      1) Control: Neon pilot light and toggle switch located on exterior of door panel.
      2) Quantity: Three.

   f. Refrigeration System: Pre-assembled remote system with condensing unit and evaporator assemblies, mounted expansion valve, liquid solenoid and SmartVap controller. Refrigerants to meet product certification for Credit EAc4. Provide all necessary components for a complete assembly.

1) Coils: Heavy gauge aluminum with easy access/quick disconnect fan, motor and mount assemblies.

2) Fan Guard: High-density polyethylene with built-in throw boosters.

3) Electric defrost coil: Include corrosion proof stainless steel heater elements, mounted on face of coil. Provide factory installed/wired combination fan delay, defrost termination control.

4) Bally Model #s:

a) Condensing Unit: BQZA011-H8-HT3A. 208-230/3/60.
b) Evaporator: BLP214MA-S1B-ECM-SV. 208-230/3/60.

5) Exterior Condensing Units: Air-cooled including the following:

a) Electric panel compressor contactor, on/off switch, and fused control circuit.
b) Discharge vibration eliminator.
c) Fan guard.
d) Spring mounted accessible scroll compressor.
e) Adjustable dual pressure control.
f) Oil failure control.
g) Large receiver with fusible plug and valves.
h) Cooper tubing secured with Hydorsorb, Cush-a Clamp.
i) Heated and Insulated receiver.

g. Temperature Monitoring System: Audio-visual temperature alarm for remote monitoring, Datalarm Single Point. Connection to building monitoring system by Division 26..
h. Closure Panels and Trim: Provide closure panels and trim matching material and finish of wall panels. Seal perimeter where walk-in refrigerator components meet building walls, slab, and soffits.

3. Finishes:

a. Exposed Exterior Finish: Stucco-patterned stainless steel.
b. Unexposed Exterior Finish: Stucco-patterned, metallic-coated steel.
c. Interior Wall Panel Finish: Stucco-patterned stainless steel.
d. Interior Ceiling Panel Finish: Smooth White Polyester painted 24 gauge galvanized steel.
e. Closure Panels and Trim: Stucco-patterned stainless steel.

2.2 MISCELLANEOUS MATERIALS

A. Pre-piping: Factory pressure tested to 150 PSIG with dry nitrogen.

B. Field Piping: Refrigeration piping to be type L, ACR grade hard drawn seamless copper tubing, wrought type copper fittings, and silver soldered joints. Line sizes as recommended by ASHRAE.

C. Sleeves: Provide sleeves wherever piping passes through walls, ceilings, or roof construction. Provide through-penetration fire stop assemblies per Division 07 where piping passes through rated construction.

D. Piping Insulation: 1” wall thickness Armaflex.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Inspect existing conditions before start of construction. Notify General Contractor of any issues detrimental to a quality installation. Do not proceed until items have been corrected.

B. Coordinate service line installation with other trades.

C. Panel Installation:

1. Install level and plumb with minimum 90% contact with subfloor.
2. Provide cutouts in equipment, neatly formed, where required to run service lines through equipment to make final connections.

D. Mechanical Equipment Installation:

1. Follow manufacturer’s installation instructions.
2. Do not run piping, conduit, wiring, etc. through the Chemical Storage or Chemical Lab Areas.

3.2 TESTING, CLEANING AND PROTECTING

A. Pressure test all system piping for leaks prior to startup and charging. Follow manufacturer’s written instructions to ensure compliance with the requirements for warrantees.

B. Follow manufacturer’s written instructions for start up. Set the room thermostat for normal operation.

C. Clean and adjust equipment as required to produce ready-for-use condition.

D. Protect equipment from damage during remainder of the construction period.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain foodservice equipment.

END OF SECTION 114000

SECTION 114510 – APPLIANCES & EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Bottom Freezer (20.3 CF) Refrigerator/Freezer.
2. Microwave: Room H102G Conf/Meeting and Room H207 Teacher's Work Room.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.

1.3 SUBMITTALS

A. Product Data: For each appliance and equipment type required indicating compliance with requirements. Include complete operating and maintenance instructions for each appliance.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of the manufacturer for both installation and maintenance of appliances and equipment required for this Project.

B. Source Limitations: Obtain appliances through one source from a single manufacturer.

C. Product Options: Drawings indicate sizes, profiles, and dimensional requirements of appliances and equipment, and are based on the specific types and models indicated. Other manufacturers' appliances and equipment, with equal performance characteristics, may be considered. Refer to Division 1 Section "Substitutions."

D. Electrical Appliances and Equipment: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

E. UL and NEMA Compliance: Provide electrical components that are listed and labeled by UL and that comply with applicable NEMA standards.

F. AHAM Standards: Provide appliances that comply with the following AHAM standards:

1. Refrigerators and Freezers: Total volume and shelf area ratings certified according to ANSI/AHAM HRF-1.

G. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the Federal Trade Commission.

1.5 DELIVERY

A. Deliver appliances and equipment only after utility rough-in is complete and construction in the spaces to receive appliances and equipment is substantially complete and ready for installation.

1.6 WARRANTIES

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranties: Written warranties, executed by manufacturer of each item specified agreeing to repair or replace appliances, equipment, or components thereof that fail in materials or workmanship within specified warranty period.

1. Parts and Labor for Dishwasher and Refrigerator: One Year.

1.7 PRODUCTS AND MANUFACTURERS

A. Products: Subject to compliance with requirements, provide the appliances and equipment indicated. All residential appliances are to be obtained from a single manufacturer.

1.8 APPLIANCES & EQUIPMENT

A. Refrigerator - 20.3 CF, bottom freezer:

1. General Electric Model GDE20GSHSS (**Energy Star Qualified**) or approved equal by one of the following:

a. Whirlpool.
b. Maytag.

B. Microwave – 2.2 CF, countertop:

1. General Electric Model PEB7226SFSS or approved equal by one of the following:

a. Whirlpool.
b. Maytag.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Examine roughing-in for electrical and plumbing services, with Installer present, to verify actual locations of services before installation.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

2.2 INSTALLATION

A. General: Comply with manufacturer's written instructions.

B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

C. Utilities:

1. Refer to Mechanical Specification Sections for mechanical requirements.
2. Refer to Electrical Specification Sections for electrical requirements.

2.3 ADJUSTING AND CLEANING

A. Test each item to verify proper operation. Make necessary adjustments.

B. Verify that accessories required have been furnished and installed.

C. Remove packing material from appliances and equipment, and leave units in clean condition, ready for operation.

END OF SECTION 114510

PEB7226SF/EH

GE Profile™ Series 2.2 Cu. Ft. Countertop Microwave Oven

Dimensions and Installation Information (in inches)

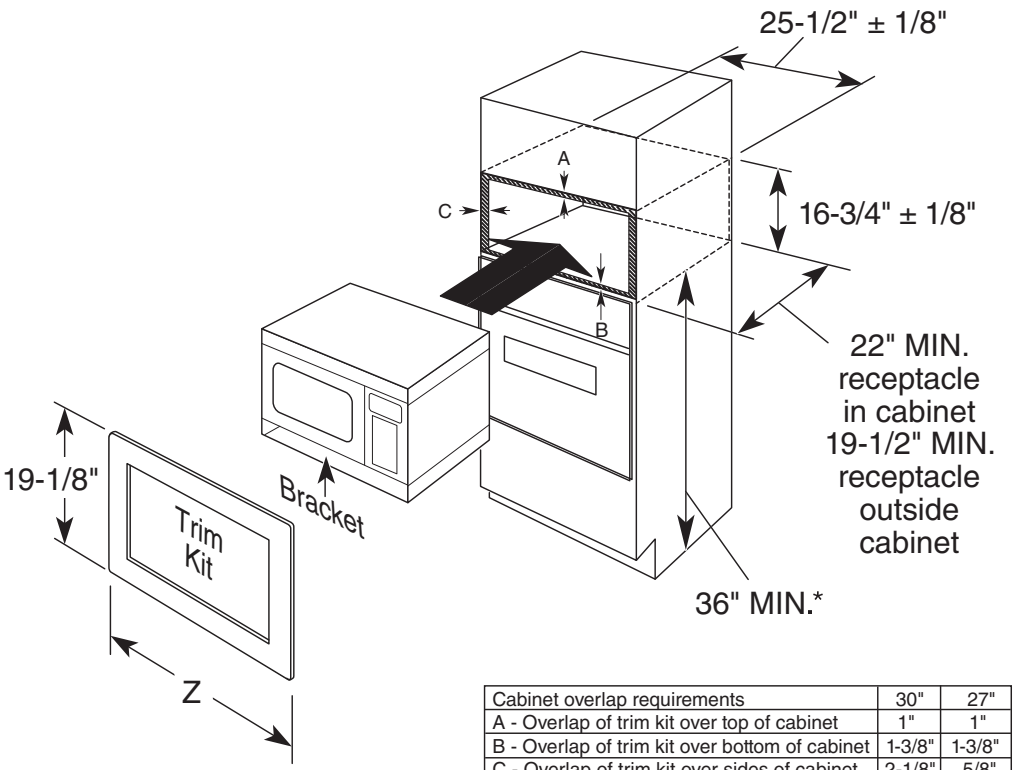
Exterior Dimensions (in inches)	
W x H x D	24-1/8 x 14 x 19-3/4

Optional Accessory Trim Kits for GE Microwave Ovens
(Available at additional cost)
For a custom built-in appearance, these kits allow built-in installation of the countertop microwave oven into a wall or cabinet alone and are U.L. approved for installation over a GE single electric wall oven. These kits should not be installed over a gas wall oven.

Accessory trim kits	"Z"	Max Height	Trim Kits
30" Deluxe	29-3/4"	19-1/8"	JX7230SFSS - Stainless Steel JX7230EHES - Slate
27" Deluxe	26-3/4"	19-1/8"	JX7227SFSS - Stainless Steel

Note: 120V, 60-cycle, grounded power receptacle location optional on back within cabinet opening.

Installation Information: This information is not intended to be used for installing unit described. Before installing, consult installation instructions packed with product/kit for current dimensional data.



Cabinet overlap requirements	30"	27"
A - Overlap of trim kit over top of cabinet	1"	1"
B - Overlap of trim kit over bottom of cabinet	1-3/8"	1-3/8"
C - Overlap of trim kit over sides of cabinet	2-1/8"	5/8"

*For ADA compliance, the microwave must be installed no higher than 36-1/4".

Note:
Allow an additional inch of clearance beyond trim frame on all sides

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For answers to your Monogram,® Cafe™ Series or Profile™ Series appliance questions, visit our website at geappliances.com or call GE Answer Center® service, 800.626.2000.

Listed by Underwriters Laboratories

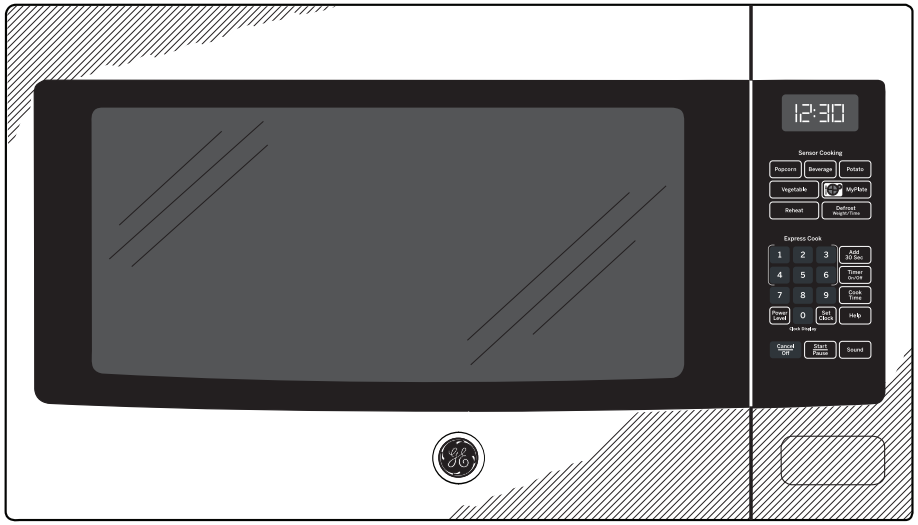
Specification Revised 11/14

PEB7226SF/EH

GE Profile™ Series 2.2 Cu. Ft. Countertop Microwave Oven

Features and Benefits

- 2.2 cu. ft. capacity - 1100 watts (IEC-705 test procedure)
- Sensor cooking controls - Automatically adjusts time and power
- Optional built-in trim kit - Custom appearance and built-in convenience
- Weight and time defrost - Simply enter the weight of the food, and the oven automatically sets the optimal defrosting time and power level or set your desired time for defrosting
- Extra-large 16" turntable - Rotates food throughout the cycle and accommodates large cookware
- Instant on controls - One-touch instant operation
- Control lockout - Helps prevent accidental activation
- Add 30 seconds - Add 30 seconds of microwave cooking time
- Kitchen timer - Minute timer helps keep you on track
- Model PEB7226SFSS – Stainless steel
- Model PEB7226EHES - Slate



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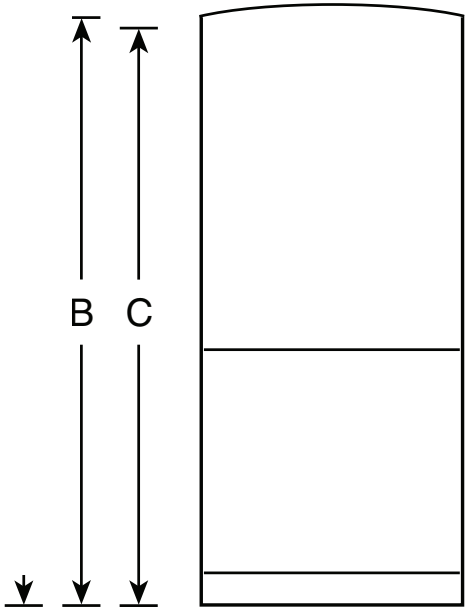
Specification Revised 11/14

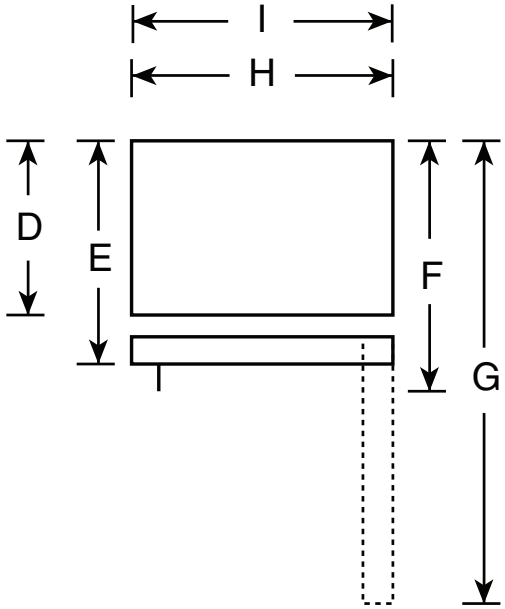
GDE20GSH/GMH

GE® ENERGY STAR® 20.3 Cu. Ft. Bottom-Freezer Refrigerator

Dimensions and Installation Information (in inches)

Overall Dimensions	Height to top of crown (in.) **A**	**67-1/4**
	Height to top of hinge (in.) **B**	**66-1/2**
	Height to top of case (in.) **C**	**66-1/8**
	Case depth without door (in.) **D**	**28-1/4**
	Case depth less door handle (in.) **E**	**32-1/2**
	Case depth with door handle (in.) **F**	**34-5/8**
	Depth with fresh food door open 90˚ (in.) **G**	**59-3/4**
	Width (in.) **H**	**29-3/4**
	Width with door open 90˚ inc. door handle (in.) **I**	**33-1/4**
Air Clearances	Each side (in.)	**1/8**
	Top (in.)	**1**
	Back (in.)	**2**





For answers to your Monogram,® GE Profile™ or GE® appliance questions, visit our website at ge.com or call GE Answer Center® service, 800.626.2000.

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As an ENERGY STAR® partner, GE has determined that this product meets the ENERGY STAR guidelines for energy efficiency.

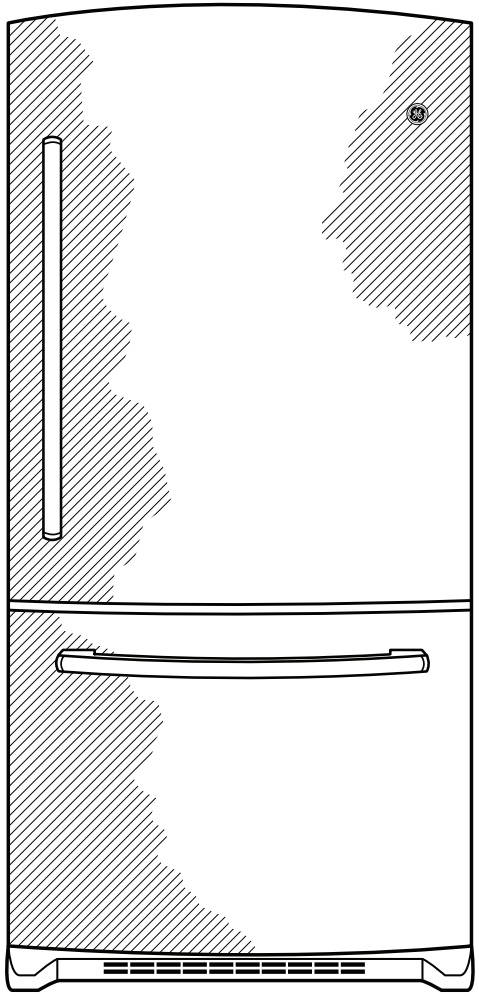
Specification Revised 7/14

GDE20GSH/GMH

GE® ENERGY STAR® 20.3 Cu. Ft. Bottom-Freezer Refrigerator

Features and Benefits

- 30" wide
- Factory-installed icemaker - Refrigerator comes ready to automatically create ice
- Upfront temperature controls - Easy-to-use controls regulate both fresh food and freezer sections
- Adjustable humidity drawers - Keep fruits and vegetables fresh
- Adjustable glass shelves - A variety of shelf configurations provide additional options for food storage
- Two-level freezer baskets - Baskets allow easy access to frozen foods
- Model GDE20GSHSS - Stainless steel
- Model GDE20GMHES - Slate



As an ENERGY STAR® partner, GE has determined that this product meets the ENERGY STAR guidelines for energy efficiency.

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Specification Revised 7/14

SECTION 115313 - LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Walk-in laboratory fume hood in custom size.
2. Barrier free bench-top laboratory fume hood.
3. Radio Isotope bench-top laboratory fume hood in custom size.
4. Piping and wiring within fume hoods for service fittings, light fixtures, fan switches, and other electrical devices included with fume hoods.
5. Fume hood base stands.
6. Laboratory cup sinks in fume hoods.
7. Water and electrical service fittings in fume hoods.
8. Sampling port in Radio Isotope fume hood.
9. All items required for a complete installation.

C. Related Requirements:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 12 Section “Wood Laboratory Casework” for fume hood base cabinets, countertops, etc.
4. Division 23 Sections for fume hood duct connections.
5. Divisions 22 and 26 Sections for installing service fittings in fume hoods.
6. Divisions 22 and 26 Sections for connecting service utilities at indicated point. Piping and wiring for service fittings within fume hoods and casework up to point of connection are specified in this Section.
7. Division 26 Sections for electrical connection of fume hoods.

1.3 PERFORMANCE REQUIREMENTS

A. Containment: Provide fume hoods with the following performance ratings at a face velocity of 100 fpm and a release rate of 4.0 L/min. when tested according to ASHRAE 110:

1. As-Manufactured Rating: AM 0.10.
2. As-Installed Rating: AI 0.10.

B. Structural Performance: Provide fume hood components capable of withstanding the following loads without permanent deformation, excessive deflection, or binding of cabinet drawers and doors:

1. Fume Hood Base Stands: 75 lb/ft on countertop, plus weight of hood.

1.4 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for lateral support of fume hoods.

B. Coordinate installation of fume hoods with laboratory casework and other laboratory equipment.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For laboratory fume hoods.

1. Include plans, elevations, sections, and attachment details.
2. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports. Include calculations demonstrating that anchorages comply with seismic performance requirements.
3. Indicate locations and types of service fittings together with associated service supply connection required.
4. Indicate duct connections, electrical connections, and locations of access panels.
5. Include roughing-in information for mechanical, plumbing, and electrical connections.
6. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from the above items.
7. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
8. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Samples for Initial Selection: For fume hood exterior finishes.

D. Delegated-Design Submittal: For fume hoods indicated to comply with seismic performance requirements and design criteria.

E. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of fume hoods with requirements based on comprehensive testing of hoods.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain laboratory fume hoods through one source from a single manufacturer.

1. Obtain through same source from the same manufacturer as laboratory casework specified in Division 12 Section "Wood Laboratory Casework."

B. Fume Hood Standard: Provide fume hoods complying with the requirements of SEFA 1.1, "Laboratory Fume Hoods--Recommended Practices."

C. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR, Part 1201 for Category II materials.

1. Subject to compliance with requirements, permanently mark safety glass with certification label of SGCC or another certification agency acceptable to authorities having jurisdiction.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish complete touchup kit for each type and color of fume hood finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged fume hood finish.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of fume hoods with delivery of other laboratory casework components.

B. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

1.9 FIELD CONDITIONS

A. Locate concealed framing, blocking, and reinforcements that support fume hoods by field measurements before being enclosed, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Drawings are based on products by Labscape. Subject to requirements provide Labscape or equal products from one of the following manufacturers:

1. Fisher Hamilton.
2. Kewaunee Scientific Corporation; Laboratory Products Group.

B. Source Limitations: Obtain laboratory fume hoods from single manufacturer.

C. Product Designations:

1. Walk-In Fume Hood in Chemical Storage: Labscape 400 Series Walk-In hood in custom size.

a. Length: 96”.
b. Height: 93”.
c. Depth: 48”.
d. Hood Opening: 84” wide x 72” high.
e. Options:

1) Explosion Proof Fluorescent Light: Class1, Group 1.
2) Explosion Proof Light Switch: Class1, Group 1.
3) Explosion Proof Duplex Outlet (2 required, one on each side): Class 1, Group 1.
4) Airflow Monitor Alarm.
5) Sash stop with manual override.

2. Bench-Top Fume Hood in Chemical Lab.: Labscape 500 Series ADA hood.

a. Length: 72”.
b. Height: 56”.
c. Depth: 33 1/4”.
d. Hood Opening: 62” wide x 29” high.
e. Options:

1) Ceiling enclosure.
2) 300 Series Epoxy Resin Work Surface.
3) 3” x 6” Epoxy Resin Cupsink.
4) Cold water gooseneck faucet with vacuum breaker.
5) Explosion Proof Fluorescent Light: Class1, Group 1.
6) Explosion Proof Light Switch: Class1, Group 1.
7) Explosion Proof Duplex Outlet (2 required, one on each side): Class 1, Group 1.
8) Airflow Monitor Alarm.
9) Sash stop with manual override.

3. Bench-Top Fume Hood in Radiation Lab.: Labscape 600 Series Radio Isotope Hood in custom size.

    a. Length: 72”.
    b. Height: 64”.
    c. Depth: 36”.
    d. Hood Opening: 62” wide x 37” high.
    e. Options:

        1) Ceiling enclosure.
        2) 304 Stainless Steel One Piece Intergral Work Surface and Liner.
        3) Single Pole 15 Amp Light Switch.
        4) 120 Volt 20 Amp GFI Duplex Outlet (2 required, one on each side):
        5) 120 Volt 20 Amp GFI Duplex Outlet inside hood.
        6) Vacuum Outlet/Port inside hood for sampling.
        7) Airflow Monitor Alarm.
        8) Sash stop with manual override.
        9) Carbon Filter.

2.2 PERFORMANCE REQUIREMENTS

A. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110:

1. As-Manufactured (AM) Rating: AM 0.02 (0.02 ppm).
2. As-Installed (AI) Rating: AI 0.05 (0.05 ppm).
3. Average Face Velocity: 100 fpm plus or minus 10 percent with sashes fully open.
4. Face-Velocity Variation: Not more than 15 percent of average face velocity across the face opening with sashes fully open.
5. Sash Position: Fully open.

    a. Test hoods with horizontal sashes with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.
    b. Test hoods with combination sashes fully raised, with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.

6. Release Rate: 4.0 L/min.
7. Test Setup Modifications: Conduct tests with a minimum of three and a maximum of five people in the test room and with two 1-gal. round paint cans, one 12-by-12-by-12-inch cardboard box, and three 6-by-6-by-12-inch cardboard boxes in the fume hood during the test. Position items from 6 to 10 inches behind the sash, randomly distributed, and supported off the work surface by 2-by-2-inch blocks.
8. Walk-by Test: At the conclusion of containment test, execute three rapid walk-bys at 30-second intervals, 12 inches behind the mannequin. Test-gas concentration during each walk-by shall not exceed 0.1 ppm and shall return to specified containment value within 15 seconds.

B. Static-Pressure Loss: Not more than 1/2-inch wg at 100-fpm face velocity with sash fully open when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.

C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design fume hoods for seismic performance.

2.3 FUME HOODS

A. Product Standards: Comply with SEFA 1, "Laboratory Fume Hoods - Recommended Practices." Provide fume hoods UL listed and labeled for compliance with UL 1805.

B. Conventional Bypass Fume Hoods: Provide conventional bypass fume hoods. Constant exhaust volume draws air efficiently through the sash when open, or through the bypass chamber when sash is closed.

2.4 MATERIALS

A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.

B. Stainless-Steel Sheet: ASTM A 666, Type 302 or 304, stretcher leveled, No. 4 finish.

C. Glass-Fiber-Reinforced Polyester: Polyester laminate with a chemical-resistant gel coat on exposed faces, and having a flame-spread index of 25 or less according to ASTM E 84.

D. Epoxy: Factory molded, modified epoxy-resin formulation with smooth, nonspecular finish.

1. Physical Properties:

   a. Flexural Strength: Not less than 10,000 psi.
   b. Modulus of Elasticity: Not less than 2,000,000 psi.
   c. Hardness (Rockwell M): Not less than 100.
   d. Water Absorption (24 Hours): Not more than 0.02 percent.
   e. Heat Distortion Point: Not less than 260 deg F.
   f. Flame-Spread Index: 25 or less according to ASTM E 84.

2. Chemical Resistance: As follows when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:

   a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
   b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).

3. Color: Black.

E. Polypropylene: Unreinforced polypropylene complying with ASTM D 4101, Group 01, Class 1, Grade 2.

F. Glass: Clear, laminated tempered glass complying with ASTM C 1172, Kind LT, Condition A, Type I, Class I, Quality-Q3; with clear, polyvinyl butyral interlayer.

1. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201 for Category II materials.
2. Permanently mark safety glass with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Fasteners: Provide stainless-steel fasteners where exposed to fumes.

2.5 FABRICATION

A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations. Fume hoods shall be capable of being partly disassembled as necessary to permit movement through a 35-by-79-inch door opening.

B. Steel Exterior: Fabricate from steel sheet, 0.048 inch thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.

C. Ends: Fabricate with double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.

D. Splay top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.

E. Molded Glass-Fiber-Reinforced Polyester Lining: Molded unit consisting of end panels, back panel, preset rear baffle, and top bonded together into a single piece; reinforced to form a rigid assembly to which exterior is attached.

1. Punch fume hood lining side panels to receive service fittings and remote controls. Provide removable plug buttons for holes not used for indicated fittings.

F. Bypass Grilles: Provide grilles at bypass openings of fume hoods.

G. Sashes: Provide vertical sliding, operable sashes of type indicated.

1. Fabricate from 0.048-inch- thick steel sheet, with chemical-resistant finish. Form into four-sided frame with bottom corners welded and finished smooth. Make top member removable for glazing replacement. Set glazing in chemical-resistant, U-shaped gaskets.
2. Glaze with laminated safety glass.
3. Counterbalance vertical-sliding sash with sash weight and stainless-steel cable system to hold sash in place regardless of position. Provide ball-bearing sheaves, plastic glides in stainless-steel guides, and stainless-steel lift handles. Provide rubber bumpers at top and bottom of each sash unit.

H. Airfoil: Unless otherwise indicated, provide airfoil at bottom of fume hood face opening with 1-inch space between airfoil and work top. Sash closes on top of airfoil, leaving 1-inch opening for air intake. Airfoil directs airflow across work top to remove heavier-than-air gases and to prevent reverse airflow.

1. Fabricate airfoil from stainless steel coated with polytetrafluoroethylene or polyvinylidene fluoride.

I. Light Fixtures: Provide vaporproof, two-tube, rapid-start, fluorescent light fixtures, of longest practicable length; complete with tubes at each fume hood. Shield tubes from hood interior with 1/4-inch- thick laminated glass or 3-mm-thick tempered glass, sealed into hood with chemical-resistant rubber gaskets. Provide units with fluorescent tubes easily replaceable from outside of fume hood.

1. Provide fluorescent tubes with color temperature of 3500 K and minimum color-rendering index of 85.

J. Filler Strips: Provide as needed to close spaces between fume hoods or fume hood base cabinets and adjacent building construction. Fabricate from same material and with same finish as fume hoods or fume hood base cabinets, as applicable.

K. Ceiling Extensions: Provide filler panels matching fume hood exterior to enclose space above fume hoods at front and sides of fume hoods and extending from tops of fume hoods to ceiling.

L. Comply with requirements in other Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings. Securely anchor fittings, piping, and conduit to fume hoods unless otherwise indicated.

2.6 FUME HOOD BASE CABINETS, BASE STANDS, WORK TOPS

A. Comply with Section 123553.19 "Wood Laboratory Casework."

2.7 CHEMICAL-RESISTANT FINISH

A. General: Prepare, treat, and finish welded assemblies after welding. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.

B. Preparation: Clean steel surfaces, other than stainless steel, of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

C. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply fume hood manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8M. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.
2. Colors for Fume Hood Finish: As selected by Architect from manufacturer's full range.

2.8 ACCESSORIES

A. Airflow Indicator: Provide each fume hood with manufacturer's standard airflow indicator.

B. Airflow Alarm: Provide fume hoods with audible and visual alarm that activates when airflow sensor reading is outside of preset range.

1. Provide with thermal-anemometer or aneroid (Magnehelic-type) gage airflow sensor.
2. Provide with reset and test switches.
3. Provide with switch that silences audible alarm and automatically resets when airflow returns to within preset range.

C. Sash Alarm: Provide fume hoods with audible and visual alarm that activates when sash is opened beyond preset position.

1. Provide with silence and test switches.

D. Sash Stops: Provide fume hoods with sash stops to limit hood opening to 50 percent of sash height. Sash stops can be manually released to open sash fully for cleaning fume hood and for placing large apparatus within fume hood.

E. Bypass Grille Blank-off Panel: Provide fume hoods with blank-off panel on bypass grille designed for use with sash stops to reduce exhaust air volume and provide design face velocity with sash at 50 percent open position.

F. Service Fittings: Comply with requirements of Division 12 Section "Wood Laboratory Casework."

1. Provide service fittings with exposed surfaces, including fittings, escutcheons, and trim, finished with acid- and solvent-resistant, baked-on plastic coating in manufacturer's standard metallic brown, aluminum, or other color as approved by Architect.
2. Provide service fittings with parts exposed within fume hoods made from polyvinylidene fluoride.
3. Provide service fittings complying with either of the above.

G. Handles: Provide forged brass lever handles for water valves, faucets, handles, and ground key cocks that comply with handicapped requirements for controls and operating mechanisms. The force required to activate controls shall be no greater than 5lbf.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fume hoods according to manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Comply with requirements in Section 123553.19 "Wood Laboratory Casework" for installing fume hood base cabinets, work tops, and sinks.

C. Comply with requirements for installing water and laboratory gas service fittings and electrical devices.

1. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink and work top-mounted fittings in sealant recommended by manufacturer of sink or work-top material. Securely anchor fittings to fume hoods unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

A. Field test installed fume hoods according to ASHRAE 110 as modified in "Performance Requirements" Article to verify compliance with performance requirements.

1. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.
2. After making corrections, retest fume hoods that failed to perform as specified.
3. Provide final test report indicating compliance with code and design requirements.

3.4 ADJUSTING AND CLEANING

A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.

B. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 115313

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes roller shades.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, details of installation, operational clearances, and relationship to adjoining Work.

1. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

C. Samples: For each exposed finish and for each color and texture required.

D. Product Test Reports: For each type of roller shade.

E. Maintenance data.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide products passing flame-resistance testing according to NFPA 701 by a testing agency acceptable to authorities having jurisdiction.

B. Comply with WCMA A 100.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, lead-free designation, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 ROLLER SHADES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers that may be incorporated into the Work include, but are not limited to, the following:

1. Draper Inc.
2. Hunter Douglas, Inc.; Hunter Douglas Window Fashions Division.
3. MechoShade Systems, Inc.
4. Springs Window Fashions.

B. Shade Band Material (sheer fabric): PVC-coated polyester.

1. Colors: As selected by Architect from manufacturer's full range.
2. Material Openness Factor: 2 -3 percent.
3. Other: GREENGUARD Certified (US).

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets. Provide capacity for one roller shade band(s) per roller.

D. Direction of Roll: Regular, from back of roller.

E. Mounting Brackets: Galvanized or zinc-plated steel.

F. Bottom Bar: Steel or extruded aluminum, concealed, by pocket of shade material, internal-type.

G. Mounting: As indicated or required.

H. Shade Operation: Manual; with continuous-loop bead-chain, clutch, and cord tensioner and bracket lift operator.

1. Clutch: Capacity to lift size and weight of shade; sized to fit roller.
2. Bead Chain: Stainless Steel.
3. Operating Function: Stop and hold shade at any position in ascending or descending travel.

2.2 ROLLER SHADE FABRICATION

A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

B. Concealed Components: Non-corrodible or corrosion-resistant-coated materials.

1. Lifting Mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.

D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting roller, and operating hardware and for hardware position and shade mounting method indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

G. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

SCHEDULE

D. Manually Operated Roller Shades Type 1.

1. Location: Office 101 and Conference Room 101A. All exterior glazing.

2. Roll and Fabric: Single roll, sheer fabric.

3. Mounting: Fascia mount inside jambs.

END OF SECTION 122413

SECTION 123553.19 - WOOD LABORATORY CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section includes the following:

1. Wood laboratory casework, including base cabinets modified for handicap accessibility.
2. Utility-space framing at backs of base cabinets.
3. Filler and closure panels.
4. Aprons and legs.
5. Laboratory countertops.
6. Shelving.
7. Apron cabinets.
8. Laboratory sinks and drain fittings.
9. Laboratory accessories.
10. Water, electrical and miscellaneous service fittings.

C. Related Requirements:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, recycling, and disposing of non hazardous waste.
3. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking for anchoring laboratory casework.
4. Division 06 Section "Interior Architectural Woodwork" for non-laboratory casework.
5. Division 09 Section "Resilient Base and Accessories" for floor base applied to wood laboratory casework.
6. Division 11 Section "Laboratory Fume Hoods".
7. Divisions 22, 26 and 27 for plumbing, electrical and communications work.

1.3 DEFINITIONS

A. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and visible surfaces in open cabinets or behind glass doors.

1. Ends of cabinets indicated to be installed directly against and completely concealed by walls or other cabinets are defined as "concealed."

B. Semi-exposed Surfaces of Casework: Surfaces behind opaque doors, such as cabinet interiors, shelves, and dividers; interiors and sides of drawers; and interior faces of doors. Tops of cases 78 inches or more above floor and bottoms of cabinets more than 24 inches but less than 48 inches above floor are defined as semiexposed.

D. Concealed Surfaces of Casework: Includes sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

E. MDF: Medium-density fiberboard.

F. Hardwood Plywood: A panel product composed of layers, or plies, of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive and faced both front and back with hardwood veneers.

1.4 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for support of laboratory casework.

B. Coordinate installation of laboratory casework with installation of fume hoods and other laboratory equipment.

1.5. LEED SUBMITTALS

A. M Rc4: “Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.”

B. MRc5: “Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of reach regional materials and the fraction by weight that is considered regional.”

C. MRc7: “Chain-of-Custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for change of custody by an FSC-accredited certification body. Include statement for wood permanently installed on the manufacturer’s invoice or letterhead. All invoices for wood products shall be submitted; certified wood invoices shall state percentage pure.”

D. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

E. IEQc4.4: "For composite wood products, documentation indicating that product contains no added urea formaldehyde."

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B.. Shop Drawings: For laboratory casework. Include plans, elevations, sections, and attachment details.

1. Indicate types and sizes of cabinets.
2. Indicate locations of hardware and keying of locks.
3. Indicate locations and types of service fittings.
1. Indicate locations of blocking and reinforcements required for installing laboratory casework.
2. Include details of utility spaces showing supports for conduits and piping.
3. Include details of support framing system.
4. Include details of exposed conduits, if required, for service fittings.
5. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
6. Include coordinated dimensions for laboratory equipment, including residential appliances, specified in other Sections.

C. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.

D. Samples for Initial Selection: For cabinet finishes and other materials requiring color selection.

F. Samples for Verification: For each type of cabinet finish and each type of countertop material, in manufacturer's standard sizes.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports for Countertop Surface Material: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface materials with requirements specified for chemical and physical resistance.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish complete touchup kit for each type and color of wood laboratory casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that produces casework of types indicated for this Project that has been tested for compliance with SEFA 8 W and is certified for chain of custody by an FSC-accredited certification body.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install laboratory casework until utility roughing-in and wet work are complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Drawings are based on products manufactured by Sheldon Laboratory Systems. Subject to compliance with requirements, provide Sheldon Laboratory Systems or comparable product by one of the following:

1. ALC-Collegedale.
2. CampbellRhea.
3. Kewaunee Scientific Corporation; Laboratory Products Group.
4. Labscape.
5. Thermo Fisher Scientific.

B. Source Limitations: Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.

C. Product Designations: Drawings indicate sizes and configurations of laboratory casework by Basis-of-Design Manufacturer. Other manufacturers' laboratory casework of similar sizes and similar door and drawer configurations and complying with Specifications may be considered. See Section 016000 "Product Requirements."

2.2 CASEWORK, GENERAL

A. Casework Product Standard: Comply with SEFA 8 W, "Laboratory Grade Wood Casework."

B. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by a testing and inspecting agency acceptable to authorities having jurisdiction.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Certified Wood: Casework shall be produced from wood and wood products certified as "FSC Pure" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

E. Low-Emitting Materials: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 WOOD CASEWORK

A. Design: Reveal overlay with square edges.

1. Provide 1/8-inch reveals between doors and drawers that are adjacent.

B. Wood Species: White Maple, clear finish.

C. Cut: Rift sawn.

D. Matching:

1. None required; select and arrange components for compatible grain and color.
2. Provide veneers for each cabinet from a single flitch, book and running matched.

   a. Provide continuous matching of adjacent drawer fronts within each cabinet.

E. Grain Direction:

1. Vertical on doors, horizontal on drawer fronts.
2. Lengthwise on face frame members.
3. Vertical on end panels.
4. Side to side on bottoms and tops of units.
5. Vertical on knee-space panels.
6. Horizontal on aprons and table frames.

F. Exposed Materials:

1. General: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.
2. Plywood: Hardwood plywood, veneer core with face veneer of species indicated. Grade A exposed faces, at least 1/50 inch thick, and Grade J crossbands. Provide backs of same species as faces.

3. Solid Wood: Clear hardwood lumber of species indicated.

G. Semi-exposed Materials:

1. Provide solid wood or hardwood plywood for semi-exposed surfaces unless otherwise indicated. Provide species similar in color and grain to exposed portions. Semi-exposed backs of plywood with exposed faces shall be the same species as faces.

H. Concealed Materials:

1. Solid Wood: Any species, with no defects affecting strength or utility.
2. Plywood: Hardwood plywood. Concealed backs of plywood with exposed faces shall be the same species as faces.
3. Hardboard.

2.4 WOOD CABINET MATERIALS

A. General:

1. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.

B. Hardwood Plywood: HPVA HP-1, veneer core and that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Hardboard: ANSI A135.4, Class 1 Tempered.

D. Edgebanding for Wood-Veneered Construction: Minimum 1/8-inch- thick, solid wood of same species as face veneer.

1. Select wood edgebanding for grain and color compatible with face veneers.
2. Colors: As selected by Architect from manufacturer's full range.

2.5 AUXILIARY CABINET MATERIALS

A. Acid Storage-Cabinet Lining: 1/4-inch- thick, polyethylene, polypropylene, epoxy, or phenolic-composite lining material.

2.6 SHELVING

A. Material:

1. Lab Shelving: Wood veneer with 1/8” hardwood edge-banding on ¾” hardwood plywood.

2.7 COUNTERTOP AND SINK MATERIALS

A. Epoxy: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Durcon, Inc.
   b. Prime Industries, Inc.
   c. Thermo Fisher Scientific.

2. Physical Properties:

   a. Flexural Strength: Not less than 10,000 psi.
   b. Modulus of Elasticity: Not less than 2,000,000 psi.
   c. Hardness (Rockwell M): Not less than 100.
   d. Water Absorption (24 Hours): Not more than 0.02 percent.
   e. Heat Distortion Point: Not less than 260 deg F.

3. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:

   a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
   b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).

4. Color: Black.

2.8 FABRICATION

A. Construction: Provide wood-faced laboratory casework complying with SEFA 8 W.

1. Bottoms of Base Cabinets and Tall Cabinets: 3/4-inch- thick, veneer-core hardwood plywood.
2. Tops and Bottoms of Wall Cabinets and Tops of Tall Cabinets: 1-inch- thick, veneer-core hardwood plywood.
3. Ends of Cabinets: 3/4-inch- thick, hardwood plywood.
4. Shelves: 3/4-inch- thick, veneer-core hardwood plywood.
5. Base Cabinet Top Frames: 3/4-by-2-inch solid wood with mortise and tenon or doweled connections, glued and pinned or screwed.
6. Base Cabinet Stretchers: 3/4-by-4-1/2-inch panel product strips or solid-wood boards at front and back of cabinet, glued and pinned or screwed.
7. Base Cabinet Subtops: 3/4-inch- thick panel product glued and pinned or screwed.
8. Exposed Backs of Cabinets: 3/4-inch- thick, particleboard- or MDF-core hardwood plywood.
9. Unexposed Backs of Cabinets: 1/4-inch- thick, hardwood plywood dadoed into sides, bottoms, and tops, unless otherwise indicated.

10. Drawer Fronts: 3/4-inch- thick,hardwood plywood or solid hardwood.
11. Drawer Sides and Backs: 1/2-inch- thick, solid hardwood or hardwood plywood, with glued dovetail or multiple-dowel joints.
12. Drawer Bottoms: 1/4-inch- thick, veneer-core hardwood plywood glued and dadoed into front, back, and sides of drawers. Use 1/2-inch- thick material for drawers more than 24 inches wide.
13. Drawer Bodies: Steel drawer pans formed from 0.036-inch- thick metal, metallic phosphate treated, and finished with manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat with a minimum dry film thickness of 1 mil for topcoat and 2 mils for system.

B. Utility-Space Framing: Steel framing units consisting of two steel slotted channels complying with MFMA-4, not less than 1-5/8 inches square by 0.105-inch nominal thickness, and connected at top and bottom by U-shaped brackets made from 1-1/4-by-1/4-inch steel flat bars. Framing units may be made by welding specified channel material into rectangular frames instead of using U-shaped brackets.

C. Removable Backs: Provide backs that can be removed from within cabinets at utility spaces.

D. Filler and Closure Panels: Provide where indicated and as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as adjacent exposed cabinet surfaces unless otherwise indicated.

1. Provide knee-space panels (modesty panels) at spaces between base cabinets, where cabinets are not installed against a wall or where space is not otherwise closed.
2. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.
3. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed

2.9 WOOD FINISH

A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors, drawer fronts, and molded shapes with profile-edge sander. Sand after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.

B. Staining: Remove fibers and dust and apply stain to exposed and semi-exposed surfaces as necessary to match approved Samples. Apply stain in a manner that produces a consistent appearance. Apply wash-coat sealer before applying stain to closed-grain wood species.

1. Stain Color: As selected by Architect from manufacturer's full range.

C. Chemical-Resistant Finish: Apply laboratory casework manufacturer's standard three-coat, chemical-resistant, transparent finish. Sand and wipe clean between coats. Topcoat(s) may be omitted on concealed surfaces.

1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8 W. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.

2.10 HARDWARE

A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

B. Butt Hinges: Stainless-steel, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two for doors 48 inches high or less and three for doors more than 48 inches high.

C. Hinged Door and Drawer Pulls: Solid-aluminum, stainless-steel, or chrome-plated-brass back-mounted pulls. Provide two pulls for drawers more than 24 inches wide.

1. Design: Rectangular loop pulls.
2. Overall Size: 1-1/4 by 4-1/2 inches.

D. Door Catches: Nylon-roller spring catches. Provide two catches on doors more than 48 inches high.

E. Drawer Slides: Side mounted, epoxy-coated steel, self-closing; designed to prevent rebound when drawers are closed; complying with BHMA A156.9, Type B05091.

1. Provide Grade 1; for drawers not more than 6 inches high and 24 inches wide.
2. Provide Grade 1HD-100; for drawers more than 6 inches high or 24 inches wide.
3. Standard Duty (Grade 1): Full-extension type, with polymer rollers.
4. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Full-extension, ball-bearing type.

F. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately 1 by 2 inches, attached with screws or rivets. Provide one per each drawer and cabinet door.

G. Locks: Cam type with five-pin tumbler, brass with chrome-plated finish; complying with BHMA A156.11, Type E07281 or Type E07261.

1. Provide a minimum of two keys per lock and two master keys.
2. **Provide locks on all cabinet doors and drawers.**
3. Keying: Key locks as directed.
4. Master Key System: Key all locks to be operable by master key.

H. Adjustable Shelf Supports: Powder-coated steel shelf rests complying with BHMA A156.9, Type B04013.

2.11 COUNTERTOPS AND SINKS

A. Countertops, General: Provide units with smooth surfaces in uniform plane, free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1 inch, with continuous drip groove on underside 1/2 inch from edge.

B. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect.

1. Outlets: Provide with strainers and tailpieces, NPS 1-1/2, unless otherwise indicated.
2. Overflows: For each sink except cup sinks, provide overflow of standard beehive or open-top design with separate strainer. Height 2 inches less than sink depth. Provide in same material as strainer.

C. Epoxy Countertops and Sinks:

1. Countertop Fabrication: Fabricate with factory cutouts for sinks, holes for service fittings and accessories, and butt joints assembled with epoxy adhesive and concealed metal splines.

a. Countertop Configuration other than Fume Hoods: Raised (Contoura control) edge, 1 inch thick, with integral curved 1/4" high raised and beveled edge and corners, and with drip groove and applied backsplash.
b. Countertop Configuration at Fume Hoods: Raised (marine) edge, 1-inch minimum thickness, with integral or applied raised edge having beveled edge and corners,

2. Sink Sizes: As indicated on drawings.

3. Sink Fabrication: Molded in one piece with smooth surfaces, coved corners, and bottom sloped to outlet; 1/2-inch minimum thickness.

a. Provide with polypropylene strainers and tailpieces.
b. Provide integral sinks in epoxy countertops, bonded to countertops with invisible joint line.
c. Provide manufacturer's recommended adjustable support system for table- and cabinet-type installations.

D. Cup Sinks: Epoxy, 3-by-6-inch oval.

1. Provide with polypropylene strainers and integral tailpieces.

2.12 WATER SERVICE FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Broen Inc.; Distributed by Laboratory Enterprises, a Watts Water Technologies company.
2. Chicago Faucets; a Geberit company.
3. WaterSaver Faucet Company.

B. Service Fittings: Provide units that comply with SEFA 7, "Laboratory and Hospital Fixtures - Recommended Practices." Provide fittings complete with washers, locknuts, nipples, and other installation accessories. Include wall and deck flanges, escutcheons, handle extension rods, and similar items.

1. Provide units that comply with "Vandal-Resistant Faucets and Fixtures" recommendations in SEFA 7.

C. Materials: Fabricated from cast or forged red brass unless otherwise indicated.

1. Reagent-Grade Water Service Fittings: Polypropylene, PVC, or PVDF for parts in contact with water.

D. Finish: Chemical-resistant powder coating in laboratory casework manufacturer's standard metallic brown, aluminum, white, or other color as approved by Architect.

E. Water Valves and Faucets: Provide ADA compliant, deck mounted, integral mixing units with cold water, hot water, and wrist blade handles. Comply with ASME A112.18.1. Provide renewable seats, designed for working pressure up to 80 psig. All faucets to be furnished with ASSE 101 vacuum breakers.

1. Aerators: Provide aerators on all water fittings.
2. Accessories:

a. Provide serrated, removable hose connection for each water fitting.
b. Provide aspirator filter pump for each water fitting.
c. Provide dual check vacuum breaker for each water fitting.

F. Ground-Key Cocks: Tapered core and handle of one-piece forged brass, ground and lapped, and held in place under constant spring pressure. Provide units designed for working pressure up to 40 psig, with serrated outlets.

G. Needle Valves: Provide units with renewable, self-centering, floating cones and renewable seats of stainless steel or Monel metal, with removable serrated outlets.

1. Provide units designed for working pressure up to 100 psig.

H. Hand of Fittings: Furnish right-hand fittings unless fitting designation is followed by "L."

I. Remote-Control Valves: Provide needle valves, straight-through or angle type as indicated for fume hoods and where indicated.

J. Handles: Provide three- or four-arm, forged-brass handles for valves unless otherwise indicated.

1. Provide lever-type handles for ground-key cocks. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
2. Provide lever-type handles for ball valves unless otherwise indicated. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.

3. Provide knurled, molded-plastic handles for needle valves.

K. Service-Outlet Identification: Provide color-coded plastic discs with embossed identification, secured to each service-fitting handle to be tamper resistant. Comply with SEFA 7 for colors and embossed identification.

2.13 ELECTRICAL AND COMMUNICATION SERVICE FITTINGS

A. Service Fittings, General: Provide units complete with metal housings, receptacles, switches, pilot lights, voice and data communication outlets, cover plates, accessories, and gaskets required for mounting on laboratory casework.

1. Receptacles, switches, pilot lights, cover plates, and accessories are specified in Section 262726 "Wiring Devices."
2. Voice and data communication outlets are specified in Section 271500 "Communication Horizontal Cabling."
3. Color of Receptacles: As selected by Architect, unless otherwise indicated or required by NFPA 70.

B. Cover Plates: Provide satin finish, chrome-plated cover plates with formed, beveled edges.

C. Pedestal-Type Fittings: Cast-aluminum housings with sloped single face or two faces, as indicated, with neoprene gasket under base and with concealed mounting holes in base for attaching to laboratory casework. Provide holes tapped for conduits.

D. Line-Type Fittings: Provide with cast-metal boxes with threaded holes for mounting on rigid steel conduit. Provide cover plates same size as boxes.

E. Recessed-Type Fittings: Provide with galvanized-steel boxes.

F. Finishes for Service-Fitting Components: Provide housings or boxes for pedestal- and line-type fittings with manufacturer's standard baked-on, chemical-resistant enamel in color as selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CABINETS

A. Comply with installation requirements in SEFA 2.3. Install level, plumb, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply

filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

B. Utility-Space Framing: Secure to floor with two fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.

C. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions, with fasteners spaced not more than 16 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.

1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches o.c. and at sides of cabinets with not less than two fasteners per side.

D. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 16 inches o.c.

E. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

F. Adjust laboratory casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

A. Comply with installation requirements in SEFA 2.3. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where indicated on Shop Drawings.

B. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Shop prepare edges for field-made joints.

1. Use concealed clamping devices for field-made joints in plastic-laminate countertops. Locate clamping devices within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.

C. Fastening:

1. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches o.c.

2. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.

D. Provide required holes and cutouts for service fittings.

E. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

F. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF SINKS

A. Comply with installation requirements in SEFA 2.3.

B. Underside Installation of Epoxy Sinks: Use laboratory casework manufacturer's recommended adjustable support system for table- and cabinet-type installations. Set top edge of sink unit in sink and countertop manufacturers' recommended chemical-resistant sealing compound or adhesive, and firmly secure to produce a tight and fully leakproof joint. Adjust sink and securely support to prevent movement. Remove excess sealant or adhesive while still wet and finish joint for neat appearance.

3.5 INSTALLATION OF LABORATORY ACCESSORIES

A. Install accessories according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions.

B. Securely fasten adjustable shelving supports, stainless-steel shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.

C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.

3.6 INSTALLATION OF SERVICE FITTINGS

A. Comply with requirements in other Sections for installing water and laboratory gas service fittings and electrical devices.

B. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings to laboratory casework unless otherwise indicated.

3.7 CLEANING AND PROTECTING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

B. Protect countertop surfaces during construction with 6-mil plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of 48 inches o.c.

3.8 SERVICE-FITTING SCHEDULE

A. Water Service Fitting: See MEP.

B. Electrical Service Fitting: See MEP

C. Communication Service Fitting, : See MEP

END OF SECTION 123553.19

SECTION 124816 – ENTRANCE MATS, FLOOR GRILLES AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes:

1. Recessed floor grilles and frames.

C. Related Sections include the following:

1. Division 01 Section “Sustainable Design Requirements” for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section “Construction Waste Management and Disposal” for salvaging, re-cycling, and disposing of non hazardous waste.
3. Division 03 Section "Cast-in-Place Concrete" for slab depression for recessed foot grilles and frames.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide foot grilles and frames capable of withstanding the following loads and stresses:

1. Wheel load of 350 lb per wheel.

1.4 LEED SUBMITTALS

A. I EQc4.1: “Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer’s

name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for mats, foot grilles and frames.

B. Shop Drawings: Show the following:

1. Divisions between grille sections.
2. Perimeter floor details.
3. Seaming.
4. Perimeter floor moldings.

C. Samples for Initial Selection: For each type of product involving color selection.

D. Samples for Verification: For each type of product indicated.

1. Floor Grille: 12-inch-square assembled sections.
2. Frame Members: 12-inch-long sample of each type and color.

E. Maintenance Data to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain mats, foot grilles and frames through one source from a single manufacturer.

B. Accessibility Requirements: Provide installed foot grilles that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and Sections 302 and 303 in ICC A117.1.

1.7 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate size and location of recesses in concrete to receive foot grilles and frames.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide Basis-of–Design product or a comparable product by another manufacturer.

B. Basis-of-Design Grilles and Frames

1. Product: Mats, Inc.; Grate Grid.
2. Recessed Frame: 1 ¾” standard recessed frame.
3. Blade Dimensions: 1 ¼” T shaped, spacing not to exceed 1/8”.
4. Tread Rails: 1 ½” O.C., secured with key-lock bars on 6” centers. Centers and key-lock bars to be welded in place.
3. Tread Inserts: 1/4-inch- high, 28-oz./sq. yd. weight, level-cut, nylon-pile, fusion-bonded carpet.
4. Colors, Textures, and Patterns of Inserts: As selected by Architect from manufacturer's full range.
5. Rail Color: As selected by Architect from manufacturer's full range.
6. Grille Size: As indicated on drawings.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B 221, Alloy 6063-T52, or T52 as standard with manufacturer. Coat surface of frame in contact with cementitious materials with manufacturer's standard protective coating.

2.3 FRAMES

A. Provide manufacturer's standard frames of size and style for grille type, for permanent recessed installation in subfloor, complete with installation anchorages and accessories. Unless otherwise indicated, fabricate frame of same material and finish as grilles.

2.4 CONCRETE FILL AND GROUT MATERIALS

A. Provide concrete grout and fill equivalent in strength to cast-in-place concrete slabs for recessed mats and frames. Use aggregate no larger than one-third fill thickness.

2.5 SUPPORT SYSTEM

A. Provide manufacturer's standard support extrusion system with intermediate support beams, sized and spaced as recommended by manufacturer for spans and sizes indicated.

2.6 FABRICATION

A. Shop fabricate floor grilles to greatest extent possible in sizes as indicated. Unless otherwise indicated, provide each grille as a single unit; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in grilles are necessary, space symmetrically and away from normal traffic lanes.

B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Mill Finish: AA-M10 (Mechanical Finish: as fabricated); grind and buff as required to remove scratches, welding, or abrasions produced in fabrication process.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, size, minimum recess depth, and other conditions affecting installation of mat, foot grilles and frames.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed floor grilles and frames to comply with manufacturer's written instructions at locations indicated and with top of foot grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set grille tops at height for most effective cleaning action. Coordinate top of floor-grille surfaces with doors that swing across grilles to provide clearance under door.

3.3 PROTECTION

A. After completing frame installations, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124816

SECTION 211100 - FIRE PROTECTION PIPING

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler systems.

1.2 RELATED SECTIONS

A. Section 015013 Integrated Pest Management

B. Section 099000 - Painting.

C. Section 220501 - Supports and Anchors.

D. Section 220503 - Mechanical Identification.

E. Section 220504 - Vibration Isolation and Seismic Restraints.

F. Section 211300 - Sprinkler Systems.

1.3 REFERENCES

A. ANSI/ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.

B. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings, Class 150 and 300.

C. ANSI/ASME B16.4 - Cast Iron Threaded Fittings, Class 125 and 250.

D. ANSI/ASME B16.5 - Pipe Flanges and Flanged Fittings.

E. ANSI/ASME B16.9 - Factory-made Wrought Steel Butt welding Fittings.

F. ANSI/ASME B16.11 - Forged Steel Fittings, Socket-welding and Threaded.

G. ANSI/ASME B16.18 - Cast Copper Alloy Solder-Joint Pressure Fittings.

H. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

I. ANSI/ASME B16.25 - Butt welding Ends.

J. ANSI/ASME B36.10 - Welded and Seamless Wrought Steel Pipe.

K. ANSI/ASME Sec 9 - Welding and Brazing Qualifications.

L. ANSI/ASTM A135 - Electric-Resistance-Welded Steel Pipe.

M. ANSI/ASTM A47 - Malleable Iron Castings.

N. ANSI/ASTM B32 - Solder Metal.

O. ANSI/AWS A5.8 - Brazing Filler Metal.

P. ANSI/AWWA C110 - Ductile Iron and Gray Iron Fittings.

Q. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast.

R. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.

S. ASTM A120 - Pipe, Steel, Black and Hot-Dipped, Zinc-coated (Galvanized) Welded and Seamless, for Ordinary Uses.

T. ASTM A234 - Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

U. ASTM A795 - Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.

V. ASTM B75 - Seamless Copper Tube.

W. ASTM B88 - Seamless Copper Water Tube.

X. ASTM B251 - General Requirements for Wrought Seamless Copper and Copper-Alloy Tube.

Y. ASTM D3309 - Polybutylene (PB) Plastic Hot- and Cold-Water Distribution Systems.

Z. ASTM F438 - Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.

AA. ASTM F439 - Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

BB. ASTM F442 - Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).

CC. ASTM F493 - Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

DD. AWS D10.9 - Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing.

EE. NFPA 13 - Installation of Sprinkler Systems.

FF. NFPA 14 - Standpipe and Hose Systems.

GG. NFPA 24 - Installation of Private Fire Service Mains and Their Appurtenances

1.4SUBMITTALS

A. Submit under provisions of Section 013300.

B. Where the terms "authorities having jurisdiction" is used, within this Specification, it is intended to include the Insurance Underwriter and all regulatory agencies having vested interest in this project.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.

E. Manufacturer's Field Report: Submit under provisions of Section 014000.

F. Manufacturer's Field Report: Indicate time of start-up of treatment systems and include analysis of system water after cleaning and treatment.

G. Provide waste management progress reports complying with section 017419 – CONSTRUCTION WASTE MANAGEMENT AND DSIPOSAL.

1.5OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017000.

B. Maintenance Instructions: Include installation instructions, spare parts lists, procedures, and treatment programs.

1.6QUALITY ASSURANCE

A. Workmanship and Qualifications: All materials and equipment shall be installed in accordance with NFPA Standard 13 and all applicable local codes and ordinances. The Sprinkler Contractor shall make sure that all work and materials conform to the requirements set forth by this specification. Fire protection equipment shall be installed to conform to NFPA Standard 13 as applicable, devices used shall be listed and approved by Underwriters Laboratories (UL)

and/or Factory Mutual (FM). Welding shall be in accordance with NFPA Standard 13 by certified welders.

B. Codes and Standards: All work shall be equal or superior to that required by codes, regulations, ordinances, and laws imposed by jurisdictional authorities, including those of the State of Connecticut, State Fire Marshal, Town of Mansfield, OSHA and Plumbing Codes. Nothing in the specifications permit violation of such directives, and where conflict occurs, the directive shall govern, except where superior work is specified or indicated.

C. In addition to complying with the above codes and regulations, comply with the requirements of the following:
   1. NFPA Standard 13.
   2. Connecticut State Building Code.
   3. Local Jurisdictional Authorities.

D. Valves: Bear UL and/or FM label or marking. Provide manufacturer's name and pressure rating marked on valve body.

E. Maintain one copy of each document on site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01600.

B. Deliver and store valves in shipping containers, with labelling in place.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. All equipment, valves, gages and etc., shall be covered and protected during the execution of the work. All equipment and piping shall be protected from freezing. Labeling to remain in place.

F. All unloading, hauling, handling, of materials, shall be the responsibility of the Sprinkler Contractor.

G. The Sprinkler contractor can obtain information on available storage space on the site from the Owner when making examination of the site.

PART 2 - PRODUCTS

2.1 SPRINKLER AND STANDPIPE PIPING, BURIED

A. Cast Iron Pipe: ANSI/AWWA C151.
   1. Fittings: ANSI/AWWA C110, standard thickness.
   2. Joints: ANSI/AWWA C111, rubber gasket.

3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.2 SPRINKLER AND STANDPIPE PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53; Schedule 40 welded or seamless black steel.
   1. Cast Iron Fittings: ANSI/ASME B16.1, flanges and fittings; ANSI/ASME B16.4, screwed fittings.
   2. Malleable Iron Fittings: ANSI/ASME B16.3, screwed class 150 type. Threads shall conform to ANSI B1.20; ANSI/ASTM A47.
   3. Grooved Mechanical Fittings: ASTM A536, Grade 65-45-12 ductile iron; ASTM A47 Grade 32510 malleable iron; or ASTM A53 Type F or Types E or S, Grade B fabricated steel fittings with grooves or shoulders designed to accept grooved end couplings.
   4. Grooved Mechanical Couplings: Consist of the ductile or malleable iron housing, a synthetic rubber gasket of a central cavity pressure responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure roll grooved pipe and fittings.

B. Cast Iron Pipe: ANSI/AWWA C151.
   1. Fittings: ANSI/AWWA C110, standard thickness.
   2. Joints: ANSI/AWWA C111, rubber gasket.
   3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.3 GATE VALVES

A. Up to and Including 2 Inches (50 mm):
   1. Manufacturers:
      a. Kennedy Valve Mfg. Co., Fig. 66.
      b. Other acceptable manufacturers offering equivalent products include:
         1) The Fairbanks Co.
         2) Stockham Valves & Fittings.

   2. Bronze body, bronze trim, 175 pound cold water working pressure, rising stem, handwheel, inside screw, wedge or disc, threaded ends.

B. Over 2 Inches (50 mm):
   1. Manufacturers:
      a. Kennedy Valve Mfg. Co., Fig. 68.
      b. Other acceptable manufacturers offering equivalent products include:
         1) The Fairbanks Co.
         2) Stockham Valves & Fittings.

   2. Iron body, bronze mounted, 175 pound cold water working pressure, non-shock. Valve shall have solid taper wedge; outside screw and yoke, rising stem; flanged bonnet with body and bonnet conforming to ASTM A126 Class B; replaceable bronze wedge facing rings; flanged ends; and a packing assembly consisting of a cast iron gland flange, brass

gland, packing, bonnet and bronze bonnet bushing. Valve shall be capable of being repacked under pressure, with valve wide open.

2.4 GLOBE VALVES

A. Up to and Including 2 Inches (50 mm):
   1. Manufacturers:
      a. Kennedy Valve Mfg. Co., Fig. 97.
      b. Other acceptable manufacturers offering equivalent products include:
         1) The Fairbanks Co.
         2) Stockham Valves & Fittings.

   2. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable composition disc, screwed ends, with back-seating capacity [repackable under pressure].

2.5 ANGLE VALVES

A. Up to and Including 2 Inches (50 mm):
   1. Manufacturers:
      a. Kennedy Valve Mfg. Co., Fig. 98.
      b. Other acceptable manufacturers offering equivalent products include:
         1) The Fairbanks Co.
         2) Stockham Valves & Fittings.

   2. Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable composition disc, screwed ends with back-seating capacity.

B. Over 2 Inches (50 mm):
   1. Manufacturers:
      a. Kennedy Valve Mfg. Co., Fig. 438.
      b. Other acceptable manufacturers offering equivalent products include:
         1) The Fairbanks Co.
         2) Stockham Valves & Fittings.

   2. Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, [flanged ends],[screwed ends] renewable seat and disc.

2.6 BALL VALVES

A. Up to and Including 2 Inches (50 mm):
   1. Manufacturers:
      a. Stockham Valves & Fittings, Fig. S-127.
      b. Other acceptable manufacturers offering equivalent products include:
         1) Kennedy Valve Mfg. Co.
         2) The Fairbanks Co.

   2. Bronze one piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle, and balancing stops, threaded ends.

2.7 CHECK VALVES

A. Up to and Including 2 Inches (50 mm):
   1. Manufacturers:
      a. Kennedy Valve Mfg. Co., Fig. 133.
      b. Other acceptable manufacturers offering equivalent products include:
         1) The Fairbanks Co.
         2) Stockham Valves & Fittings.

   2. Bronze swing disc, screwed ends.

B. Over 2 Inches (50 mm):
   1. Manufacturers:
      a. Kennedy Valve Mfg. Co., Fig. 126.
      b. Other acceptable manufacturers offering equivalent products include:
         1) The Fairbanks Co.
         2) Stockham Valves & Fittings.

   2. MSS SP-71; Class 175, cast iron body and bolted cap conforming to ASTM A126, Class B; horizontal swing, with a bronze disc or cast iron disc with bronze disc ring, and flanged ends Valve shall be capable of being refitted while the valve remains in line.

2.8 BACKFLOW PREVENTERS

A. Manufacturers:
   1. Watts .
   2. Other acceptable manufacturers offering equivalent products.
      a. Beeco
      b. Hersey
      c. Cla-Val
      d. Grinnell
      e. Zurn
      f. Febco

B. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013,[AWWA C506; bronze body; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; assembled with two gate valves, strainer, test cocks ; Model 909 manufactured by Watts.

2.9 DRAIN VALVES

A. Manufacturers:
   1. Stockham Valves & Fittings, Fig S-127.
   2. Other acceptable manufacturers offering equivalent products include:
      a. Kennedy Valve Mfg. Co.
      b. The Fairbanks Co.

B. Bronze compression stop with hose thread nipple and cap.

C. Brass ball valve with cap and chain, 3/4 inch (19 mm) hose thread.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install piping in accordance with NFPA 13 for sprinkler systems.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space and not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

G. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 099000.

H. Do not penetrate building structural members unless indicated.

I. Provide sleeves when penetrating footings floors and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required. Refer to Section 220501 and Section 015013.

J. Die cut screw joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

K. All valves shall be accessible for operation and servicing. Provide access panels where required.

L. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.

M. Provide gate valves for shut-off or isolating service.

N. Provide drain valves at main shut-off valves, low points of piping and apparatus.

3.3 TESTING

A. Piping: The completed system shall be subject to a pressure test, and to such other tests as the authorities having jurisdiction may require. The pressure test shall be a hydrostatic pressure of (200) pounds per square inch for a period of two hours. The above ground piping and attached appurtenances shall show no pressure loss or leaks, refer to NFPA Standard 13 Hydrostatic tests. For buried piping refer to NFPA Standard 24 Testing Underground Systems. Before applying specified test pressure, all air must be expelled from the system. All defects of whatever type shall be repaired or replaced to the satisfaction of the Owner and authorities having jurisdiction and at no additional cost to the Owner. Packing rings, special joint bolts, gaskets, and other material required for the proper installation of the pipe and fittings shall be provided. Testing shall be completed prior to permanent sealing of walls and partition.

B. Leaks in mechanical joints shall be repaired by dismantling the joint, reassembling it, and tightening the bolts in the correct order. Leaks in screw or grooved joint shall be repaired by dismantling the joint and reassembling it. Attempting to repair leaks in joints by overtightening the bolts or fittings shall not be permitted.

C. Upon satisfactory completion of all tests, the Contractor shall submit three copies of the Standard Contractors Material and Test Certificate to the Owner.

END OF SECTION

SECTION 211300 - SPRINKLER SYSTEMS

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. Dry-pipe sprinkler system.

C. System design, installation, and certification.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 211100 - Fire Protection Piping: Piping and valves.

1.3 RELATED SECTIONS

A. Section 220501 - Supports and Anchors.

B. Section 220503 - Mechanical Identification.

C. Section 220504 - Vibration Isolation and Seismic Restraints.

1.4 REFERENCES

A. NFPA 13 - Installation of Sprinkler Systems.

B. FM - Factory Mutual Approval Guide.

C. UL - Fire Resistance Directory.

1.5 SYSTEM DESCRIPTION

A. Existing system provides coverage for entire building. System modifications include renovated areas.

B. Provide system to NFPA 13 light occupancy requirements.

C. Determine volume and pressure of incoming water supply for hydraulic calculations from water flow test data. When performing hydraulic calculations, a minimum of 8 psi safety cushion shall be provided, unless this will result in having to install a fire pump.

1.6 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Where the terms "authority having jurisdiction" is used within this specification, it is intended to include the Insurance Underwriter and all regulatory agencies having vested interest in this project.

C. Preliminary Shop Drawings: Prior to detailed submission, submit preliminary layout of finished ceiling areas indicating only head locations coordinated with ceiling installation.

D. Shop Drawings: Indicate hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories. Indicate system controls.

E. Product Data: Provide data on sprinklers, valves and specialties, including manufacturers catalogue information. Submit performance ratings rough-in details, weights, support requirements, and piping connections.

F. Submit shop drawings, product data, hydraulic calculations to authority having jurisdiction for approval. Submit proof of approval to Architect/Engineer.

G. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and all code requirements.

H. Provide waste management progress reports complying with section 017419 – CONSTRUCTION WASTE MANAGEMENT AND DSIPOSAL.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017000.

B. Record actual locations of sprinkler heads and deviations of piping from drawings.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017000.

B. Maintenance Data: Include components of system, servicing requirements, Record Drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

1.9 QUALITY ASSURANCE

A. Workmanship and Qualifications: All materials and equipment shall be installed in accordance with NFPA Standard 13 and all applicable local codes and ordinances. The Sprinkler Contractor shall be state licensed to install sprinkler systems. The Sprinkler Contractor shall make sure that all work and materials conform to the requirements set forth by this Specification. Fire protection equipment shall be installed to conform to NFPA Standard 13 as applicable, and devices used shall be listed and approved by Underwriters laboratories (UL) and/or Factory Mutual (FM). Welding shall be in accordance with NFPA Standard 13 by certified welders.

B. Codes and Standards: All work shall be equal or superior to that required by codes, regulations, ordinances, and laws imposed by the jurisdictional authorities. Nothing in the Specifications permit violation of such directives, and where conflict occurs, the directive shall govern, except where superior work is specified or indicated.

C. In addition to complying with the above codes and regulations, comply with the requirements of the following:

1. NFPA Standard 13.
2. State Building and Fire Codes.
3. Local Jurisdictional Authorities.

D. Maintain one copy of document on site.

1.10 QUALIFICATIONS

A. Installer: Company specializing in performing work of this Section with minimum five years experience.

B. Design sprinkler system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State where the Project is located.
1. Arrange for and obtain current "three point" hydrant flow tests conforming to procedures described in NFPA Standard 291 in cooperation with the water utility. Include the following data:
   Static pressure
   Residual pressure flowing - gpm (1)
   Residual pressure flowing - gpm (2)
   Hydrant numbers and locations
   Hydrant datum elevation (adjusted to datum used on drawings)
2. Arrange to perform tests during period of estimated maximum daily demand or adjust to such periods from data obtained from utility.
3. Design system based on 90% of test data.

1.11 REGULATORY REQUIREMENTS

A. Hydraulic Calculations, Product Data, Shop Drawings: Bear stamp of approval of Owner's fire insurance underwriter.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and protect products to site under provisions of Section 016000.

B. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

C. All equipment, valves, alarms, gages and etc., shall be covered and protected during the execution of the work. All equipment and piping shall be protected from freezing. Labeling to remain in place.

D. All unloading, hauling, and handling of materials shall be the responsibility of the Sprinkler Contractor.

E. The Sprinkler Contractor can obtain information on available storage space on site from the Owner when making examination of the site.

1.13 EXTRA MATERIALS

A. Furnish under provisions of Section 017000.

B. Provide extra sprinkler heads under provisions of NFPA 13.

C. Provide suitable wrenches for each head type.

D. Provide metal storage cabinet in location designated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Viking Corp.

B. Tyco Fire & Building Products.

C. Reliable Automatic Sprinkler Co.

D. Substitutions: Shall be approved by the Architect/Engineer.

2.2 SPRINKLERS

A. Manufacturers:
   1. Viking Corp.
   2. Other acceptable manufacturers offering equivalent products include:
      a. Tyco Fire & Building Products.
      b. Reliable Automatic Sprinkler Co.
      c. Or Approved Equal.

B. Suspended Ceiling:
   1. Type: Quick response, concealed, pendant type with matching screw on escutcheon plate.

2. Finish: Chrome plated.
3. Escutcheon Plate Finish: Chrome plated.
4. Fusible Link: Glass bulb type with a rated temperature of 155deg.
5. Sprinkler shall be Viking Model VK-410.

C. Exposed Area Type:
1. Type: Quick response, upright type with guard.
2. Finish: Chrome plated.
3. Fusible Link: Glass bulb type with a rated temperature of 165deg.
4. Sprinkler shall be Viking, Model VK-300.

D. Sidewall Type:
1. Type: Recessed, quick response, extended coverage, horizontal sidewall type with matching screw on escutcheon plate.
2. Finish: Chrome plated.
3. Escutcheon Plate Finish: Chrome plated.
4. Fusible Link: Glass bulb type with a rated temperature of 155deg.
5. Sprinkler shall be Viking, Model VK-605.

E. Spare Sprinklers: The Sprinkler Contractor shall furnish spare automatic sprinklers in accordance with the requirements of NFPA Standard 13 for stock of extra sprinklers. The sprinklers shall be packed in a suitable container and shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. The Sprinkler Contractor shall furnish no less than two special sprinkler wrenches, or at least one wrench for each container or sprinkler box, whichever is greater.

F. Guards: Finish to match sprinkler finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate work of this Section with other affected work.

3.2 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

B. Products shall be installed in accordance with the requirements of this Specification and all applicable NFPA Standards.

C. Impairments to the existing water supplies shall be minimized. All work shall be complete before making the final connections to the existing water supplies. The Contractor shall notify the owner's representative before impairing any fire protection equipment.

D. The Contractor shall maintain a clean and orderly site during the installation of the sprinkler system. Materials shall not be stored in the halls or other public areas.

E. Cutting, welding and other hot work shall not be permitted without permission from the building owner.

F. Place pipe runs to minimize obstruction to other work.

G. Place piping in concealed spaces above finished ceilings.

H. Center heads in two directions in ceiling tile and provide piping offsets as required.

I. Apply masking tape or paper cover to ensure concealed sprinkler head cover plates do not receive field paint finish.

J. Flush entire piping system of foreign matter.

K. Hydrostatically test entire system.

L. Require test be witnessed by authority having jurisdiction.

3.3 SYSTEM SCHEDULE

Location	System Type/Hazard
Refer to Drawings	Refer to Drawings

3.4 IDENTIFICATION:

A. Provide and permanently attach hydraulic calculations data nameplate at the controlling valve for the sprinkler system. Provide lettering size and style from NFPA's suggested styles.

3.5 TESTING:

A. For Testing of sprinkler system, refer to Section 211100 - Fire Protection Piping.

END OF SECTION

SECTION 220000 - BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Basic Mechanical Requirements specifically applicable to Division 15 Sections, in addition to Division 1 - General Requirements.

1.2 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Include Products specified in the individual Sections.

C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

D. Mark dimensions and values in units to match those specified.

1.3 SEQUENCING AND SCHEDULING

A. Construct Work in sequence under provisions of Section 013213.

B. Connections to existing systems shall be coordinated with Owner. Contractor shall notify Owner 48 hours in advance of making connections.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 220500 – COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.01 SUMMARY

A. Section Includes:

1. This Section provides the basic plumbing requirements that apply to the Work of Division 22.

B. Related Requirements:

1. Division 01: General Requirements.
2. Division 22: Plumbing
3. Division 23: HVAC
4. Division 26: Electrical.

1.02 REGULATORY REQUIREMENTS

A. Current federal Safe Drinking Water Act (SDWA) regulations require the furnishing of lead-free pipe, solder, and flux in the installation or repair of plumbing in non-residential facilities connected to public drinking water systems. Under this regulation, solders and flux are considered lead-free when they contain 0.2 percent lead or less.

1. Provide lead-free water pipe, solder, and flux materials that meet the standards as outlined by the federal SDWA regulations.
2. Collect pipe, solder, and flux material samples as required by the Project Inspector. Test samples shall be delivered to an Owner designated testing laboratory for testing of lead content.
    a. Test samples for lead content by the atomic absorption spectrophotometry method.
3. Materials found not conforming to SDWA regulations shall be deemed defective Work and shall be replaced with lead-free materials.
4. Comprehensive testing of the remaining materials for their lead content shall be performed as required by the Project INSPECTOR.

A. Materials, fabrication, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:
1. ANSI - American National Standards Institute.
2. ASME - American Society of Mechanical Engineers.
    a. ASME Boiler and Pressure Vessel Code.
    b. ASME B31 - Standards for Pressure Piping.
3. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers.
4. ASTM - American Society for Testing and Materials.
    a. ASTM A53 Specification for Welded and Seamless Pipe.
5. AWWA - American Water Works Association.
6. CSA - Canadian Standards Association.
7. FM Global - Factory Mutual Global
8. IAPMO - International Association of Plumbing and Mechanical Officials.
9. NFPA - National Fire Protection Association.
10. OSHA - Occupational Safety and Health Administration.
11. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association.

12. UL - Underwriters Laboratories Inc.

13. Intertek (ETL Certification).

B. Materials, fabrication, equipment, and installation shall comply with federal, state, and local codes

C. Specifications or Drawings shall not be construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.

D. Permits and Fees: Refer to the General and Supplementary Conditions.

1.03 SUBMITTALS

A. Provide submittals in accordance with Section 01 3300: Submittal Procedures and with specific requirements of Division 22 sections, as applicable.

B. The above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.

C. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project. Drawings prepared in accordance with requirements of Section 01 3113: Project Coordination and Section 01 3300 may be provided by the Architect to serve as a background for the Shop Drawings. Shop Drawings shall comply with the requirements of Section 01 3113 and Section 01 3300 and shall indicate at a minimum:

1. Complete system layout of equipment, components, plumbing fixtures, piping, indicating service clearances, and pipe sizes, fitting types and sizes and pipe elevations, distances of pipes and equipment from building reference points and hanger support locations. The above items shall be coordinated on the shop drawings according to the requirements of Section 01 3113.

2. Schedule and description of equipment, piping and fittings.

1.04 PROJECT RECORD DOCUMENTS

A. Comply with provisions of Section 01 7700: Contract Closeout.

B. Project Record Drawings:

1. Provide a complete set of plumbing and fire protection drawings in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-

ROM. Also submit one set of full size reproducible plots on vellum and 3 sets of prints.

2. Before Contract Completion, deliver corrected and completed prints to the ARCHITECT. Delivery of project record documents to the ARCHITECT does not relinquish responsibility of furnishing required information omitted from project record documents.

C. Operation and Maintenance Manuals:

1. Submit two copies of operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy shall be returned with instructions for changes; perform such changes and return three copies of manuals. Manuals shall be bound in accordance to Section 01 7700. Deliver manuals to the ARCHITECT. Submit an electronic copy of the entire manual in PDF file format.

2. Contents of Manual:

a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.

b. Manufacturer's operating instructions including, but not limited to, the following:

1) Identification of components and controls.

2) Trouble shooting checklist and guidelines.

3) Recommendations for optimum performance.

4) Warnings and safety precautions on improper or hazardous operational procedures or conditions

c. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 22 that includes the following as a minimum:

1) Manufacturer’s model, identification and serial numbers.

2) Exploded view of assembly drawings identifying each component or part with the relevant part number.

3) Directory of manufacturer’s representatives, service contractors and part distributors.

4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.

d. Project Record Drawings: Complete set of plumbing, fire protection and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.

e. Testing, Adjusting, and Balancing reports: Submit as specified in Section 23 0593.

f. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.

i. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.05 COORDINATION

A. Contract Documents indicate extent and general arrangement of Work under Division 22. Contractor shall coordinate work in accordance with Section 01 3113 requirements and make adjustments as required to provide maximum headroom, a neat arrangement to keep passageways and openings clear to provide accessibility and provisions for maintenance, and to meet code requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.

B. Do not store plastic pipe or materials in direct sunlight.

1.07 PRELIMINARY OPERATION

A. ARCHITECT may require any portion of plumbing Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.

B. Notify the INSPECTOR at least 24 hours in advance of lighting or re-lighting pilots.

1.08 TRAINING OF OWNER PERSONNEL

A. Training of Owner's personnel shall include:

1. A minimum of 4 hours of on-site overview of the overall Plumbing System.

2. Refer to Division 22 sections for specific training on each of the components of the Plumbing System.

B. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance, trouble-shooting, and Project site repair of each component, equipment, or system provided under this Contract.

C. Operational and maintenance training shall be conducted on the Project site, unless indicated otherwise.

D. Upon completion of Owner training, a completion certificate indicating the nature of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by ARCHITECT.

E. An attendance sheet with the names and signatures of all participants attending the training shall be submitted to the ARCHITECT and kept as part of the project documents.

1.09 GUARANTEES AND DAMAGE RESPONSIBILITY

A. Sound of water flowing in piping shall not be transmitted to building structure. Operation of mechanical system shall not produce operational sounds that can be heard outside of rooms enclosing apparatus or equipment.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.

B. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.

C. Equipment and materials indicated or required to be installed outdoors shall be of the type that is designed, manufactured, listed or approved by authorities having jurisdiction for outdoor installation by being resistant to the adverse effects of

weather. The additional protective measures against outdoor weather required by the manufacturers' installation instructions and prevalent practice shall be provided.

D. For substitution of materials or products, refer to the General Conditions.

PART 3 – EXECUTION

3.01 SERVICE INTERRUPTIONS, OFF-SITE, GAS AND WATER

A. Schedule Work so there shall be no service interruptions of existing systems or systems during normal hours of operation of affected systems and facilities.

B. When service interruptions are mandatory, arrange in advance with the ARCHITECT as to time and date of such interruptions.

C. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

3.02 CUTTING, NOTCHING, AND BACKING

A. Conform to California Building Code, Title 24, Part 2, for notches and bored holes in wood and for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.

B. Where pipes pass through, or are located within one inch of any construction element, install a resilient pad, ½ inch thick minimum, to prevent contact.

C. Furnish provisions for recesses, chases, and accesses and provide blocking and backing for proper reception and installation of plumbing Work.

3.03 LOCATION OF PIPING AND EQUIPMENT

A. Location of piping, apparatus and equipment indicated on the Drawings is approximate and shall be altered to avoid obstructions, preserve headroom, and provide free and clear openings and passageways.

B. Trenches parallel to footings shall not be closer than 18 inches to the face of footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.

C. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.

D. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.04 TESTS AND TESTING

A. Tests shall be as required under the applicable sections of Division 22, including this Section.

B. Additional tests may be required in the case of products, materials, and equipment if:

1. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.

2. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.

C. Piping Tests:

1. Perform tests required to demonstrate that operation of plumbing systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the Inspector, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.

2. If required tests are not performed, Owner may provide in accordance with the Contract Documents.

3. Pressure gauges furnished in testing shall comply with CPC. Air shall be bled from lines requiring hydrostatic or water tests.

4. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.

5. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.

6. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the Inspector.

7. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.

D. Pipe Testing Schedule:

System Tested	**Test Pressure (psig)**	**Test With:**

Durham system, glass or plastic acid waste, vent and roof drain (except pipes running under a slab or underground)	Fill with water to top of highest vent; allow to stand two hours, or longer, as required by Inspector. Minimum head required for any joint shall be 10 feet in building.	Water
Cast-iron soil, waste and interior downspout, condensate drain from air conditioning equipment	10 feet of water, vertically	
Storm water disposal lines	Running water test	Water
Vacuum pump or condensate pump discharge and condensate return piping	150	Water
Domestic water piping	200	Water
Standpipes, wet or dry	300	Water
Fire sprinkler piping	200	Water
Gas piping(steel threaded or plastic)	60 (both tests)	Air
Gas piping (steel welded)	100 (both tests)	Air
Gas welding station	1-1/2 Working pressure 100 min.	Dry nitrogen
Compressed air piping	175	Air

E. Equipment Performance Assurance Tests:

1. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed and recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and materials shall be replaced or repaired as required.

2. Upon completion of the above, adjust the system settings to within normal operating conditions to prevent the system from being damaged upon start-up.

3. Run-test the equipment after start-up for five consecutive days. Tests shall include operation of all equipment and systems for a period of not less than two 8 hour periods at 90 percent of the full specified capacities.

4. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of start-up report for review by the Architect.

   a. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.

5. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.

6. Provide electric energy and fuel required for tests.

7. Final adjustment to equipment or systems shall meet specified performance requirements.

8. Equipment, systems, or Work deemed defective during testing shall be replaced or corrected as required. Test until satisfactory results are provided.

F. Specific Coordinated Plan for Test and Balance:

1. Provide a narrative of the operational intent that clearly describes the function and sequence of operation of each component, equipment, or system installed. Instruct designated Owner personnel in the operation of the installed systems.

2. Prior to final test and balance, plumbing equipment and systems shall be operated and tested as indicated in Article 3.04.F above to demonstrate satisfactory overall operation of the installed systems.

3. Welding performed as part of this Division may be subject to radiographic inspections at random in accordance with requirements specified in Section 22 0513: Basic Plumbing Materials and Methods.

3.05 NOISE AND VIBRATION REDUCTION

A. Correct noise or vibration caused by plumbing systems. Provide all necessary adjustments to specified and installed equipment and accessories to reduce noise to the lowest possible level

B. Correct noise or vibration problems caused by failure to install work in accordance with Contract Documents. Include all labor and materials required as a result of such failure. Pay for re-testing of corrected noise or vibration problems by the project acoustical consultant including travel, lodging, test equipment expenses, etc.

3.06 PROTECTION, CARE AND CLEANING

A. In addition to storage criteria of the General Conditions, and provisions under Section 01 5000: Construction Facilities and Temporary Controls, the following shall be provided:

1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.

2. Protect installed Work.

3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.

4. Protect covering for bearings, open connections to tanks, pumps, compressors and similar equipment.

5. Interior of piping shall be maintained free of dirt, grit, dust, and other foreign materials.

6. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.

7. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas.

END OF SECTION

SECTION 220501 - SUPPORTS AND ANCHORS

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Pipe and equipment hangers and supports.

B. Pipe anchors and guides.

C. Equipment bases and supports.

D. Sleeves and seals.

E. Flashing and sealing equipment and pipe stacks.

1.2 RELATED SECTIONS

A. Section 015013 Integrated Pest Management

B. Section 030000 - Cast-In-Place Concrete: Equipment bases.

C. Section 099120 - Painting.

D. Section 220000 – Basic Mechanical Requirements.

E. Section 220504 - Vibration Isolation and Seismic Restraints.

F. Section 220700 - Piping Insulation.

G. Section 211100 - Fire Protection Piping.

H. Section 221000 - Plumbing Piping.

I. Section 232300 - Refrigerant Piping and Specialties.

1.3 REFERENCES

A. ASME B31.1 - Power Piping.

B. ASME B31.2 - Fuel Gas Piping.

C. ASME B31.5 - Refrigeration Piping.

D. ASME B31.9 - Building Services Piping.

E. ASTM F708 - Design and Installation of Rigid Pipe Hangers.

F. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

G. MSS SP69 - Pipe Hangers and Supports - Selection and Application.

H. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

I. NFPA 13 - Installation of Sprinkler Systems.

J. NFPA 14 - Installation of Standpipe and Hose Systems.

K. UL 203 - Pipe Hanger Equipment for Fire Protection Service.

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.

C. Product Data: Provide manufacturers catalog data including load capacity.

D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

E. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.5 REGULATORY REQUIREMENTS

A. All piping supports shall conform to ASTM F708, MSS SP58, MSS SP69 and MSS SP89.

B. Plumbing piping (DWV) shall conform to ASME B31.9.

C. Plumbing piping (Water) shall conform to ASME B31.9.

D. Natural gas piping shall conform to ASME B31.2.

E. Refrigerant piping shall conform to ASME B31.5.

F. Supports for Sprinkler Piping: In conformance with NFPA 13.

G. Supports for Standpipes: In conformance with NFPA 14.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
   1. Grinnell Corp. models listed below.
   2. Other acceptable manufacturers offering equivalent products:
      a. Mason Industries Inc.
      b. B Line Systems Inc.

B. Hangers: Carbon steel, adjustable, clevis; Grinnell Figure 260.

C. Hangers for Hot Pipe Sizes 6 Inches (150 mm) and Over: Adjustable steel yoke, cast iron roll; Grinnell Figure 181.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers, hanger rods and U-bolt pipe clamp.

E. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches (150 mm) and Over: Steel channels with welded spacers, hanger rods and cast iron roller chair; Grinnell Figure 175.

F. Wall Support for Pipe Sizes to 3 Inches (76 mm): Cast iron clamp; Grinnell Figure 126 or steel bracket and hanger.

G. Wall Support for Pipe Sizes 3 Inches (76) mm) and Over: Welded steel bracket and hanger.

H. Vertical Support: Steel riser clamp; Grinnell Figure 261.

I. Floor Support: Carbon steel adjustable pipe saddle, U-bolt, lock nut, nipple and floor flange; Grinnell Figure 191.

J. Floor Support for Hot Pipe Sizes 6 Inches (150 mm) and Over: Adjustable cast iron roll and stand, steel screws, and steel support; Grinnell Figure 274.

K. Hanger Rods: Mild steel threaded both ends, or continuous threaded.

L. Beam Clamps: Carbon steel, center I-beam clamp for providing even distribution on "T" flanges; Grinnell Figure 133 or 134.

M. Beam Clamps For Piping 2" Diameter and Less: Malleable iron C-clamp with locknut; Grinnell Fig 86. Provide retaining clip for piping to be seismically braced.

N. Insulation Shields: Galvanized carbon steel; Grinnell Figure 167.

2.2 PIPE ALIGNMENT GUIDES

A. Manufacturers:
   1. Adsco Model "E".
   2. Other acceptable manufacturers offering equivalent products include:
      a. Grinnell.

B. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for insulation, minimum 3 inch (75 mm) travel.

2.3 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors, Beams, Walls and Footings: Schedule 10 carbon steel pipe or 18 gage (1.2 mm thick) galvanized steel or schedule 40 PVC.

B. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors, Walls Building Components and Fire Proofing: Schedule 40 carbon steel sleeve with firestop sealant.

C. Sleeves for Round and Rectangular Ductwork: Galvanized steel.

D. Firestopping Insulation: Glass fiber type, non-combustible.

E. Sealant: RTV Silicone.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.2 PIPE HANGERS AND SUPPORTS

A. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.

B. Place hangers within 12 inches (300 mm) of each horizontal elbow.

C. Use hangers with 1-1/2 inch (38 mm) minimum vertical adjustment.

D. Support horizontal cast iron pipe adjacent to each hub, with 5 feet (1.5 m) maximum spacing between hangers.

E. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

F. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Support riser piping independently of connected horizontal piping.

H. Design hangers for pipe movement without disengagement of supported pipe.

I. Provide insulation shields at all insulated piping.

J. Rigidly anchor pipe to building structure where shown on the drawings and as necessary due to field conditions. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

K. Provide supplemental steel channels, unistrut, etc. supported from building structure as required.

3.3 EQUIPMENT BASES AND SUPPORTS

A. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

B. Construct supports of steel members. Brace and fasten to structure.

C. Provide rigid anchors for pipes after vibration isolation components are installed.

3.4 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Extend sleeves through floors one inch (25 mm) above finished floor level. Calk sleeves.

D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and calk. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Refer to section 015013 Integrated Pest Management.

E. Install chrome plated steel escutcheons at finished surfaces.

END OF SECTION

SECTION 220502 – MOTORS

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Single phase electric motors.

B. Three phase electric motors.

1.2 RELATED SECTIONS

A. Section 220000 – Basic Mechanical Requirements.

B. Division 260000 - Electrical.

1.3 REFERENCES

A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

C. IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators.

D. NEMA MG 1 - Motors and Generators.

E. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors 10 horsepower and larger.

D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017700.

B. Operation Data: Include instructions for safe operating procedures.

C. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacture of electric motors for commercial use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. as suitable for the purpose specified and indicated.

C. Minimum motor nominal efficiencies shall be in accordance with the current Code requirements of the state the equipment is installed in.

D. All motors are to be Energy Star rated per CT High Performance Standard mandatory Requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016000.

B. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Baldor Electric Co.

B. Other acceptable manufacturers offering equivalent products include:
   1. General Electric.
   2. Marathon Electric.

2.2 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Motors Less Than 250 Watts, for Intermittent Service: Equipment manufacturer's standard and need not conform to these specifications.

B. Electrical Service:
   1. Refer to schedules on drawings and respective equipment specification sections.
   2. Motors less than 1/2 HP: 120 volts, single phase, 60 Hz except where specifically noted otherwise.
   3. Motors 1/2 HP and larger: Three phase, 60 Hz except where specifically noted otherwise. Refer to drawings regarding voltage.

C. Type:
   1. Open drip-proof except where specifically noted otherwise.
   2. Motors: Design for continuous operation in 40 degrees C environment except where specifically noted otherwise.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

D. Explosion-Proof Motors: UL approved and labeled for hazard classification, with over temperature protection.

E. Inverter Duty Rated Motors: Totally enclosed blower cooled (TEBC) with Class H insulation, two normally closed thermal protectors, 1800 rpm for belt drive application. Blower motor shall be 230/460 volt, three phase. Efficiencies and power factors shall be as itemized at TEFC schedule.

F. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

G. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.3 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.4 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.5 SINGLE PHASE POWER - CAPACITOR START MOTORS

A. Starting Torque: Three times full load torque.

B. Starting Current: Less than five times full load current.

C. Pull-up Torque: Up to 350 percent of full load torque.

D. Breakdown Torque: Approximately 250 percent of full load torque.

E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.6 THREE PHASE POWER

A. Starting Torque: Between 1 and 1-1/2 times full load torque.

B. Starting Current: Six times full load current.

C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.

D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.

E. Insulation System: NEMA Class B or better.

F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

H. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors imbedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter.

I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for AFBMA 9, L-10 life of 20,000 hours except where specifically noted otherwise. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

J. Sound Power Levels: To NEMA MG 1.

K. Part Winding Start: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.

L. Weatherproof Epoxy Sealed or Treated Motors: Epoxy seal windings using vacuum and pressure or coat windings with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.

M. Nominal Efficiency: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

N. Nominal Power Factor: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

PART 3 - EXECUTION

3.1 APPLICATION

A. Motors located in exterior locations, wet air streams downstream of humidifiers or sprayed coil dehumidifiers, draw thru cooling towers, explosion proof environments or dust collection systems shall be totally enclosed type.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

3.3 NEMA OPEN MOTOR SERVICE FACTOR SCHEDULE

A.

HP	3600 RPM	1800 RPM	1200 RPM	900 RPM
1/6-1/3	1.35	1.35	1.35	1.35
1/2	1.25	1.25	1.25	1.15
3/4	1.25	1.25	1.15	1.15
1	1.25	1.15	1.15	1.15
1.5-150	1.15	1.15	1.15	1.15

END OF SECTION

SECTION 220503 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

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It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe Markers.

1.2 RELATED SECTIONS

A. Section 099000 - Painting: Identification painting.

B. Section 220000 – Basic Mechanical Requirements.

1.3 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required. Include printed statement of VOC content.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017700.

B. Record actual locations of tagged valves.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Manufacturers: Best, EMED Co. or approved equal.

B. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.2 TAGS

A. Manufacturers: Seton Name Plate Co., EMED Co. or approved equal.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) square.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) square with smooth edges.

D. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 STENCILS

A. Manufacturers: Seton Name Plate Co., EMED Co. or approved equal.

B. Stencils: With clean cut symbols and letters of following size:

1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.
4. 8 to 10 inch (200-250 mm) Outside Diameter of Insulation or Pipe: 24 inch (600 mm) long color field, 2-1/2 inch (65 mm) high letters.
5. Ductwork and Equipment: 2-1/2 inch (65 mm) high letters.

C. Stencil Paint: As specified in Section 09900, semi-gloss enamel, colors conforming to Owner's standards or ASME A13.1 if Owner does not have a set standard.

2.4 PIPE MARKERS

A. Manufacturers: Setmark as manufactured by Seton Name Plate Co., EMED Co. or approved equal.

B. Color: Conform to Owner's standards or ASME A13.1 if Owner does not have a set standard.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings; minimum information indicating flow direction arrow and identification of fluid being conveyed.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 099000 for stencil painting.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant brass or nylon chain.

C. Apply stencil painting in accordance with Section 099000.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

G. Identify all equipment with nameplates. Small devices may be identified with tags.

H. Identify control panels and major control components outside panels with nameplates.

I. Identify thermostats with nameplates.

J. Identify valves in main and branch piping with tags.

K. Tag all control components, instruments and relays. Key to control schematic.

L. Identify all piping, concealed or exposed, with pipe markers or stencilled painting. Use tags on piping 3/4 inch (20 mm) diameter and smaller. Identify service and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

M. Identify ductwork with stencilled painting. Identify system type (supply, exhaust, etc.) and direction of flow. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 220504 - VIBRATION ISOLATION AND SEISMIC RESTRAINTS

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

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It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Vibration isolation and seismic restraints for all mechanical and electrical system including equipment, piping, conduit and ductwork within the building.

B. The work of this section includes but is not limited to the following:
   1. Vibration isolation elements.
   2. Equipment isolation bases.
   3. Piping flexible connections.
   4. Seismic restraints for isolated and non-isolated mechanical and electrical items.

1.2 RELATED SECTIONS

A. Section 030000 - Cast-in-Place Concrete.

B. Division 220000 - Mechanical.

C. Division 260000 - Electrical.

1.3 REFERENCES

A. State of Connecticut Building Code.

B. NFPA 13 - Installation of Sprinkler Systems.

C. SMACNA - Seismic Restraint Manual Guidelines for Mechanical Systems.

1.4 QUALIFICATIONS

A. Qualifications: Only firms having five years experience designing and manufacturing seismic devices shall be capable of work in this specification.

1.5 SUBMITTALS

A. Submit under provisions of Section 013300.

B. The submittal material shall include copies of descriptive data for all products and materials including but not limited to the following:
   1. Descriptive Data:
      a. Catalog cuts and data sheets.
      b. An itemized list showing the items to be isolated and/or seismically restrained, product type or model number to be used and loading and deflection data.
      c. Seismic restraint calculations.
      d. Structural or civil engineer's State of Connecticut professional engineer's seal verifying design and calculations for seismic restraining system used.
   2. Shop Drawings:
      a. Drawings showing equipment base construction for each machine, including dimensions, structural member sizes, and support point locations.
      b. Drawings showing methods of suspension, support guides for conduit, piping and ductwork.
      c. Drawings showing methods for isolation of conduits, pipes and ductwork penetrating walls and floor slabs.
      d. Concrete and steel details for bases including anchor bolt locations.
      e. Number location of seismic restraints and anchors for each piece of equipment.
      f. Specific details of restraints including anchor bolts for mounting and maximum loading at each location, for each piece of equipment and/or pipe and duct locations.

1.6 GENERAL [MANUFACTURER] RESPONSIBILITIES

A. Contractor shall have the following responsibilities:
   1. Determine vibration isolation and seismic restraint sizes and locations per specifications.
   2. Provide and install isolation systems and seismic restraints as scheduled or specified.
   3. Guarantee specified isolation system deflection.
   4. Provide installation instructions, drawings and field supervision to assure proper installation and performance.

5. Substitution of "Internally Isolated" mechanical equipment in lieu of the specified isolation of this section is acceptable.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017700.

B. Record actual locations and installation of vibration isolators and seismic restraints including attachment points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Mason Industries Inc. models listed below.

B. Other approved manufacturers providing equivalent products include:
1. Vibration Mountings & Controls Inc.
2. Amber/Booth Co.

2.2 SEISMIC RESTRAINT TYPES

A. General: Installations shall be designed to safely accept external forces of one-half "G" load in any direction for all rigidly supported equipment without failure and permanent displacement of the equipment. Life safety equipment such as [fire pumps, sprinkler piping and emergency generators] shall be capable of safely accepting external forces up to one "G" load in any direction without permanent displacement of the supported equipment. Seismic restraints shall not short circuit vibration isolation systems or transmit objectionable vibration or noise.

B. Type I (spring mount): Shall comply with general characteristics of spring isolators having a minimum o.d. to o.h. of .8 to 1 and minimum runout of 50% to solid. Shall incorporate snubbing restraint in all directions. Shall be capable of supporting equipment at a fixed elevation during equipment erection. Cast housings shall be ductile iron or aluminum. System to be field bolted or welded to deck with 1 G acceleration capability. Mason Type SSLFH or as approved.

C. Type II (snubber): Each corner of side shall incorporate a seismic restraint having a minimum 5/8" thick resilient pad limit stops working in all directions. Restraints shall be made of plate, structural members, or square metal tubing concentric within a welded assembly incorporated resilient pads. Angle bumpers are not acceptable. System to be field bolted or welded to a deck with 1 G acceleration capability. Mason Type Z-1011 and Z-1225.

D. Type III (cable braces): Metal cable type with approved end fastening devices to equipment and structure. System to be field bolted to deck or overhead structural members using two sided

beam clamps to steel or appropriately designed insert for concrete. All parts of system including cables, clamps, excluding fastenings are to be single vendor furnished to assure seismic compliance. Mason Type SCB.

E. Type IV (neoprene mount): Double deflection neoprene isolator encased in ductile iron or steel casing minimum .30 static deflection. System to be field bolted or welded to deck with 1 G acceleration capacity. Mason Type BR, RBA.

F. Type V: Non-isolated equipment to be field bolted or welded (powder shots not acceptable) to resist seismic forces unless under 100 lb. shear force required.

2.3 VIBRATION ISOLATION - GENERAL

A. Vibration isolation shall control excessive noise and vibration in the buildings due to the operation of machinery or equipment, and/or due to interconnected piping, ductwork, or conduit. [The installation of all vibration isolation units, and associated hangers and bases, shall be under the direct supervision of the vibration isolation manufacturer's representative.]

B. All vibration isolators shall have either known non-deflected heights or calibration markings so that, after adjustment, when carrying their load, the deflection can be verified.

C. All isolators shall operate in the linear portion of their load versus deflection curve. Load versus deflection curves shall be furnished by the manufacturer and must be linear over a deflection range of not less than 50% above the design deflection.

D. The theoretical vertical natural frequency for each support point, based upon load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than +/- 10%.

E. All neoprene mountings shall have a Shore hardness of 30 to 60 +/- 5, after minimum aging of 20 days or corresponding oven aging.

2.4 VIBRATION ISOLATOR TYPES:

A. Type A: Spring isolators:
   1. Minimum diameter of 0.8 of the loaded operating height.
   2. Corrosion resistance where exposed to corrosive environment with:
      a. Springs cadmium plated or electro-galvanized.
      b. Hardware cadmium plated.
      c. All other metal parts hot-dip galvanized.
   3. Reserve deflection (from loaded to solid height) of 50% of rated deflection.
   4. Minimum 1/4" thick neoprene acoustical base pad on underside, unless designated otherwise.

5. Designed and installed so that ends of springs remain parallel and all springs installed with adjustment bolts.
6. Non-resonant with equipment forcing frequencies or support structure natural frequencies.
7. Mason Type SLF.
8. When used in conjunction with seismic bracing, seismic restraint Type II shall be installed.

B. Type B: Spring isolators shall be same as Type A, except:
1. Provide built-in vertical limit stops with minimum 1/4" clearance under normal operation.
2. Tapped holes in top plate for bolting to equipment when subject to wind load.
3. Capable of supporting equipment at a fixed elevation during equipment erection. Installed and operating heights shall be identical.
4. Adjustable and removable spring pack with separate neoprene pad isolation.
5. Capable of accepting 1 G of acceleration.
6. Mason Type SLR.

C. Type C: Spring hanger rod isolators:
1. Spring element seated on a steel washer within a neoprene cup incorporating a rod isolation bushing.
2. Steel retainer box encasing the spring and neoprene cut.
3. When used in conjunction with seismic bracing, seismic restraint Type III shall be installed.
4. Mason Type HS.

D. Type D: Seismic Restraint, Type IV: Double deflection neoprene isolator encased in ductile iron or steel casing minimum .30 static deflection. System to be field bolted or welded to deck with 1 G acceleration capacity. Mason Type BR, RBA.

E. Type E: Elastomer hanger rod isolators:
1. Molded unit type neoprene element with projecting bushing lining rod clearance hole.
2. Neoprene element to be minimum 1-3/4" thick.
3. Steel retainer box encasing neoprene mounting.
4. Clearance between mounting hanger rod and neoprene bushing shall be minimum of 1/8".
5. Minimum static deflection of 0.35".
6. When used in conjunction with seismic bracing, seismic restraint Type III shall be installed.
7. Mason Type HD.

F. Type F: Combination spring/elastomer hanger rod isolators:
1. Spring and neoprene isolator elements in a steel box retainer. Neoprene double deflection type. Single deflection is unacceptable. Spring seated in a neoprene cup with extended rod bushing.

2. Characteristics of spring and neoprene as described in Type A and Type E isolators.
3. When used in conjunction with seismic bracing, seismic restraint Type III shall be installed.
4. Mason Type DNHS.

G. Type G: Pad type elastomer mountings:
1. 0.750" minimum thickness.
2. 50 psi maximum loading.
3. Ribbed or waffled design.
4. .10" deflection per pad thickness.
5. 1/16" galvanized steel plate between multiple layers or pad thickness.
6. Suitable bearing plate to distribute load.
7. Mason Type Super W.

H. Type H: Pad type elastomer mountings:
1. Laminate canvas duck and neoprene.
2. Maximum loading 1,000 psi.
3. Suitable bearing plate to distribute load.
4. Minimum thickness, 1/2".
5. Mason Type HL.

I. Type J: Rail type spring isolators:
1. Steel members of sufficient strength to prevent flexure with equipment operation.
2. Springs shall be the same as Type I with seismic restraint Type II or seismic restraint Type I or IV isolation.
3. Mason Type ICS.

J. Type K: Pipe Anchors:
1. All-directional acoustical pipe anchor consisting of a telescopic arrangement of two sizes of steel tubing separated by a minimum one-half inch thickness of heavy-duty neoprene and duck or neoprene isolation material. Vertical restraints shall be provided by similar material arranged to prevent vertical travel in either direction. Allowable loads on the isolation material travel in either direction. Allowable loads on the isolation material shall not exceed 500 psi and the design shall be balanced for equal resistance in any direction. Isolation to be bolted or welded depending on structure.
2. Mason Type ADA.

2.5 EQUIPMENT BASES

A. Integral Structural Steel Base, Type B-1:
1. Reinforced as required to prevent base flexure at start-up and misalignment of drive and driven units. Centrifugal fan bases complete with motor slide rails. Drills for drive and driven unit mounting template.
2. Must be utilized with seismic restraint Type I, II, or IV.

3. Mason Type M, WF.

B. Concrete Inertia Base, Type B-2:
1. Vibration isolator manufacturer shall furnish rectangular structural concrete forms for floating foundation. Bases for split case pumps shall be large enough to provide support for suction and discharge base ells. The base depth shall be a minimum of 1/10 of the longest span but not less than 6" or greater than 14". Forms shall include minimum concrete reinforcement consisting of 1/2" bars or angles in place in 6" centers running both ways and a layer 1-1/2" above the bottom and a top layer of reinforcing steel as above for all bases exceeding 120" in one direction. Isolators shall be set into pocket housings which are an integral part of the base construction and set at the proper height to maintain a 1" clearance below the base. Bases shall be furnished with templates and anchor bolt sleeves as part of this system.
2. Must be utilized with seismic restraint Type I, II or IV.
3. Mason Type K, BMK, KIPWF.

C. Isolated Curb, Type B-3:
1. Curb mounted rooftop equipment shall be mounted on structural spring isolation curbs that directly sit on roof construction and are flashed and waterproofed into roof's membrane waterproofing system. Manufacturer's curb shall not be used.
2. All spring locations shall have removable waterproof covers to allow for spring adjustment and/or removal.
3. Curbs shall be sound attenuating type which will utilize standard 2" roof insulation for sound attenuation or will require 2" of interior lining.
4. All spring mounts shall be as Isolator Type A.
5. Curbs shall have 3" of static deflection.
6. Curbs shall be rated for 1 G of acceleration and shall be wind restrained for 110 mph wind loads.
7. Curbs shall have NRCA approval.
8. Sound barrier package, SBC-3. Two layers of waterproof sheetrock shall be supplied and installed by Contractor. Elevation kit EK-1 to allow for up to 9" of roof pitch.
9. Curbs to be welded to building steel or bolted to concrete decks to attain acceleration criteria.
10. Mason Type p-6000.

D. Roof Isolation Rail System Type B-4: Rooftop fans, condensing units, exterior ducted air handling units, etc., shall be installed on continuous equipment support piers which shall combine a regular equipment support and an isolation system into one assembly. The system shall be designed with 2" or 3" static deflection steel springs which are both adjustable, removable, and interchangeable after equipment has been installed. The system shall maintain the same operating and installed height both with and without the equipment load and shall be fully restrained during wind load conditions allowing no more than 1/4" motion in any direction. The isolation pier shall be designed to accept the membrane waterproofing. The entire assembly shall be dry galvanized or plastic coated. System design permits minimum 1 G

of acceleration. Curbs to be welded to building steel or bolted to concrete decks to attain acceleration criteria. Mason Industries Model R-7000

E. Isolated Rail Base, Type B-5:
   1. Rails shall be constructed from structural steel angles as required to prevent flexure and misalignment under load.
   2. Each rail shall be the full length of the supported equipment and be welded to a series of vertically restrained spring isolators as Type B described above.
   3. Angles shall have bolt together ties at the ends and center to form one rigid base platform.
   4. System to be bolted or welded to deck.
   5. System shall be designed for minimum 1 G of acceleration.
   6. Mason Type TRSLR.

F. Non-Isolated Curb Type, B-6:
   1. Curb mounted rooftop equipment shall be mounted on structural curbs that meet 1 G acceleration criteria. Curbs shall accept standard 2" roof insulation and be waterproofed in accordance with NRCA standard.
   2. Curbs shall be sound attenuating type which will utilize standard 2" roof insulation for sound attenuation or will require 2" for interior lining.
   3. Curbs to be welded to building steel or bolted to concrete decks to attain acceleration criteria.
   4. Mason Type B-6000.

2.6 FLEXIBLE CONNECTORS

A. Elastomer Type FC-1:
   1. Manufactured of nylon tire cord and EPDM, both molded and cured with hydraulic presses.
   2. Straight connectors to have two spheres reinforced with a molded-in external ductile iron ring between spheres.
   3. Elbow shall be long radius type.
   4. Rated 250 psi at 170 degrees F. Dropping in a straight line to 170 psi at 250 degrees F for sizes 1-1/2" to 12" elbows. Elbows shall be rated no less than 90% of straight connections.
   5. Sizes 10" to 12" to employ control cables with neoprene end fittings isolated from anchor plates by means of 1/2" bridge bearing neoprene bushings.
   6. Minimum safety factor, 4:1 at maximum pressure ratings.
   7. Systems bolted to victaulic type couplings or gate, butterfly, or check valves to have a minimum 5/8" flange spacer installed between conductor and coupling on flange.
   8. Submittals to include test reports.
   9. Mason Type MFTNC Superflex.

B. Flexible Stainless Hose, Type FC-2:

1. Type 321 stainless steel braided flexible metal hose.
2. 2" pipe size and smaller: Threaded carbon steel fittings.
3. 2-1/2" pipe size and larger: Class 150 carbon steel flanges.
4. Suitable for operating pressure with 4:1 minimum safety factor.
5. Mason Type BSS.

C. Unbraided Exhaust Hose, Type FC-3:
1. Low pressure stainless steel annularly corrugated.
2. Fitted with flanged ends.
3. Maximum temperature 1,500 degrees F.
4. Mason Type SDL-RF.

D. Flexible Stainless Hose, Type FC-4:
1. Type 321 stainless steel braided flexible metal hose.
2. End fittings: Type 316 stainless steel, Class 150, raised face weld neck flange.
3. Flexonics Series 400M or approved equal.

PART 3 - PART EXECUTION

3.1 GENERAL SEISMIC RESTRAINT REQUIREMENTS

A. Install seismic restraints in accordance with manufacturers recommendations.

B. Seismic restraining system Type III: Install taut for non-isolated equipment and slack with 1/2" cable deflection for isolated systems.

C. Seismically restrain all piping, conduit and ductwork with Type III or Type V seismic restraint in accordance with guidelines outlined below. Restraints which are to be used in conjunction with vibration isolators shall be Type III.
1. Carbon steel piping shall be braced at maximum 40' intervals and at turns of more than 4'. Lateral bracing at maximum 80' intervals. No-hub piping to be braced at maximum 20' intervals or maximum 40' using 1/2 G acceleration rated couplings.
2. Ductwork to be braced at maximum 30' and at every turn and duct run end. Lateral bracing at maximum 60'.

D. Equipment mounted on housekeeping pads: Pads shall be properly doweled or expansion shielded to deck to meet acceleration criteria.

E. Seismic restraints are not required for the following:
1. Piping in boiler or mechanical rooms or penthouses less than 1-1/4" I.D., except gas piping and fire protection piping.
2. Piping in other areas less than 2-1/2" I.D., except gas piping and fire protection piping
3. Ducts which have a cross sectional area less than 6 square feet.

4. All piping suspended by individual hangers 12" or less in length from the top of the pipe to the bottom of the support for the hanger, except gas piping and fire protection piping.
5. Fire protection feed mains and cross mains suspended by individual hangers 6" or less in length from the top of the pipe to the bottom of the support for the hanger.
6. Fire protection branches less than 2 1/2" I.D.
7. All top supported ducts suspended by hangers 12" or less in length from the top of the duct to the bottom of the support for the hanger.
8. Electrical conduit less than 2-1/2" I.D.

F. For overhead supported equipment, overstress of the building structure must not occur. Bracing can occur from:
   1. Flanges to structural beams.
   2. Upper or lower truss chords in bar joist construction at panel points.
   3. Cast-in-place inserts or drilled and shielded inserts in concrete structures.

3.2 GENERAL VIBRATION ISOLATION REQUIREMENTS

A. Install isolators in accordance with manufacturer's recommendations. Vibration isolators shall not cause any change of position resulting in stresses or misalignment.

B. Mechanical equipment shall be isolated from the building structure by means of noise and vibration isolators.

C. Each fan and motor assembly shall be supported on a single structural steel frame. Flexible duct connections shall be provided at inlet and discharge ducts. Refer to Section 15910.

D. Provide resiliently mounted equipment, piping, and ductwork with seismic snubbers. Each inertia base shall have minimum of four seismic snubbers located close to isolators. Snub equipment designated for post disaster use to 0.05 inch (1.5 mm) maximum clearance. Other snubbers shall have clearance between 0.15 inch (4 mm) and 0.25 inch (7 mm).]

E. Ductwork connected to rotating equipment shall be supported with Type C or Type F isolators for the first three support points.

F. Installation of piping vibration isolators:
   1. All piping, except fire protection standpipe systems, is included under this section.
   2. Vibration isolators shall be installed on all piping outside the shafts as follows:
      a. Piping in boiler or mechanical rooms.
      b. Piping where exposed on roof.
      c. Piping connected to rotating equipment and pressure reducing stations.
   3. Horizontal suspended pipe 2" and smaller and all steam piping shall be suspended by Type E isolator with a minimum 3/8" deflection. Water pipe larger than 2" shall be

supported by Type C or Type F isolator with minimum 1" or same static deflection as isolated equipment to which pipe connects, whichever is greater.

4. Horizontal pipe floor supported at slab shall be supported via Type A with a minimum static deflection of 1" or same deflection as isolated equipment to which pipe connects, whichever is greater.
5. Vertical riser pipe supports under 2" diameter shall utilize Type H.
6. Vertical riser guides, if required, shall avoid direct contact of piping with building.
7. Pipe anchors or guides, where required, shall utilize resilient pipe anchors, Mason Industries Type ADA, or equivalent, to avoid direct contact of piping with building.
8. Isolated piping which requires sway bracing shall utilize two neoprene elements, Type G or H to accommodate tension and compression forces.
9. Pipe extension and alignment connectors: Provide connectors at riser takeoffs, cooling and heating coils, and elsewhere as required, to accommodate thermal expansion and misalignment.

G. Pipe Isolation Schedule

PIPE SIZE - INCH (MM)	ISOLATED DISTANCE FROM EQUIPMENT
1 (25)	120 diameters (3.0 m)
2 (50)	90 diameters (4.5 m)
3 (80)	80 diameters (6.0 m)
4 (100)	75 diameters (7.5 m)
6 (150)	60 diameters (9.0 m)
8 (200)	60 diameters (12.0 m)
10 (250)	54 diameters (13.5 m)
12 (300)	50 diameters (15.0 m)
16 (400)	45 diameters (18.0 m)
24 (600)	38 diameters (23.0 m)

3.3 EQUIPMENT INSTALLATION

A. Requirements for installation on concrete inertia bases shall be as follows:
1. Minimum operating clearance between concrete inertia and base and housekeeping pad or floor shall be 2".
2. The equipment structural steel or concrete inertia base shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the machine or isolators.
3. The isolators shall be installed without raising the machine and frame assembly.
4. After the entire installation is complete and under full operational load, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators. When all isolators are properly adjusted, the blocks or shims shall be barely free and shall be removed.
5. Install equipment with flexibility in wiring connection.

6. Verify that all installed isolator and mounting systems permit equipment motion in all directions. Adjust or provide additional resilient restraints to flexibly limit start-up equipment lateral motion to 1/4".
7. Prior to start-up, clean out all foreign matter between bases and equipment. Verify that there are no isolation short circuits in the base, isolators, or seismic restraints.

3.4 INSPECTION

A. Examine systems under provisions of Section 014000.

B. On completion of installation of all vibration isolation devices herein specified, the local representative shall inspect the completed system and report in writing any installation error, improperly elected isolation devices, or other faults in the system that could affect the performance of the system. Contractor shall submit a report to the Owner, including the manufacturers representatives' final report, indicating all isolation reported as properly installed or requiring correction, and include a report by the Contractor on steps taken to properly complete the isolation work.

3.5 SCHEDULES

A. Schedule of Equipment Above Grade

TYPE OF EQUIPMENT	TYPE	DEFLECTION
Air conditioning units	Isolation Type B or S.R. Type I	1.0"
Factory assembled AHU, floor S.R. Type I	Isolation Type B or above 600rpm	2.0"
	Base Type B-2	2.5" below 600rpm
Factory assembled AHU, suspended	F	2.0" above 600rpm
Class I fans Arr. 1 and 3, indoor	Isolation Type B or S.R. Type I	2.0" above 600rpm
	Base Type B-1	3.0" above 600rpm 4.0" below 400rpm
Class II and III fans	Isolation Type B or S.R. Type I	2.0" above 600rpm

	Base Type B-2 (all)	3.0" below 600rpm 4.0" below 600rpm
Class I Arr. 9 fans	Isolation Type B or S.R. Type I	2.0"
Exhaust fan EF-1	S.R. Type III	
Makeup air unit	S.R. Type III	
Hot water tank	S.R. Types III and V	
Flexible connections at connection to pumps	Type FC-1	
Transformers	S.R. Type V	
Electrical panels	S.R. Type V	
Ductwork at the discharge of exhaust fans	Type F and S.R. Type III	

Note: S.R. = Seismic Restraint

END OF SECTION

SECTION 220700 - PIPING INSULATION

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

C. Electric heat tracing.

1.2 RELATED SECTIONS

A. Section 099120 - Painting.

B. Section 220000 – Basic Mechanical Requirements.

C. Section 220501 - Supports and Anchors.

D. Section 220503 - Mechanical Identification.

E. Section 221000 - Plumbing Piping.

F. Section 232300 - Refrigerant Piping and Specialties.

G. Division 160000 - Electrical.

1.3 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

C. ASTM C195 - Mineral Fiber Thermal Insulation Cement.

D. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

E. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

F. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

G. ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.

H. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

I. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

J. ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.

K. ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

L. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.

M. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

N. ASTM D1667 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed Cell Foam).

O. ASTM D1784 - Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

P. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

Q. ASTM E84 - Surface Burning Characteristics of Building Materials.

R. ASTM E96 - Water Vapor Transmission of Materials.

S. NFPA 255 - Surface Burning Characteristics of Building Materials.

T. UL 723 - Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide product description, list of materials and thickness for each service, and locations. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.

C. Samples: Submit two samples of any representative size illustrating each insulation type.

D. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Materials: Flame spread/smoke developed rating of 25/50 or less in accordance with ASTM E84, NFPA 255, and UL 723.

1.6 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 016000.

B. Deliver materials to site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastic, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.1 GLASS FIBER

A. Manufacturers:
   1. Schuller/Manville Micro-Lok.
   2. Other acceptable manufacturers offering equivalent products:
      a. Owens Corning.
      b. Certainteed Manson.
      c. Knauf.

B. Insulation: ASTM C547; rigid molded, noncombustible.
   1. 'K' value (SI 'k' value): ASTM C335, 0.25 at 75 degrees F (0.036 at 24 degrees C).
   2. Minimum Service Temperature: -20 degrees F (-28.9 degrees C).
   3. Maximum Service Temperature: 850 degrees F (454 degrees C).
   4. Maximum Moisture Adsorption: 0.2 percent by volume.

C. Vapor Barrier Jacket:
   1. White kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: ASTM E96; 0.02 perm inch.

D. Installation and Jacketing:
   1. Secure seams with pressure sensitive tape closure and butt joints with minimum 3 inch (76 mm) wide tape of same material as vapor barrier jacket.
   2. PVC jacket shall be installed on following:
      a. Insulated piping located within mechanical rooms that is installed less than 10 feet (3 m) above finished floor.
      b. All insulated fittings and valves.
   3. For finish see Section 09900.

2.2 CELLULAR GLASS

A. Manufacturers: Pittsburgh Corning FOAMGLAS or approved equal.

B. Insulation: ASTM C552.
   1. 'K' value (SI 'k' value): 0.33 at 75 degrees F (0.048 at 24 degrees C).
   2. Maximum Water Vapor Permeability: 0.00 perm inch.
   3. Minimum Service Temperature: 65 degrees F (18.3 degrees C).
   4. Maximum Service Temperature: 400 degrees F (200 degrees C).

C. Installation and Jacketing:

1. Secure insulation with fiber reinforced tape at all seams and joints.
2. Apply heat sealable FOAMGLAS Pittwrap jacketing consisting of 125 mils thick bituminous resin reinforced with woven glass fabric, integral aluminum foil and plastic film coating.
3. Fittings and valves: FOAMGLAS prefabricated and field fabricated products.

2.3 HYDROUS CALCIUM SILICATE

A. Manufacturers:
   1. Schuller/Manville Thermo-12.
   2. Other acceptable manufacturers offering equivalent products:
      a. Owens Corning.
      b. Calsilite.

B. Insulation: ASTM C533; rigid; asbestos free.
   1. 'K' value (SI 'k' value): ASTM C177 and C518; 0.40 at 300 degrees F (0.055 at 147 degrees C).
   2. Maximum Service Temperature: 1200 degrees F (650 degrees C).
   3. Density: 14 lb/cu ft (224 kg/cu m).

C. Installation and Jacketing:
   1. General: Install with tie wire and canvas jacket.
   2. Fittings: Mitered segments with insulating cement.
   3. Flanges and valves: Oversized pipe insulation.
   4. Tie Wire: 16 gage (1.5 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
   5. For finish see Section 09900.

2.4 FLEXIBLE ELASTOMERIC CELLULAR

A. Manufacturers: Armstrong Armaflex AP or approved equal.

B. Insulation: ASTM C534; flexible, cellular elastomeric, tubular.
   1. 'K' value (SI 'k' value): ASTM C177 or C518; 0.27 at 75 degrees F (0.04 at 24 degrees C).
   2. Minimum Service Temperature: -40 degrees F (-40 degrees C).
   3. Maximum Service Temperature: 220 degrees F (104 degrees C).
   4. Maximum Moisture Absorption: ASTM D1056; 5 percent by volume.
   5. Moisture Vapor Permeability: ASTM E96; 0.20 perm inches.

C. Installation
   1. Slip insulation over piping or slit and snap over piping.
   2. Apply Armstrong 520 adhesive to all seams and butt joints.
   3. Fittings and Valves: Field fabricate per manufacturer's instructions.
   4. Finish with WB Armaflex finish.

2.5 JACKETS

A. Polyvinyl Chloride (PVC) Plastic
   1. Manufacturer: Schuller/Manville Zeston 2000 or approved equal.
   2. Jacket: ASTM D1784, one piece molded type fitting covers and sheet material, off white color.
      a. Minimum Service Temperature: 0 degrees F (-18 degrees C).
      b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      c. Thickness: 10 mil (.26 mm).
   3. Installation:
      a. Fittings and Valves: Factory precut inserts.
      b. Apply vapor retardant mastic to all seams and joints.
      c. Secure all seams and joints with Zeston PVC Z-Tape.

B. Canvas Jacket: UL listed
   1. Fabric: ASTM C921, 6 oz/sq yd (220 g/sq m), plain weave cotton treated with dilute fire retardant lagging adhesive compatible with insulation.

C. Aluminum Jacket: ASTM B209.
   1. Thickness: 0.020 inch (0.50 mm) sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps with cut edge of slip lap turned under 1 inch (25.4 mm) to provide smooth edge.
   4. Fittings: 0.02 inch (0.5 mm) thick with protective liner.
   5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.02 inch (0.5 mm) thick aluminum installed at 9 inches (230 mm) on center.

D. Stainless Steel Jacket: Type 316 stainless steel.
   1. Thickness: 0.016 inch
   2. Finish: Corrugated.
   3. Metal Jacket Bands: 3/8 inch (10 mm) wide; thick stainless steel.

E. Insulating Cement
   1. Manufacturer: Rock Wool "One Shot" or approved equal.
   2. Jacket: ASTM C449, mineral wool/inorganic dry mix, non-combustible.
      a. Maximum Service Temperature: 1200 degrees F (649 degrees C).
      b. 'K' value (SI 'k' value): 1.12 at 400 degrees F.
      c. Thickness: Same as adjoining piping.
   3. Installation:
      a. One monolithic layer directly applied.
      b. Exterior finish shall be troweled for smooth paintable surface.

2.6 ELECTRIC HEAT TRACING {constant wattage}

A. Manufacturers:
   1. BriskHeat Type KM-CAB.
   2. Other acceptable manufacturers offering equivalent products include:
      a. Raychem.
      b. Heat-Trace.

B. Characteristics:
   1. Parallel resistance, constant wattage type. Product shall be Factory Mutual approved or UL listed.
   2. Construction shall consist of nickel plated copper conductor, Teflon insulation, moisture/dielectric barrier, braided fiberglass insulation, moisture/abrasion barrier and braided grounding sheath of tinned copper and stainless steel.
   3. Capacity: 5 watts per foot with 120 volt electrical power.

C. Temperature Controller: BriskHeat Model TB250N controller with bulb type sensor and 10'0" long capillary, NEMA 3R enclosure, 22 amp SPDT switch and adjustable range of 0 to 150 degrees F.

2.7 ELECTRIC HEAT TRACING {self limiting}

A. Manufacturers:
   1. BriskHeat Type SL-CAB.
   2. Other acceptable manufacturers offering equivalent products include:
      a. Raychem.
      b. Heat-Trace.

B. Characteristics:
   1. Self limiting, parallel circuit type which automatically self regulates heat output. Product shall be Factory Mutual approved or UL listed.
   2. Construction: 16 gauge nickel plated copper conductor, self regulating conductive core, thermoplastic elastomer inner jacket, metallic over-braid and thermoplastic outer jacket.
   3. Capacity: 5 watts per foot with 120 volt electrical power.

C. Temperature Controller: BriskHeat Model TB250N controller with bulb type sensor and 10'0" long capillary, NEMA 3R enclosure, 22 amp SPDT switch and adjustable range of 0 to 150 degrees F.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. On exposed piping, locate insulation and cover seams in least visible locations.

C. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations, unless required otherwise to maintain fire ratings.

D. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, expansion joints, tanks, equipment and all other devices.

E. Inserts and Shields:
   1. Application: Piping 2 inches (50 mm) diameter or larger.
   2. Shields: Refer to Section 15140.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: ASTM C640 cork, hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

F. Finish insulation at supports, protrusions, and interruptions.

G. All Insulated Piping at Exterior of Building: Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

H. For heat traced piping, insulate fittings, joints, and valves with insulation of like material and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.3 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.4 GLASS FIBER INSULATION SCHEDULE

1. PIPING SYSTEMS	PIPE SIZE Inch	PIPE SIZE Inch	THICKNESS

Domestic Cold Water	Up to 1"	1/2"
Domestic Cold Water	1 1/4" and over	1"
Domestic Hot Water	Up to 1.5"	1.5"
Domestic Hot Water	2 and larger	2"
Cold Water at Exterior of Building	All	1 1/2"
Domestic Hot Water Recirculating	All	1.5"
Horizontal Storm Piping Above Grade	Up to 6"	1"
Horizontal Storm Piping Above Grade	8" and over	1 1/2"
Hot Water Supply and Return	All	1 1/2"
Condensate Drain (copper pipe only)	All	3/4"
Chilled Water (40 F to 55 F)	All	1”

3.5 CELLULAR GLASS INSULATION SCHEDULE

PIPING SYSTEMS	PIPE SIZE Inch (mm)	THICKNESS Inch (mm)

3.6 HYDROUS CALCIUM SILICATE INSULATION SCHEDULE

PIPING SYSTEMS	PIPE SIZE Inch (mm)	THICKNESS Inch (mm)

3.7 FLEXIBLE ELASTOMERIC CELLULAR INSULATION SCHEDULE

PIPING SYSTEMS	PIPE SIZE Inch (mm)	THICKNESS Inch (mm)
Refrigerant Piping	All	3/4"

END OF SECTION

SECTION 22 0800 - PLUMBING SYSTEM COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for commissioning the building plumbing systems, assemblies and equipment.

B. General Commissioning Requirements are described in Section 01 9110 (General Commissioning Requirements), and are not repeated in this Section.

C. Related Sections:

1. In addition to the drawings and general provisions of the contract, commissioning requirements are defined in the following sections:

   a. Section 01 9110 – General Commissioning Requirements
   b. Section 01 9115 – Facility Exterior Envelope Commissioning Requirements
   c. Section 22 0800 – Plumbing System Commissioning Requirements
   d. Section 23 0800 – HVAC System Commissioning Requirements
   e. Section 23 0910 – Building Control System Commissioning Requirements
   f. Section 26 0800 – Electrical System Commissioning Requirements

1.2 DEFINITIONS

A. Definitions are listed in Section 01 9110 – General Commissioning Requirements

1.3 SUBMITTALS

A. Refer to Section 01 9010 for submittal requirements.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the contractor for the equipment being tested. For example, the plumbing contractor of Division 22 shall ultimately be responsible for all standard testing equipment for the plumbing system in Division 22, except for equipment specific to and used by TAB in their commissioning responsibilities. A sufficient quantity of two-way radios shall be provided by each subcontractor.

B. Refer to Section 01 9110 "General Commissioning Requirements" for a detailed description of test equipment requirements.

PART 3 - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

A. With assistance from the installing contractors, the CxA will prepare Construction Checklists for all commissioned components, equipment, and systems

1. Checklists will be developed by the CxA and provided to the contractors.
2. Contractors will complete the construction checklists and provide completed copies to the CxA prior to beginning system functional testing
3. To avoid duplication of effort, contractors may document testing and start-up activities using their own checklists, and provide them as attachments to the checklists issued by the CxA.

B. Red-lined Drawings:

1. The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
4. The contracted party, as defined in the Contract Documents will create the as-built CAD drawings.
5. All red-lined drawings are to be available on-site for review by the Owner and the CxA.

C. Operation and Maintenance Data:

1. The contractor will provide a copy of O&M literature for use during the commissioning process for all commissioned equipment and systems.
2. The CxA will review the O&M literature for conformance to project requirements.
3. The CxA shall have access to a copy of the final approved O&M literature once corrections have been made by the Contractor.

3.2 COMMISSIONING TEAM RESPONSIBILITIES

A. Refer to Section 01 9110 "General Commissioning Requirements" for commissioning team member roles and responsibilities.

3.3 TESTING PREPARATION

A. Certify in writing to the CxA that plumbing systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Inspect and verify the position of each device and interlock identified on the construction documents and equipment vendor's submittals.

C. Certify in writing that balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. If the failure rate of a similar family of equipment or devices is greater than 10%, then the Owner shall be notified. The matter shall be addressed by the Owner, CM, CxA, and other applicable parties. The failure issue shall be resolved to the Owner's satisfaction.

3.4 TESTING, ADJUSTING AND BALANCING VERIFICATION

A. Prior to performance of Domestic Water Balancing work, provide copies of reports, sample forms, checklists, and certificates as part of the TAB submittal.

B. Notify the CxA at least ten (10) days in advance of testing and balancing work, and provide access for the CxA to witness balancing activities.

3.5 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to support the CxA in performing systems functional testing.

B. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

C. The CxA along with the plumbing contractor, balancing subcontractor shall prepare detailed testing plans, procedures, and checklists for plumbing systems, subsystems, and equipment.

D. Tests will be performed using design conditions whenever possible.

E. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

F. The CxA may direct that set points be altered when simulating conditions is not practical.

G. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

H. If tests cannot be completed because of a deficiency outside the scope of the plumbing system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

I. If the testing plan indicates specific post-occupancy, or seasonal testing, provide technicians to support the CxA in performing the defined performance tests.

3.6 PLUMBING SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 22 sections. Submittals, test data, inspector record, and certifications will be reviewed by the CxA.

B. Pipe system cleaning, flushing, hydrostatic tests and chemical treatment: Test requirements are specified in Division 22 piping Sections. Plumbing Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
2. Description of equipment for flushing operations.
3. Minimum flushing water velocity.
4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

C. Plumbing Distribution System Testing:

1. Provide technicians, instrumentation, tools, and equipment to test performance of air, fuel gas, and sanitary waste and vent piping, storm drainage piping, sprinkler and domestic water distribution systems.

D. Vibration and Sound Tests:

1. Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.

3.7 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.8 APPROVAL

A. Refer to Division 01 Section "General Commissioning Requirements" for approval procedures.

3.9 DEFERRED TESTING

A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deferred testing.

3.10 OPERATION AND MAINTENANCE MANUALS

A. Refer to Division 01 Section 01 9110 "General Commissioning Requirements" for requirements pertaining to operation and maintenance manuals.

3.11 TRAINING OF OWNER PERSONNEL

A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to training.

END OF SECTION 220800

SECTION 221000 - PLUMBING PIPING

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Pipe and pipe fittings.

B. Valves.

C. Sanitary sewer piping system.

D. Domestic water piping system.

E. Storm water piping system.

F. Natural gas piping system.

1.2 RELATED SECTIONS

A. Section 310000 - Earthwork.

B. Section 099000 - Painting.

C. Section 015013 Integrated Pest Management

D. Section 220000 – Basic Mechanical Requirements.

E. Section 220501 - Supports and Anchors.

F. Section 220503 - Mechanical Identification.

G. Section 220504 - Vibration Isolation.

H. Section 220700 - Piping Insulation.

I. Section 222000 - Plumbing Specialties.

J. Section 224000 - Plumbing Fixtures.

K. Section 225000 - Plumbing Equipment.

1.3 REFERENCES

A. ANSI B31.1 - Power Piping.

B. ANSI B31.2 - Fuel Gas Piping.

C. ANSI B31.9 - Building Service Piping.

D. ASME Sec. 9 - Welding and Brazing Qualifications.

E. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.

F. ASME B16.3 - Malleable Iron Threaded Fittings.

G. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250.

H. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.

I. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings

J. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

K. ASTM A74 - Cast Iron Soil Pipe and Fittings.

L. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.

M. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

N. ASTM B32 - Solder Metal.

O. ASTM B88 - Seamless Copper Water Tube.

P. ASTM B251 - Wrought Seamless Copper and Copper-Alloy Tube.

Q. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

R. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

S. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

T. ASTM D2665 - Specifications for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe Fittings.

U. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

V. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.

W. AWWA C111- Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.

X. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

Y. AWWA C651 - Disinfecting Water Mains.

Z. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

AA. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.

BB. NCPWB - Procedure Specifications for Pipe Welding.

CC. NFPA 54 - National Fuel Gas Code.

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017700.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017700.

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.7 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

C. Welders Certification: In accordance with ASME Sec 9.

D. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

B. Installer: Company specializing in performing the work of this section with minimum five years documented experience.

1.9 REGULATORY REQUIREMENTS

A. Perform Work in accordance with[State of Connecticut Building Code.

B. Conform to[applicable codes for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016000.

B. Accept valves on site in shipping containers with labelling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding are wet or frozen.

1.12 EXTRA MATERIALS

A. Furnish under provisions of Section 017000.

B. Provide one repacking kit for each size valve.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED

A. Cast Iron Pipe: ASTM A74 [service weight. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, compression type with ASTM C564 neoprene gaskets.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: 3" size and over, CISPI 301, hubless, service weight. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.3 WATER PIPING, BURIED

A. Copper Tubing: ASTM B88, Type K,[annealed.
   1. Fittings: ASME B16.18, cast bronze or ASTM B16.22 wrought copper and bronze.
   2. Joints: ASTM B32, solder, Grade 95TA.

B. Cast Iron (Ductile Iron) Cement Lined Pipe: AWWA C151.
   1. Fittings: [Ductile iron, standard thickness.
   2. Joints: AWWA C111, rubber basket with 3/4 inch (19 mm) diameter rods.

2.4 WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type [K, hard drawn.
   1. Fittings: ASME B16.18, cast bronze, or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, solder, Grade 95TA.

2.5 STORM WATER PIPING, BURIED

A. Cast Iron Pipe: ASTM A74 [extra heavy] [service] weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, compression type ASTM C564, neoprene gasket system.

2.6 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.7 NATURAL GAS PIPING, BURIED

A. Steel Pipe: ASTM A53 or A120, Schedule 40 black.
   1. Fittings: ASTM A234, forged steel welding type, with AWWA C105 polyethylene jacket or double layer, half- lapped 10 mil (0.25 mm) polyethylene tape.
   2. Joints: ANSI B31.9, welded.

2.8 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53 or A120, Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron screwed up to 3" size and ASTM A234, forged steel welding type for sizes over 3".
   2. Joints: NFPA 54, threaded or welded to ANSI B31.9.

2.9 UNIONS AND DIELECTRIC CONNECTIONS

A. Unions for Pipe 2 Inches (50 mm) and Under:
   1. Ferrous Piping: 150 psig (1034 kPa) malleable iron, threaded.
   2. Copper Pipe: Bronze, soldered joints.

B. Dielectric Connections: Union or flange with water impervious isolation barrier; Watts 3000 Series or approved equal.

2.10 GATE VALVES

A. Up To and Including 2 Inches (50 mm):
   1. Manufacturers:
      a. NIBCO Figure T-113 or S-113.
      b. Other acceptable manufacturers offering equivalent products include:
         1) Watts.
         2) Stockham.

2. Bronze body, bronze trim, screwed bonnet, non-rising stem, non-asbestos packing, handwheel, inside screw, solid wedge disc, Class 125, threaded or solder ends.

B. Over 2 Inches (50 mm):
1. Manufacturers:
a. NIBCO Figure F-619.
b. Other acceptable manufacturers offering equivalent products include:
1) Watts.
2) Stockham.
2. Iron body, bronze trim, bolted bonnet, non-asbestos packing, non-rising stem, handwheel, solid wedge disc with bronze seat rings, Class 125, flanged ends.

2.11 GLOBE VALVES

A. Up To and Including 2 Inches (50 mm):
1. Manufacturers:
a. NIBCO Figure T-211 or S-211.
b. Other acceptable manufacturers offering equivalent products include:
1) Watts.
2) Stockham.
2. Bronze body, bronze trim, screwed bonnet, non-asbestos packing, rising stem, handwheel, inside screw, renewable composition disc and bronze seat, Class 125, threaded or solder ends.

B. Over 2 Inches (50 mm):
1. Manufacturers:
a. NIBCO Figure F-718-B.
b. Other acceptable manufacturers offering equivalent products include:
1) Watts.
2) Stockham.
2. Iron body, bronze trim, bolted bonnet, rising stem, non-asbestos packing, handwheel, outside screw and yoke, rotating plug-type disc with renewable seat ring and disc, Class 125, flanged ends.

2.12 BALL VALVES

A. Up To and Including 2 Inches (50 mm):
1. Manufacturers:
a. NIBCO Model 585-70-66.
b. Other acceptable manufacturers offering equivalent products include:
1) Watts.
2) Jamesbury.
2. Bronze two piece body, blowout-proof stem, stainless steel ball, teflon seats and packing, lever handle, solder or threaded ends. Provide with full port thru 1" and conventual port in sizes over 1".

2.13 PLUG VALVES

A. Up To and Including 2 Inches (50 mm):
1. Manufacturers:
a. DeZurik Series 100
b. Other acceptable manufacturers offering equivalent products include:
1) Tufline
2) Nibco
2. Bronze body, neoprene plug, non-lubricated, buna packing, threaded ends.
3. Operator: One plug valve wrench for every ten plug valves minimum of one.

B. Over 2 Inches (50 mm):
1. Manufacturers:
a. Tufline Series 067
b. Other acceptable manufacturers offering equivalent products include:
1) Tufline
2) Stockham
3) Powell
2. Carbon Steel body and plug, 2-way valve, PTFE sleeve, Class 150,flanged ends.
3. Operator: Each plug valve with a wrench with set screw.

2.14 SWING CHECK VALVES

A. Up To and Including 2 Inches (50 mm):
1. Manufacturers:
a. NIBCO Figure T-413 or S-413.
b. Other acceptable manufacturers offering equivalent products include:
1) Watts.
2) Stockham.
2. Bronze body, bronze trim, bronze rotating swing disc, Buna-N seat disc, Class 125, threaded or solder ends.

B. Over 2 Inches (50 mm):
1. Manufacturers:
a. NIBCO Figure F-918.
b. Other acceptable manufacturers offering equivalent products include:
1) Watts.
2) Stockham.
2. Iron body, bronze trim, cast bronze rotating swing disc, bolted bonnet, non-asbestos gaskets, renewable disc and seat, Class 125, flanged ends.

2.15 WATER PRESSURE REDUCING VALVES

A. Manufacturers:

1. Watts Model 223.
2. Other acceptable manufacturers offering equivalent products.
   a. Cla-Val
   b. Amtrol
   c. Zurn

B. Up to 2 Inches (50 mm): Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, [threaded] ends, with strainer.

C. Over 2 Inches (50 mm): Cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged, with strainer.

2.16 TEMPERATURE AND PRESSURE RELIEF VALVES

A. Manufacturers:
   1. Watts Model 40, 140, N240, 340
   2. Other acceptable manufacturers offering equivalent products.
      a. ITT
      b. T&S Brass
      c. Zurn

B. Bronze body, teflon seat, steel stem and springs,automatic, direct pressure actuated, capacities ASME certified and labelled.

2.17 STRAINERS

A. Manufacturers:
   1. Keckley Model 777, and 77.
   2. Other acceptable manufacturers offering equivalent products.
      a. Watts
      b. Armstrong
      c. FEBCO

B. Size 2 inch (50 mm) and Under: Screwed brass or iron body for 175 psig (1200 kPa) working pressure, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.

C. Size 2-1/2 inch (65 mm) to 4 inch (100 mm): Flanged cast iron body, Class 125, 200 psig (1370 kPa) working pressure, Y pattern with 3/64 inch (1.2 mm) stainless steel perforated screen.

D. Size 5 inch (125 mm) and Larger: Flanged cast iron body, Class 125, 200 psig (1370 kPa) working pressure, basket pattern with 1/8 inch (3.2 mm) stainless steel perforated screen.

PART 3 - EXECUTION

3.1EXAMINATION

A. Verify excavations under provisions of Section 310000.

B. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Use fittings for all changes in direction and branch connections.

C. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted unless expressly indicated.

D. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

E. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls with sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inches shall be galvanized steel pipe; pipe sleeves 6 inches and larger shall be galvanized steel sheet metal.

F. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity.

G. Install piping with 1/32 inch per foot (1/4 percent) downward slope towards drain point.

H. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

I. Route piping in orderly manner and maintain gradient.

J. Install piping to conserve building space and not interfere with use of space.

K. Group piping whenever practical at common elevations.

L. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

M. Provide clearance for installation of insulation and access to valves and fittings.

N. Provide access where valves and fittings are not exposed.

O. Establish elevations of buried piping outside the building to ensure not less than three ft of cover for drainage and four ft for domestic water.

P. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

Q. Provide support for utility meters in accordance with requirements of utility companies.

R. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Section 099120.

S. Excavate in accordance with Section 310000 for work of this Section.

T. Backfill in accordance with Section 310000 for work of this Section.

U. Install bell and spigot pipe with bell end upstream.

V. Install valves with stems upright or horizontal, not inverted.

W. Provide one plug valve wrench for every ten plug valves sized 2 inches ([150] mm) and smaller, minimum of one. Provide each plug valve sized 2-1/2 inches ([60] mm) and larger with a wrench with set screw.

X. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

3.4 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

D. Install gate ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install globe ball or butterfly valves for throttling, bypass, or manual flow control services.

F. Provide spring loaded check valves on discharge of water pumps.

G. Provide plug valves in Natural gas systems for shut-off service.

H. Provide flow controls in water recirculating systems where indicated.

3.5 ERECTION TOLERANCES

A. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

B. Slope water piping and arrange to drain at low points.

3.6 CLEANING AND FLUSHING

A. Upon completion of all work, all piping systems except gas piping shall be flushed with water/liquid alkaline solution with emulsifying agents and detergents, to remove dirt, grease, grit, chips and foreign matter.

B. Solutions for flushing shall be used in sufficient quantity to produce a velocity of at least 2.5 feet per second. Flushing shall continue until discharge solution shows no discoloration or evidence of foreign materials.

C. During flushing operation, all valves shall be operated several times, bypasses opened, pumps operated and equipment flushed.

D. Upon completion of flushing operations, all strainers, filters and blowdowns shall be removed and cleaned of accumulated waste.

3.7 TESTING

A. All new piping systems installed and parts of existing piping systems which have been altered, extended or repaired under this contract shall be tested as prescribed hereinafter.

B. All new, altered, extended or replaced piping systems shall be left uncovered and unconcealed until tested and approved. Where such work has been covered or concealed before tested and approved, it shall be exposed for testing.

C. Contractor shall be responsible for furnishing all plugs, piping, valves, hoses, pumps and equipment necessary for required tests and for proper disposal of the water upon completion of the tests. All systems shall be thoroughly cleaned before testing.

D. The drainage and vent systems shall be tested in accordance with International Plumbing Code. Rough piping shall be tested by water or air and proved water-tight. Either of the following methods shall be used.
   1. Water test: Subject to not less than 10 foot head of water. Keep water in system for a minimum of 15 minutes before inspection starts. The system shall than be tight at all points.

2. Air test: Subject to not less than gauge pressure of 5 pounds per square inch. The air pressure shall be held without introduction of additional air for a minimum period of 15 minutes.

E. +Finished plumbing: After the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proved gas and water tight by one of the following methods.
   1. The final test for gas and water-tightness of the completed drainage and vent system shall be made by a smoke test. Pressure equivalent to a 1 inch water column shall be built and maintained for the period of the inspection.
   2. Introduce air into the system equal to the pressure of a 1 inch water column by the use of a manometer or "U" tube inserted into a trap of a water closet. Pressure shall remain constant for the period of inspection without the introduction of additional air.

F. Building sewer shall be tested in accordance with the Internatioanl Plumbing Code. The system shall be filled with water to a head of not less than 10 feet. The water level at the top of the test head of water shall not drop for at least 15 minutes.

G. Water piping shall be tested in accordance with the International Plumbing Code. The system shall be proved tight under a water pressure of 150 PSIG. The system shall be filled with water through a low connection point, care being taken to completely vent air so that no air pockets remain. The pressure shall be applied gradually and than held for a minimum of two hours. Care shall be taken to insure that at no point a dangerous overpressure is experienced. The hydrostatic test shall be considered satisfactory if no visible leakage, cracks or other signs of distress are discovered. Pressure drop other than that due to temperature change or similar reasons shall not be allowed. The water used for the test shall be obtained from a potable source of supply.

H. Gas piping shall be tested in accordance with NFPA 54. Test pressure shall be not less than 1 1/2 times the proposed maximum working pressure, but not less than 3 PSIG. Test duration shall be not less than one-half hour for each 500 cubic feet of pipe volume. The piping shall withstand the test pressure without showing any evidence of leakage or other defects. Test medium shall be air, nitrogen, or carbon dioxide. Oxygen shall never be used. Fuel gas may be used in systems operating at pressures of 1/2 pound per square inch or less.

I. At completion of tests Contractor shall submit a typewritten log of test data for Owner's permanent file including:
   1. Data of test.
   2. Section tested-attach sketch.
   3. Equipment used.
   4. Personnel involved.
   5. Owner or Owner's witness in attendance.
   6. Results.

3.8 After repair any failed test shall be repeated until all requirements of this Section are met.

3.9 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.10 SERVICE CONNECTIONS

A. Provide new sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with water meter with by-pass valves.
   1. Provide sleeve in wall for service main and support at wall. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to wall.

C. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 14 inch wg .

D. Refer to section 015013 Integrated Pest management for all wall penetrations.

END OF SECTION

SECTION 221313 – EXTERIOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all sections within DIVISION 01- GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

2. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Pipe and fittings.
2. Nonpressure and pressure couplings.
3. Expansion joints.
4. Cleanouts.
5. Encasement for piping.
6. Manholes.
7. Water and Gas Service

1.2 ACTION SUBMITTALS

A. Product Data: For expansion joints.

B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Inspect materials delivered to site for damage; store with minimum of handling. Store rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings and structures free of dirt and debris. Handle pipe, fittings and structures in a manner to ensure safe delivery to the installation location in sound undamaged condition. Carry; do not drag materials to the installation location.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. PVC Type PSM Sewer Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

B. Water Service:

1. Provide materials in accordance with Rules and Regulations, Connecticut Water Company, July 14, 2010.

C. Gas Service:

1. Provided by Connecticut Natural Gas Corporation.

2.2 CLEANOUTS

A. Cast-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.

1. Top-Loading Classification(s): Heavy Duty.
2. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

2.3 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: as indicated; 12-inch minimum thickness for floor slab and 12-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: as indicated; 8-inch minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals.
10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 36-inch ID by 4-inch riser, with 4-inch minimum-width flange and 42-inch diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.4 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

   a. Invert Slope: 1 percent through manhole.

2. Benches: Concrete, sloped to drain into channel.

   a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.

2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earthwork".

3.2 SANITARY PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's and utility companies written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install sanitary manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of **1** percent unless otherwise indicated.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
3. Install piping with 36-inch minimum cover unless otherwise indicated.
4. Install PVC Type PSM sewer piping according to ASTM D 2321 and ASTM F 1668.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 WATER SERVICE INSTALLATION

A. Install water service in accordance with Rules and Regulations, Connecticut Water Company, July 14, 2010.

3.4 GAS SERVICE INSTALLATION

A. Provide excavation and backfill for the gas service in accordance Connecticut Natural Gas Corporation Rules and Regulations, February 1, 2014.

3.5 SANITARY PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:
   1. Join PVC Type PSM sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
   2. Join dissimilar pipe materials with nonpressure-type, rigid couplings.

3.6 SANITARY MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Form continuous concrete channels and benches between inlets and outlet.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 1 inch above finished surface elsewhere unless otherwise indicated.

E. Install manhole-cover inserts in frame and immediately below cover.

3.7 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.8 SANITARY CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.9 SANITARY CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Section 221316 "Sanitary Waste and Vent Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.10 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.
1. Use detectable warning tape over piping and over edges of underground manholes.

3.11 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.

b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.

5. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
b. Option: Test concrete gravity sewer piping according to ASTM C 924.

6. Manholes: Perform hydraulic test according to ASTM C 969.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.12 CLEANING

A. Clean dirt and superfluous material from interior of manholes and piping.

END OF SECTION 221313

SECTION 222000 - PLUMBING SPECIALTIES

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Roof and floor drains.

B. Cleanouts.

C. Hose bibs.

D. Hydrants.

E. Emergency shower and eyewash.

F. Backflow preventers.

G. Water hammer arrestors.

H. Thermostatic mixing valves.

I. Trap Primers.

J. Leak Detection System

K. Oxygen Deficiency Sensing System

1.2 RELATED SECTIONS

A. Section 22000 – Basic Mechanical Requirements.

B. Section 221000 - Plumbing Piping.

C. Section 224000 - Plumbing Fixtures.

D. Section 225000 - Plumbing Equipment.

1.3 REFERENCES

A. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.

B. ANSI/ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent.

C. ANSI/ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.

D. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.

E. ANSI A112.21.1 - Floor Drains.

F. ANSI A112.21.2 - Roof Drains.

G. ANSI A112.26.1 - Water Hammer Arrestors.

H. ASTM C478 - Precast Reinforced Concrete Manhole Sections.

I. AWWA C506 - Backflow Prevention Devices - Reduced Pressure Principle and Double Check Valve Types.

J. PDI WH-201 Water Hammer Arresters.

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

C. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

D. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017700.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017700.

B. Operation Data: Indicate frequency of treatment required for interceptors.

C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016000.

B. Accept specialties on site in original factory packaging. Inspect for damage.

1.8 EXTRA MATERIALS

A. Furnish under provisions of Section 017700.

PART 2 - PRODUCTS

2.1 ROOF DRAINS

A. Manufacturers:
   1. J R Smith .
   2. Other acceptable manufacturers offering equivalent products.
      a. Zurn
      b. Jonespec
      c. Wade

B. Roof Drains (RD-1): ANSI A112.21.2.
   1. Body: Lacquered cast iron with sump.
   2. Strainer: Removable cast iron dome with vandal proof screws.
   3. Accessories: Flashing clamp with integral gravel stop, with adjustable under deck clamp roof sump receiver [adjustable extension sleeve for roof insulation.
   4. Model: 1010 manufactured by J R Smith .

C. Roof Overflow Drains (OD): Lacquered cast iron body and underdeck clamp and bottom clamp ring; pipe extended to 2 inches ([50] mm) above flood elevation; Model 1070 manufactured by J R Smith. Provide with options as noted in B above.

2.2 FLOOR DRAINS

A. Manufacturers:
   1. J R Smith .
   2. Other acceptable manufacturers offering equivalent products.
      a. Zurn
      b. Jonespec
      c. Wade

B. FD-1: ANSI A112.21.1; [lacquered] cast iron body with drainage flange, weep holes, and round, adjustable nickel-bronze strainer; Model [2005-A] manufactured by [J R Smith].

2.3 CLEANOUTS

A. Manufacturers:
   1. J R Smith .
   2. Other acceptable manufacturers offering equivalent products.
      a. Zurn
      b. Jonespec
      c. Wade

B. Interior Finished Floor Areas (CO-1): [Lacquered] cast iron body with square adjustable scoriated secured nickel bronze top, and vandal proof screws; Model [4040] manufactured by [J R Smith].

C. Interior Finished Wall Areas (CO-2): Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw; Model [4422] manufactured by [J R Smith].

D. Interior Unfinished Accessible Areas (CO-3): Caulked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.4 HYDRANTS

A. Manufacturers:
   1. Woodford .
   2. Other acceptable manufacturers offering equivalent products.
      a. J R Smith
      b. NIBCO
      c. Watts

B. Wall Hydrant: ANSI/ASSE 1019; non-freeze, self-draining type with brass hose thread spout, lockshield and removable key, box and door, and integral vacuum breaker; Model B67 manufactured by Woodford.

C. Roof Hydrant: ANSI/ASSE 1019; 1057, 1052 non-freeze Model SRH-MS 50H manufactured by Woodford. Provide with roof mounting system.

2.5 EMERGENCY SHOWER AND EYE/FACEWASH

A. Manufacturers:
   1. Braley Model S19314.
   2. Other acceptable manufacturers offering equivalent products.
      a. Haws
      b. Chicago Faucet

B. Shower: ABS plastic head, instant action stay open ball valve with stainless steel pull rod, high visibility self-adhesive stripes, universal emergency sign, 1 1/4 inch galvanized steel pipe with 9 inch diameter floor flange, and 30 gpm flow control.

C. Eye/Face Wash: Corrosion resistant stainless steel receptor, twin ABS plastic heads, instant action stay open ball valve, 1 1/4 inch supply, and varying pressure stream control.

2.6 RECESSED VALVE BOX

A. Manufacturers:
   1. Trumbull].
   2. Other acceptable manufacturers offering equivalent products.
      a. Mueller
      b. Josam
      c. Potter Roemer

B. Floor Valve and Box: Cast iron floor box with cover. Provide isolation valve, wrench nut adapter, T wrench handle, open-closed indicator as manufactured by Trumbull .

2.7 BACKFLOW PREVENTERS

A. Manufacturers:
   1. Watts .
   2. Other acceptable manufacturers offering equivalent products.
      a. Beeco
      b. Hersey
      c. Cla-Val
      d. Grinnell
      e. Zurn
      f. Febco

B. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013,[AWWA C506; bronze body; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; assembled with two gate valves, strainer, test cocks ; Model 909 manufactured by Watts.

2.8 WATER HAMMER ARRESTORS

A. Manufacturers:
   1. PPP Model WH-201.
   2. Other acceptable manufacturers offering equivalent products.
      a. J R Smith
      b. Amtrol
      c. Josam
      d. Tyler

B. ANSI A112.26.1; sized in accordance with PDI, precharged suitable for operation in temperature range -100 to 300 degrees F (-73 to 149 degrees C) and maximum 250 psig (1700 kPa) working pressure.

2.9 TRAP PRIMERS

A. Manufacturers:
   1. PPP Model SMP 500 115V.
   2. Other acceptable manufacturers offering equivalent products.
      a. J R Smith
      b. Sioux Chief

2.10 LEAK DETECTION

A. Manufacturers:
   1. Flowline Model LU10 rated for Class 1 Div 1, intrinsically safe.
   2. Other acceptable manufacturers offering equivalent products.
      a. Perma pipe Liquid Watch
      b. Pentair
B. Product:
   1. Provide one model LU-10 sensor in each sump. Provide LI-90 monitoring panel mounted on a Hoffman box wired to each sensor. Connect alarm output to fire alarm panel. Provide local alarm and flashing light above entrance to the chemical storage room. Provide calibration equipment. Provide onsite system setup, calibration and training. Power and sensor wiring to be provided by electrical contractor.

2.11 OXYGEN DEPLETION SENSING SYSTEM

A. Manufacturers:
   1. Sierra Monitor Corp Model 5100-XX-IT Class 1 Div 1 rated oxygen deficiency sensors with model 5383 NEMA 4X 8 channel wall mounted controller.
   2. Other acceptable manufacturers offering equivalent products.
      a. Sensidyne
      b. Detcon

B. Product:
   1. Provide three model 5100 oxygen sensors. Provide 5383 monitoring panel mounted in a NEMA 4X wall mount cabinet, wired to each sensor. Connect alarm output to fire alarm panel. Provide local alarm and flashing light above entrance to the chemical storage room. Provide calibration equipment. Provide onsite system setup, calibration and training. Power and sensor wiring to be provided by electrical contractor.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate cutting and forming of roof and floor construction to receive drains to required invert elevations.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Cleanouts shall be same size as the pipes served, up to 4 inches; 5 and 6 inch pipes shall have 4 inch cleanouts; 8 inch pipes shall have 6 inch cleanouts; 10 inch pipes and larger shall have 8 inch cleanouts.

E. Pipe relief from back flow preventer to nearest drain.

F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories, sinks, and emergency showers.

END OF SECTION

SECTION 224000 - PLUMBING FIXTURES

PART 1 - PART GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Sinks.

E. Service sinks.

F. Electric water coolers.

G. Drinking fountains.

H. Showers.

I. Emergency drench and eye wash units.

1.2 RELATED SECTIONS

A. Section 115313 - Laboratory Fume Hoods.

B. Section 114000 – Walk-in Refrigeration.

C. Section 220000 – Basic Mechanical Requirements.

D. Section 220501 - Supports and Anchors.

E. Section 221000 - Plumbing Piping.

F. Section 222000 - Plumbing Specialties.

G. Section 225000 - Plumbing Equipment.

1.3 REFERENCES

A. ANSI/ASME A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use.

B. ASME A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.

C. ANSI/ASME A112.19.1 - Enameled Cast Iron Plumbing Fixtures.

D. ANSI/ASME A112.19.2 - Vitreous China Plumbing Fixtures.

E. ANSI/ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).

F. ANSI/ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.

G. ANSI/ASME A112.19.5 - Trim for Water Closet Bowls, Tanks, and Urinals (Dimensional Standards).

H. IAPMO/ANSI Z124.1 - Plastic Bathtub Units.

I. IAPMO/ANSI Z124.2 - Plastic Shower Receptors and Shower Stalls.

J. ANSI Z358.1 - Emergency Eyewash and Shower Equipment.

K. ANSI/ARI 1010 - Drinking Fountains and Self-Contained, Mechanically-Refrigerated Drinking-Water Coolers.

1.4 DEFINITIONS

A. Accessory: Devices that adds effectiveness, convenience or improved appearance to a fixture but is not essential to its operation.

B. Equipment: Device used with plumbing fixtures or plumbing systems to perform a certain function for plumbing fixtures but that is not part of the fixture.

C. Fixture: Installed receptor connected to the water distribution system, that receives and makes available potable water and discharges the used liquid or liquid borne wastes directly or indirectly into the drainage system.

D. Support: Device normally concealed in building construction, for supporting and securing plumbing fixtures to walls and structural members. Supports for urinals, lavatories, and sinks are made in types suitable for fixture construction and the mounting required.

E. Trim: Hardware and miscellaneous parts, specific to a fixture and normally supplied with it required to complete fixture assembly and installation.

1.5 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide catalogue illustrations of fixtures, sizes, utility sizes, trim, and finishes.

C. Manufacturer's Installation Instructions.

D. List each product including manufacturer’s name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017700.

B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016000.

B. Accept fixtures on site in factory packaging. Inspect for damage.

C. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

B. Confirm that millwork is constructed with adequate provision for the installation of countertop lavatories and sinks.

1.9 WARRANTY

A. Provide five year warranty under provisions of Section 017700.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Section 017700.

B. Provide two of flush valve service kits.

PART 2 - PRODUCTS

2.1 WATER CLOSET "A"

A. Bowl
   1. Manufacturer: American Standard Afwall Millenium Flowise
   2. Other acceptable manufacturers offering equivalent products.
      a. Kohler
      b. Eljer
      c. Crane
   3. ANSI/ASME A112.19.2; wall hung, siphon jet] vitreous china closet bowl, with elongated rim, 1-1/2 inch (38 mm) top spud, china bolt caps.

B. Flush Valve
   1. Manufacturer: American Standard Selectronic
   2. Other acceptable manufacturers offering equivalent products.
      a. Delany
      b. Unispec
      c. Zurn
   3. ASME A112.18.1; chrome plated electronic flush valve, integral angle stop and backflow preventor; maximum 1.28 gpm flush volume.

C. Seat
   1. Manufacturer: Church Model 295NSSC
   2. Other acceptable manufacturers offering equivalent products.
      a. Olsonite
      b. Kohler
      c. Sperzel

3. Solid [white] plastic, open front, extended back, [self-sustaining hinge,] brass bolts, [less] cover.

D. Wall Mounted Carrier
1. Manufacturer: J R Smith Model 210 & 230
2. Other acceptable manufacturers offering equivalent products.
a. Zurn
b. Tyler
c. Josam
3. ANSI/ASME A112.6.1; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.2 LAVATORY "B"

A. Basin
1. Manufacturer: American Standard Lucerne Wall Hung Lavatory.
2. Other acceptable manufacturers offering equivalent products.
a. Kohler
b. Eljer
c. Crane
3. ANSI/ASME A112.19.2; vitreous china wall-hung lavatory 20 x 18 inch minimum, with 4 inch high back, drillings on 4 inch centers, rectangular basin with splash lip, front overflow.

B. Trim
1. Manufacturer: American Standard Selectronic Electronic Lavatory Faucet.
2. Other acceptable manufacturers offering equivalent products.
a. Symmons
b. Delta
c. Moen
3. ASME A112.18.1; chrome plated, 0.5 gpm water, chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon, 120v.

C. Wall Mounted Carrier
1. Manufacturer: J R Smith Model 700
2. Other acceptable manufacturers offering equivalent products.
a. Zurn
b. Tyler
c. Josam
3. ANSI/ASME A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.3 SHOWER "C"

A. Shower
   1. Manufacturer: Fiat Model A3636 .
   2. Other acceptable manufacturers offering equivalent products.
      a. Kohler
      b. American Standard
   3. One piece acrylic with foldup wheelchair transfer seat with white phenolic slotted bench, stainless steel grab bars, stainless steel curtain rod.

   4. Shower Head and Control: Symmons Temptrol shower system 96-1, polished chrome finish, 1.5 gpm flow restrictor, pressure balancing mixing valve, check stops, vandal resistant.

2.4 MOP SINK "D"

A. Bowl
   1. Manufacturer: Fiat Terazzo Mop Service Basin TSB3002.
   2. Other acceptable manufacturers offering equivalent products.
      a. American Standard
   3. 36 x 36 x 12 inch high molded stone, floor mounted, with two inch wide shoulders, 6: threshold, stainless steel strainer.

B. Trim
   1. Manufacturer: Fiat Service Sink Faucet Model 830-AA.
   2. Other acceptable manufacturers offering equivalent products.
      a. American Standard
   3. ASME A112.18.1 exposed wall type supply with handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral stops with covering caps and adjustable threaded wall flanges.

C. Accessories
   1. 5 feet of 1/2 inch diameter plain end reinforced rubber hose.
   2. Hose clamp hanger.
   3. Mop hanger.

2.5 SINK "E"

A. Bowl
   1. Manufacturer: Sheldon Labs D61 .
   2. Other acceptable manufacturers offering equivalent products.
      a. Just
      b. Moen
      c. Elkay
   3. ANSI/ASME A112.19.3; single compartment 30 x 16 x 17.8 inch outside dimensions, molded epoxy resin, 3-1/2 inch drain opening.

B. Trim
   1. Manufacturer: Elkay .
   2. Other acceptable manufacturers offering equivalent products.
      a. American Standard
      b. Delta
   3. ASME A112.18.1; provide chrome plated wall mount goose neck faucet LKB722C 120V, LK 18B drain, 2 gpm water economy aerator, chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.

2.6 LAVATORY "F"

A. Bowl
   1. Manufacturer: Elkay ELV2219SACMC .
   2. Other acceptable manufacturers offering equivalent products.
      a. Just
      b. Moen
      c. Kohler
   3. ANSI/ASME A112.19.3; single compartment 22 x 19 x 5.5 inch outside dimensions, 18 gage thick, stainless steel, mixing valve, mounting brackets, 1-5/8 inch drain opening and deck drilled for trim.

B. Trim
   1. Manufacturer: Elkay .
   2. Other acceptable manufacturers offering equivalent products.
      a. American Standard
      b. Delta
   3. ASME A112.18.1; provide LKB721C 120v electronic faucet, LK drain, 2 gpmwater economy aerator, chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.

2.7 LAVATORY "G"

A. Bowl
   1. Manufacturer: Elkay WNSF8124 .
   2. Other acceptable manufacturers offering equivalent products.
      a. Just
      b. Moen
      c. Kohler
   3. ANSI/ASME A112.19.3; single compartment 27 x 24 x 14 inch outside dimensions, 14 gage thick, 304 stainless steel,LK251 Legs, mixing valve, mounting brackets, 3-1/2 inch drain opening.

B. Trim

1. Manufacturer: Elkay .
2. Other acceptable manufacturers offering equivalent products.
   a. American Standard
   b. Delta
3. ASME A112.18.1; provide LK940A and LK398C faucet with foot pedals, LK drain, 2 gpm water economy aerator, chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.

2.8 EMERGENCY DRENCH SHOWER AND EYE WASH UNIT "H"

A. Manufacturer:
   1. Bradley Model S1931 ADA Compliant
   2. Other acceptable manufacturers offering equivalent products.
      a. Haws

B. ANSI Z358.1; freestanding, Cycolac bowl eye wash with stay open ball valves, twin soft flow eye wash heads and protective sprayhead ccovers.

C. ANSI Z358.1; freestanding, Cycolac 10 inch (250 mm) diameter deluge shower head, full flow stay open ball valve with pull chain and 9 inch triangular handle, and interconnecting fittings.

2.9 LAVATORY "I"

A. Bowl
   1. Manufacturer: Elkay ELUHAD ADA compliant.
   2. Other acceptable manufacturers offering equivalent products.
      a. Just
      b. Moen
      c. Kohler
   3. ANSI/ASME A112.19.3; single compartment 21.5 x 18.5 x 5.5 inch outside dimensions, 18 gage thick, stainless steel, mixing valve, mounting brackets, 1-5/8 inch drain opening and deck drilled for trim.

B. Trim
   1. Manufacturer: Elkay .
   2. Other acceptable manufacturers offering equivalent products.
      a. American Standard
      b. Delta
   3. ASME A112.18.1; provide LKB721C 120v electronic faucet, LK drain, 2 gpm water economy aerator, chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.

2.10 DRINKING FOUNTAIN "J"

A. Fountain
   1. Manufacturer: Elkay Model EHWM217C Double Unit.
   2. Other acceptable manufacturers offering equivalent products.
      a. Halsey Taylor
      b. Sunroc
      c. Oasis
      d. ANSI/ARI 1010; wall mount, barrier free, two-level drinking fountain with stainless steel top, stainless steel body, bubbler with stream guard, automatic stream regulator, mounting panel, push buttons, bottom cover pale and trap.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install each fixture with trap, easily removable for servicing and cleaning.

C. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

D. Install components level and plumb.

E. Install and secure fixtures in place with wall supports, wall carriers and bolts.

F. Seal fixtures to wall and floor surfaces with sealant as specified in Section 079200, color to match fixture.

G. Solidly attach water closets to floor with lag screws.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

A. Adjust work under provisions of Section 017700.

B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

A. Clean work under provisions of 017700.

B. At completion clean plumbing fixtures and equipment.

3.7 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 015000.

B. Do not permit use of fixtures.

3.8 FIXTURE HEIGHTS

A. Verify with Architectural drawings

END OF SECTION

SECTION 225000 - PLUMBING EQUIPMENT

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Water Heaters.

B. Pumps.

1.2 RELATED SECTIONS

A. Section 220000 – Plumbing.

B. Section 220511 - Supports and Anchors.

C. Section 220504 - Vibration Isolation and Seismic Restraints

D. Section 260000 - Electrical.

1.3 REFERENCES

A. ANSI/ASHRAE 90A - Energy Conservation in New Building Design.

B. ASME Section VIIID - Pressure Vessels; Boiler and Pressure Vessel Codes.

C. ANSI/NFPA 30 - Flammable and Combustible Liquids Code.

D. ANSI/NFPA 54 - National Fuel Gas Code.

E. ANSI/NFPA 58 - Storage and Handling of Liquified Petroleum Gases.

F. ANSI/NFPA 70 - National Electrical Code.

G. ANSI/UL 1453 - Electric Booster and Commercial Storage Tank Water Heaters.

H. ANSI/UL 174 - Household Electric Storage Tank Water Heaters.

I. ANSI/NEMA 250 - Enclosure for Electrical Equipment (1000 Volts Maximum).

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings:
   1. Include heat exchanger dimensions, size of tappings, and performance data.
   2. Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

C. Product Data:
   1. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements, and affected adjacent construction.
   3. Submit certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   4. Provide electrical characteristics and connection requirements.
   5. All equipment to be Energy Star rated.

D. Manufacturer's installation instructions.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 017700.

B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with State of Connecticut standards.

B. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
   1. American Gas Association (AGA).
   2. National Sanitation Foundation (NSF).
   3. American Society of Mechanical Engineers (ASME).
   4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
   5. National Electrical Manufacturers' Association (NEMA).
   6. Underwriters Laboratories (UL).

D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation; operate within 25 percent of midpoint of published maximum efficiency curve.

1.7 REGULATORY REQUIREMENTS

A. Conform to AGA, NSF,ANSI/NFPA 54 requirements for water heaters.

B. Conform to ASME Section VIIID for manufacture of pressure vessels for heat exchangers.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016000.

B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.9 WARRANTY

A. Provide five year warranty under provisions of Section 017700.

B. Warranty: Include coverage of domestic water heaters, water storage tanks, packaged water heating systems and in-line circulator.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Section 017700.

PART 2 - PRODUCTS

2.1 INDIRECT GAS FIRED WATER HEATER

A. Manufacturers:
   1. Noritz Model NCC199-DV.

2. Other acceptable manufacturers offering equivalent products.
   a. Lochinvar
   b. PVI
   c. Rheem

B. Type: Automatic, natural gas-fired, condensing, tankless gas water heater.

C. Performance:
   1. Input: 199,000 Btuh
   2. Minimum recovery rate: 8.4 gpm with 45 degrees F temperature rise.
   3. Maximum working pressure: 150 psig (1000 kPa)

D. Accessories: Concentric vent kit, isolation valves, pressure relief valve, pipe cover, pvc adapters, neutralizer and system controller.

E. Controls: Automatic water thermostat with temperature range adjustable from 100 to 180 degrees F , gas pressure regulator, multi-ribbon or tubular burner, flame rod, freeze protection.

2.2 PACKAGED WATER HEATING SYSTEM

A. Manufacturers:
   1. Therm0Omega-Tch Inc. Model EMV.
   2. Other acceptable manufacturers offering equivalent products.
      a. AO Smith
      b. Lochinvar
      c. Rheem

B. System: Electric water heater, controls, piping and valving as indicated, lined 120 gallon storage tank, relief valve, controls, mixing valve, all piped, wired and tested at the factory.

C. Heater:
   1. Performance:
      a. 0.4-24 gpm capacity supplying 85F water for 15 minutes.
      b.

2.3 IN-LINE CIRCULATOR PUMPS

A. Manufacturers:
   1. B & G Model [_____].
   2. Other acceptable manufacturers offering equivalent products.
      a. Little Giant
      b. Paco
      c. Taco

B. Performance:

1. Flow: 0 .5 gpm , at 10 feet head.
2. Electrical Characteristics:
   a. 120 volts, single phase, 60 Hz.

C. Casing: Bronze, rated for 125 psig (860 kPa) working pressure.

D. Impeller: Bronze.

E. Seal: Carbon rotating against a stationary ceramic seat.

2.4 AQUASTAT

A. Manufacturers:
   1. Honeywell Model L6006C.
   2. Surface mount aquastat controller with adjustable range of 65F to 200F for control of recirculation pump. Initial setpoint to be 105F.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install water heaters in accordance with manufacturer's instructions and to AGA, NSF, ANSI/NFPA 54, UL requirements.

B. Coordinate with plumbing piping and related fuel piping, gas venting, electrical work to achieve operating system.

3.2 GENERAL INSTALLATION

A. Install tank in accordance with manufacturer's instructions.

B. Install units with clearance for service without disturbing other installed equipment or piping.

C. Pipe relief valves and drains to nearest floor drain.

D. Support unit on concrete pad.

3.3 PUMP INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Ensure shaft length allows sump pumps to be located minimum 24 inches (600 mm) below lowest invert into sump pit and minimum 6 inches (150) clearance from bottom of sump pit.

C. Provide air cock and drain connection on horizontal pump casings.

D. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.

E. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches (100 mm) and over.

F. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

G. Align and verify alignment of base mounted pumps prior to start-up.

END OF SECTION

SECTION 230500 – COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.01 SUMMARY

A. Section Includes:

1. This Section provides the basic mechanical requirements that apply to the Work of Division 23.

B. Related Requirements:

1. Division 01: General Requirements.
2. Division 26: Electrical.

1.02 REGULATORY REQUIREMENTS

A. Materials, fabrication, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:

1. AMCA - Air Movement and Control Association.
2. ANSI - American National Standards Institute.
3. ASME - American Society of Mechanical Engineers.

a. ASME Boiler and Pressure Vessel Code.

b. ASME B31 - Code for Pressure Piping.

4. AHRI - Air-Conditioning, Heating, and Refrigeration Institute.

5. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers.

6. ASTM - American Society for Testing and Materials.

a. ASTM A53 - Specification for Welded and Seamless Pipe.

7. CSA - Canadian Standards Association.

8. FM Global - Factory Mutual Global

9. IAPMO - International Association of Plumbing and Mechanical Officials.

10. NFPA - National Fire Protection Association.

11. OSHA - Occupational Safety and Health Administration.

12. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association.

13. UL - Underwriters Laboratories Inc.

14. Intertek (ETL Certification).

B. Materials, fabrication, equipment, and installation shall comply with federal, state, and local codes.

C. Specifications or Drawings shall not be construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.

D. Permits and Fees: Refer to the General and Supplementary Conditions.

1.03 SUBMITTALS

A. Provide submittals in accordance with Section 01 3300: Submittal Procedures and with specific requirements of Division 23 sections, as applicable.

B. After Architect's approval, the above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.

C. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project. Drawings prepared in accordance with requirements of

Section 01 3113: Project Coordination and Section 01 3300 may be provided by the Architect to serve as a background for the Shop Drawings. Shop Drawings shall comply with the requirements of Section 01 3113 and Section 01 3300 and shall indicate at a minimum:

1. Complete system layout of equipment, components, ductwork, and piping, indicating service clearances, duct and pipe sizes, fitting types and sizes, top or bottom of duct and pipe elevations, distances of ducts, pipes and equipment from building reference points and hanger / support locations. All the above items shall be coordinated on the shop drawings according to the requirements of Section 01 3113.
2. Schedule and description of equipment, ductwork, piping, fittings, valves, dampers, and controllers.

1.04 PROJECT RECORD DOCUMENTS

A. Comply with provisions of Section 01 7700: Contract Closeout.

B. Project Record Drawings:

1. Provide a complete set of mechanical and control system drawings in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-ROM. Also submit one set of full size reproducible plots on vellum and three sets of prints.
2. Before Contract Completion, deliver corrected and completed prints to the Architect. Delivery of project record documents to the Architect does not relinquish responsibility of furnishing required information omitted from project record documents.

C. Operation and Maintenance Manuals:

1. Submit operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy shall be returned with instructions for changes; perform such changes and return manuals. Manuals shall be bound in accordance to Section 01 7700. Deliver manuals to the Architect. Submit an electronic copy of the entire manual in PDF file format.
2. Contents of Manual:
   a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.

b. Manufacturer's operating instructions including, but not limited to, the following:

1) Identification of components and controls.

2) Pre-start checklist and start-up procedures.

3) Normal operation settings and checklists.

4) Pre-shut down checklist and shut down procedures.

5) Trouble shooting checklist and guidelines.

6) Recommendations for optimum performance.

7) Warnings and safety precautions on improper or hazardous operational procedures or conditions

c. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 23 that includes the following as a minimum:

1) Manufacturer’s model, identification and serial numbers.

2) Exploded view of assembly drawings identifying each component or part with the relevant part number.

3) Directory of manufacturer’s representatives, service contractors and part distributors.

4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.

d. Project Record Drawings: Complete set of mechanical and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.

e. Testing, Adjusting, and Balancing reports: Submit as specified in Section 01 4525.

f. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.

i. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.05 COORDINATION

A. Contract Documents indicate extent and general arrangement of Work under Division 23. Contractor shall coordinate work in accordance with Section 01 3113 requirements and make adjustments as required to provide maximum headroom, a neat arrangement to keep passageways and openings clear to provide accessibility and provisions for maintenance, and to meet code requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.

B. Do not store plastic pipe or materials in direct sunlight.

1.07 PRELIMINARY OPERATION

A. Architect may require any portion of mechanical Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.

B. Notify the Project Inspector at least 24 hours in advance of lighting or re-lighting pilots.

1.08 TRAINING OF OWNER PERSONNEL

A. Training of Owner’s personnel shall include:

1. A minimum of 8 hours of on-site overview of the overall Mechanical System.

2. Refer to Division 23 sections for specific training on each of the components of the Mechanical System.

3. A minimum of 8 hours of on-site overview identifying location and function of all Control Valves and Actuator assemblies.

4. A minimum of 40 hours of (in classroom) software training for a minimum of 20 LAUSD personnel on EMS/BMS if such systems are utilized in the project. Training shall be conducted at control contractor training facility with computer setup for each person attending.

B. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance, trouble-shooting, and Project site repair of each component, equipment, or system provided under this Contract.

C. Operational and maintenance training shall be conducted on the Project site, unless indicated otherwise.

D. Upon completion of Owner training, a completion certificate indicating the nature of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by the Architect.

E. An attendance sheet with the names and signatures of all participants attending the training shall be submitted to the Architect and kept as part of the project documents.

1.09 GUARANTEES AND DAMAGE RESPONSIBILITY

A. Sound of water flowing in piping shall not be transmitted to building structure. Operation of mechanical system shall not produce operational sounds that can be heard outside of rooms enclosing apparatus or equipment.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.

B. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.

C. HVAC equipment products from different manufacturers are never identical. Equipment approved as being equal is interpreted as being equivalent in capacity, performance and quality. The dimensions, weight, configuration and utility requirements could be quite different from the equipment used as the basis of design. Due to these differences, additional coordination and adjustments by the Contractor are required. For the equipment to be deemed truly equal, the additional coordination and adjustments by the Contractor should not incur any additional cost to the Owner and any additional labor to the design team.

D. Equipment and materials indicated or required to be installed outdoors shall be of the type that is designed, manufactured, listed or approved by authorities having jurisdiction for outdoor installation by being resistant to the adverse effects of weather. All the additional protective measures against outdoor weather required

by the manufacturers' installation instructions and prevalent practice shall be provided.

E. For substitution of materials or products, refer to the General Conditions.

PART 3 – EXECUTION

3.01 SERVICE INTERRUPTIONS, OFF-SITE, GAS AND WATER

A. Schedule Work so there shall be no service interruptions of existing systems or systems during normal hours of operation of affected systems and facilities.

B. When service interruptions are mandatory, arrange in advance with the OAR as to time and date of such interruptions.

C. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

3.02 CUTTING, NOTCHING, AND BACKING

A. Conform to California Building Code, Title 24, Part 2, for notches and bored holes in wood and for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.

B. Where pipes or ducts pass through, or are located within one inch of any construction element, install a resilient pad, 1/2 inch thick minimum, to prevent contact.

C. Furnish all necessary provisions for recesses, chases, and accesses and provide blocking and backing as necessary for proper reception and installation of mechanical Work.

3.03 LOCATION OF PIPING AND EQUIPMENT

A. Location of piping, apparatus and equipment as indicated on Drawings is approximate and shall be altered to avoid obstructions, preserve headroom, and provide free and clear openings and passageways.

B. Trenches parallel to footings shall not be closer than 18 inches to the face of footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.

C. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.

D. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.04 TESTS AND TESTING

A. Tests shall be as required under the applicable sections of Division 23, including this Section.

B. Tests required by other sections of the Contract Documents include the following:

1. Test and balance of mechanical equipment and systems: Refer to Section 230500: Testing, Adjusting, and Balancing for HVAC.

2. Test of smoke and fire detectors: Refer to Division 26: Electrical.

C. Additional tests may be required in the case of products, materials, and equipment if:

1. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.

2. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.

D. Piping Tests:

1. Perform tests required to demonstrate that operation of mechanical systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the Project Inspector, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.

2. If required tests are not performed, Owner may provide in accordance with the Contract Documents.

3. Pressure gages furnished in testing shall comply with CPC. Air shall be bled from lines requiring hydrostatic or water tests.

4. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.

5. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.

6. Refrigerant piping may be tested with a halide detector or calibrated electronic testing equipment.

7. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the Project Inspector.

8. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.

E. Pipe Testing Schedule:

1. Test refrigerant piping per manufacturer's recommendations.

F. Equipment Performance Assurance Tests:

1. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed and recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and materials shall be replaced or repaired as required.

2. Upon completion of the above, adjust the system settings to within normal operating conditions to prevent the system from being damaged upon start-up.

3. Run-test the equipment after start-up for five consecutive days. Tests shall include operation of heating, ventilating, and air conditioning equipment and systems for a period of not less than two 8 hour periods at 90 percent of the full specified heating and cooling capacities. If equipment passes, install new filters. If equipment fails, it shall be adjusted and retested until system meets all applicable codes.

4. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of start-up report for review by the Architect.

   a. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.

5. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.

6. Provide electric energy and fuel required for tests.

7. Final adjustment to equipment or systems shall meet specified performance requirements.

8. Equipment, systems, or Work deemed defective during testing shall be replaced or corrected as required. Test until satisfactory results are provided.

G. Specific Coordinated Plan for Test and Balance:

1. Provide a narrative of the operational intent that clearly describes the function and sequence of operation of each component, equipment, or system installed. Instruct designated Owner personnel in the operation of the installed systems.

2. Prior to final test and balance, mechanical equipment and systems shall be operated and tested as indicated in Paragraph 3.04.F above to demonstrate satisfactory overall operation of the installed systems.

3. Immediately before starting tests, air filter media shall be cleaned or renewed. Roll-type filters shall be advanced to provide new clean media. Cleanable type media shall be thoroughly cleaned and re-oiled with new, clean oil as recommended by manufacturer if they are of viscous impingement type. Disposable type filters shall be replaced with new filters. Replaceable media shall be replaced with new media.

4. An accurate means of measuring air flow and temperatures shall be furnished to balance air supply, return, and exhaust systems so uniform temperatures occur in every room and design airflow is obtained through registers, diffusers, and grilles.

5. Systems shall be adjusted to provide airflows indicated including maximum fresh air and maximum return air. Dampers shall be checked for proper settings and operation. Air and water inlet and leaving temperatures at coils shall be checked. Complete operational data including airflows, room temperatures, fan speeds, motor currents, plenum, and duct static pressures shall be tabulated.

3.05 NOISE AND VIBRATION REDUCTION

A. Correct noise or vibration caused by mechanical systems. Provide all necessary adjustments to specified and installed equipment and accessories to reduce noise to the lowest possible level

B. Correct noise or vibration problems caused by failure to install work in accordance with Contract Documents. Include all labor and materials required as a result of such failure. Pay for re-testing of corrected noise or vibration problems by the project acoustical consultant including travel, lodging, test equipment expenses, etc.

3.06 PROTECTION, CARE AND CLEANING

A. In addition to storage criteria of the General Conditions, and provisions under Section 01 5000: Construction Facilities and Temporary Controls, the following shall be provided:

1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.

2. Protect installed Work.

3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.

4. Protect covering for bearings, open connections to tanks, pipe coils, pumps, compressors and similar equipment.

5. Interior of ductwork shall be maintained free of dirt, grit, dust, loose insulation, and other foreign materials.

6. Air handling equipment shall not be operated until building is cleaned and air filters are installed.

7. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.

8. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas. Refrigerant piping shall be cleaned as specified.

END OF SECTION

SECTION 230500 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

C. Sound measurement of equipment operating conditions.

D. Vibration measurement of equipment operating conditions.

1.2 RELATED SECTIONS

A. Section 014000 - Quality Control.

B. Section 220000 – Basic Mechanical Requirements.

1.3 REFERENCES

A. AABC - National Standards for Total System Balance.

B. ADC - Test Code for Grilles, Registers, and Diffusers.

C. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.

D. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.

C. Field Reports: Submit under provisions of Section 014000.

D. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

E. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

F. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner and for inclusion in operating and maintenance manuals.

G. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Report shall reference the contract drawings for location of equipment and devices. Where reference to the contract drawings is not satisfactory, include a set of reduced drawings or sketches with equipment and devices identified to correspond with data sheets.

H. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

I. Test Reports: Indicate data on AABC National Standards for Total System Balance forms or NEBB forms.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017000.

B. Record actual locations of flow measuring points and balancing valves and rough setting.

1.6 QUALITY ASSURANCE

A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE 111, and NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

B. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

A. Agency: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC.
B. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor.

1.8 PRE-BALANCING CONFERENCE

A. Convene one week prior to commencing work of this section, under provisions of Section 010400.

1.9 SEQUENCING

A. Sequence work under the provisions of Section 010400.

B. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

1.10 SCHEDULING

A. Schedule work under the provisions of Section 010400.

PART 2 - PRODUCTS

2.1 Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Ductwork Systems:

a. Final filters are clean and in place. If required, install temporary media in addition to final filters.
b. Duct systems are clean of debris.
c. Fans are rotating correctly.
d. Dampers are in place and open.
e. Air coil fins are cleaned and combed.
f. Access doors are closed and duct end caps are in place.
g. Air inlets and outlets are installed and connected.
h. Duct system leakage is minimized.

5. Piping Systems:
   a. Hydronic systems are flushed, filled, tested and vented.
   b. Pumps are rotating correctly.
   c. Proper strainer baskets are clean and in place.
   d. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

C. Beginning of work means acceptance of existing conditions.

3.2 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Owner to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.3 INSTALLATION TOLERANCES

A. HVAC Systems: Adjust to within plus or minus 5 percent of design for supply and return systems and plus or minus 10 percent of design for exhaust systems.

B. Air Outlets and Inlets: Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of balancing devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.5 AIR SYSTEM PROCEDURE

A. Adjust equipment and distribution systems to provide required or design air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure and record air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Adjust air volume by adjusting duct internal devices such as dampers and splitters. Do not utilized opposed blade dampers at air inlets and outlets.

F. Vary total system air quantities by adjusting sheave position at each fan. Vary branch air quantities by damper regulation.

G. Measure and record static air pressure conditions at air supply and exhaust units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

H. Adjust settings and minimum setpoints for motorized and backdraft dampers to design conditions.

I. Measure and record temperature conditions across dampers to check leakage.

J. Where modulating dampers are provided, take measurements and balance at extreme conditions.

K. [Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.]

L. Measure and record building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.

M. [For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.]

N. Measure and record inlet and outlet temperatures at each air supply unit at full cooling and heating capacity.

3.6 REPORT FORMS

A. Forms shall include the following:
   1. Title Page:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone number of Testing, Adjusting, and Balancing Agency.
      d. Project name.
      e. Project location.
      f. Project Architect.
      g. Project Engineer.
      h. Project Contractor.
      i. Project altitude.
      j. Report date.
   2. Summary Comments:
      a. Design versus final performance.
      b. Notable characteristics of system.
      c. Description of systems operation sequence.
      d. Summary of outdoor and exhaust flows to indicate amount of building pressurization.
      e. Nomenclature used throughout report.
      f. Test conditions.
   3. Instrument List:
      a. Instrument.
      b. Manufacturer.
      c. Model number.
      d. Serial number.
      e. Range.
      f. Calibration date.
   4. Electric Motors:
      a. Manufacturer.
      b. Model/Frame.
      c. HP/BHP/efficiency.
      d. Phase, voltage, amperage; nameplate, actual, no load.
      e. RPM.
      f. Service factor.
      g. Starter size, rating, heater elements.

h. Sheave Make/Size/Bore.

5. V-Belt Drive:
   a. Identification/location.
   b. Required driven RPM.
   c. Driven sheave, diameter and RPM.
   d. Belt, size and quantity.
   e. Motor sheave diameter and RPM.
   f. Center to center distance, maximum, minimum, and actual.
6. Equipment Data:
   a. Identification/number.
   b. Manufacturer.
   c. Model number and Serial number.
   d. Capacity.
   e. Service.
   f. Design flow rate, pressure drop, BHP.
   g. Actual flow rate, pressure drop, BHP.
   h. Temperature readings.
7. Duct Traverse:
   a. System zone/branch.
   b. Duct size.
   c. Area.
   d. Design velocity.
   e. Design air flow.
   f. Test velocity.
   g. Test air flow.
   h. Duct static pressure.
   i. Air temperature.
   j. Air correction factor.
8. Air Distribution Test Sheet:
   a. Air terminal number.
   b. Room number/location.
   c. Terminal type.
   d. Terminal size.
   e. Area factor.
   f. Design velocity.
   g. Design air flow.
   h. Test (final) velocity.
   i. Test (final) air flow.
   j. Percent of design air flow.
9. Water Distribution Test Sheet:
   a. Heat transfer terminal number.
   b. Room number/location.
   c. Terminal type.
   d. Terminal size.

e. Design flow.
f. Test (final) flow.
g. Percent of design flow.

10. Steam Distribution Test Sheet:
    a. Heat transfer terminal number.
    b. Room number/location.
    c. Terminal type.
    d. Terminal size.

END OF SECTION

SECTION 230700 - DUCTWORK INSULATION

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Ductwork insulation.

B. Duct Liner.

C. Insulation jackets.

1.2 RELATED SECTIONS

A. Section 099000 - Painting.

B. Section 220000 – Basic Mechanical Requirements.

C. Section 220503 - Mechanical Identification.

D. Section 233100 - Ductwork.

E. Section 233300 - Ductwork Accessories.

1.3 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.

D. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

E. ASTM E84 - Surface Burning Characteristics of Building Materials.

F. ASTM E96 - Water Vapor Transmission of Materials.

G. NFPA 255 - Surface Burning Characteristics of Building Materials.

H. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

I. UL 723 - Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide product description, list of materials and thickness for each service, and locations.

C. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved. List each product including manufacturer’s name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.

1.5 QUALITY ASSURANCE

A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255 and UL 723.

1.6 QUALIFICATIONS

A. Applicator: Company specializing in performing the work of this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Deliver materials to site in original factory packaging, labeled with manufacturer's density and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic.

D. Protect insulation against dirt, water, chemical, and mechanical damage.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.1 GLASS FIBER, FLEXIBLE

A. Manufacturers:
   1. Manville Microlite.
   2. Other acceptable manufacturers offering equivalent products:
      a. Owens Corning.
      b. Certainteed.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value (SI 'K' value): ASTM C518, 0.26 at 75 degrees F (0.038 at 24 degrees C).
   2. Maximum service temperature: 250 degrees F (121 degrees C).
   3. Maximum moisture adsorption: 0.20 percent by volume.
   4. Density: Type 100; 1.0 lb/cu ft (16 kg/cu m).
   5. Thickness: 1.5 inches (38 mm).

C. Vapor Barrier Jacket
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture vapor permeability: ASTM E96; 0.02 perm inch.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.2 GLASS FIBER, RIGID

A. Manufacturers:
   1. Manville 800 Series.
   2. Other acceptable manufacturers offering equivalent products:

a. Owens Corning.
b. Certainteed.

B. Insulation: ASTM C612; rigid, noncombustible blanket.
1. 'K' value (SI 'K' value): ASTM C518, 0.22 at 75 degrees F (0.032 at 24 degrees C).
2. Maximum service temperature: 450 degrees F (232 degrees C).
3. Maximum moisture adsorption: 1.0 percent by volume.
4. Density: 6.0 lb/cu ft (96 kg/cu m).
5. Thickness: 1 inch (25 mm).

C. Vapor Barrier Jacket
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture vapor permeability: ASTM E96; .02 perm inch.
3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.3 GLASS FIBER DUCT LINER

A. Manufacturers:
1. Owens Corning Aeroflex Type 200.
2. Other acceptable manufacturers offering equivalent products.
a. Manville.
b. Certainteed.

B. Insulation: ASTM C1071; flexible, noncombustible blanket.
1. 'K' value (SI 'K' value): ASTM C518, 0.26 at 75 degrees F (0.038 at 24 degrees C).
2. Maximum service temperature: 250 degrees F (121 degrees C).
3. Density: 2.0 lb/cu ft (32 kg/cu m).
4. Maximum Velocity on Coated Air Side: 6,000 ft/min (20.3 m/sec).
5. Thickness: 1 inch (25 mm).

C. Noise Reducing Coefficient: NRC shall not exceed 0.6.

D. Adhesive: Waterproof, fire retardant type.

E. Liner Fasteners: Galvanized steel mechanical fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that ductwork has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install materials in accordance with manufacturer's instructions and as outlined within this specification.

B. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

C. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Flexible Glass Fiber Insulation Application:
   1. Secure insulation seams with staples, spaced at 6 inches (150 mm) on center.
   2. Seal seams with pressure sensitive tape.
   3. Install without sags on underside of ductwork. Use mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
   4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
   5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
   6. Seal all tears, punctures and other penetrations with pressure sensitive tape.

E. Rigid Glass Fiber Insulation Application:
   1. Secure insulation with weld pins or stick clips at 12 inches (350 mm) on center. Locate at maximum 3 inches (76 mm) from each edge and corner of board.
   2. Cover pins and clips with vapor sealing pressure sensitive patches or tape.
   3. Apply 5 inch (130 mm) wide vapor sealing pressure sensitive tape to all joints and seams.

F. Duct Liner Application:
   1. Adhere insulation with adhesive for 90 percent coverage and adhere adhesive at all exposed edges and transverse joints.
   2. Secure insulation with mechanical liner fasteners. Refer to SMACNA Standards for spacing.
   3. Seal and smooth joints.
   4. Seal liner surface penetrations with adhesive.
   5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.3 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.4 DUCTWORK INSULATION SCHEDULE

A. Schedule of Ductwork In Concealed Spaces:

DUCTWORK	TYPE
Supply Air	Flexible Glass Fiber
Return Air	Flexible Glass Fiber
Outside Air	Flexible Glass Fiber
Plenums	Flexible Glass Fiber

B. Schedule of Ductwork In Exposed Unconditioned Spaces:

DUCTWORK	TYPE
Supply Air	Rigid Glass Fiber
Return Air	Rigid Glass Fiber
Outside Air	Rigid Glass Fiber
Plenums	Rigid Glass Fiber

C. Schedule of Miscellaneous Ductwork:

DUCTWORK	TYPE
Ductwork shown lined on Drawings	Glass Fiber Liner
Exposed ductwork in conditioned spaces	Insulation not required

END OF SECTION

SECTION 23 0800 - HVAC SYSTEM COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for commissioning the Heating, Ventilation, Air-Conditioning and Refrigeration (HVAC&R) systems, assemblies and equipment.

B. General Commissioning Requirements are described in Section 01 9110 (General Commissioning Requirements), and are not repeated in this Section.

C. In addition to the drawings and general provisions of the contract, commissioning requirements are defined in the following sections:

Section 01 9110 – General Commissioning Requirements
Section 01 9115 – Facility Exterior Envelope Commissioning Requirements
Section 22 0800 – Plumbing System Commissioning Requirements
Section 23 0800 – HVAC System Commissioning Requirements
Section 23 0910 – Building Control System Commissioning Requirements
Section 26 0800 – Electrical System Commissioning Requirements

1.2 DEFINITIONS

A. Definitions are listed in Section 01 9110 – General Commissioning Requirements

1.3 SUBMITTALS

A. Refer to Section 01 9010 for submittal requirements.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC&R system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. A sufficient quantity of two-way radios shall be provided by each subcontractor.

B. Refer to Section 01 9110 “General Commissioning Requirements” for a detailed description of test equipment requirements.

PART 3 - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

A. With assistance from the installing contractors, the CxA will prepare Construction Checklists for all commissioned components, equipment, and systems

1. Checklists will be developed by the CxA and provided to the contractors.
2. Contractors will complete the construction checklists and provide completed copies to the CxA prior to beginning system functional testing
3. To avoid duplication of effort, contractors may document testing and start-up activities using their own checklists, and provide them as attachments to the checklists issued by the CxA.

B. Red-lined Drawings:

1. The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
4. The contracted party, as defined in the Contract Documents will create the as-built CAD drawings.
5. All red-lined drawings are to be available on-site for review by the Owner and the CxA.

C. Operation and Maintenance Data:

1. The contractor will provide a copy of O&M literature for use during the commissioning process for all commissioned equipment and systems.
2. The CxA will review the O&M literature for conformance to project requirements.
3. The CxA shall have access to a copy of the final approved O&M literature once corrections have been made by the Contractor.

3.2 COMMISSIONING TEAM RESPONSIBILITIES

A. Refer to Division 01 Section 01 9110 “General Commissioning Requirements” for commissioning team member roles and responsibilities.

3.3 TESTING PREPARATION

A. Certify in writing to the CxA that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify in writing to the CxA that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify in writing that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on the construction documents and equipment vendor's submittals.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

H. If the failure rate of a similar family of equipment or devices is greater than 10%, then the Owner shall be notified. The matter shall be addressed by the Owner, CM, CxA, and other applicable parties. The failure issue shall be resolved to the Owner's satisfaction.

3.4 TESTING, ADJUSTING AND BALANCING VERIFICATION

A. Prior to performance of HVAC Balancing work, provide copies of reports, sample forms, checklists, and certificates as part of the TAB submittal.

B. Notify the CxA at least ten (10) days in advance of testing and balancing work, and provide access for the CxA to witness balancing activities.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems for verification by the CxA.

1. The testing and balancing subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.
2. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.
3. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.5 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to support the CxA in performing systems functional testing.

B. The scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the HVAC&R contractor, Testing and Balancing Subcontractor, and HVAC&R Instrumentation and Control Subcontractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific post-occupancy, or seasonal testing, provide technicians to support the CxA in performing the defined performance tests.

3.6 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 23 sections. Provide submittals, test data, inspector record, and certifications to the CxA.

B. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment: Test requirements are specified in Division 23 piping Sections. HVAC&R Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. The CxA will review the testing reports.

C. Contractor testing will include:

1. Description of equipment for flushing operations.
2. Minimum flushing water velocity.

3. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.
4. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.
5. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.
6. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.

3.7 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

A. Refer to Section 01 9110 “General Commissioning Requirements” for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.8 APPROVAL

A. Refer to Division 01 Section 01 9110 “General Commissioning Requirements” for approval procedures.

3.9 DEFERRED TESTING

A. Refer to Division 01 Section 01 9110 “General Commissioning Requirements” for requirements pertaining to deferred testing.

3.10 OPERATION AND MAINTENANCE MANUALS

A. Refer to Division 01 Section 01 9110 “General Commissioning Requirements” for operation and maintenance manual requirements.

3.11 TRAINING OF OWNER PERSONNEL

A. Refer to Division 01 Section 01 9110 “General Commissioning Requirements” for owner training requirements

END OF SECTION 230800

SECTION 230900 - SEQUENCES OF OPERATION

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Packaged rooftop air conditioners.

B. Exhaust fans.

1.2 RELATED SECTIONS

A. Section 220000 – Basic Mechanical Requirements.

B. Division 26 - Electrical.

1.3 SYSTEM DESCRIPTION

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

1.4 SUBMITTALS

A. Submit under provisions of Section 013000.

B. Submit diagrams indicating mechanical system controlled and control system components. Label equipment and control devices using the nomenclature on the drawings. Control devices shall be labelled with settings, adjustable range of control and limits. Include written description of control sequence.

C. Include flow diagrams for each control system, graphically depicting control logic.

D. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

E. Include wiring schematics of each control panel clearly showing extent of internal and external wiring. Provide detail of panel face including controls, instruments, gauges and labels.

1.5 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 017000.

B. Accurately record actual locations, setpoints and settings of control devices, including changes to sequences made after submission of shop drawings.

PART 2 - PRODUCTS

2.1 Not Used

PART 3 - EXECUTION

3.1 SEQUENCES OF OPERATION

A. All sequences shall be performed by the control system provided with the units unless noted as a being controlled locally or specifically noted as controlled by other systems.

3.2 CONTROL DEVICES

A. All devices and sensors shall be adjustable. Controls shall display setpoints and actual conditions of all control devices and position of all actuators at the user interface.

3.3 PACKAGED ROOFTOP AIR CONDITIONING SYSTEMS, RTU-1

A. Unit shall operate in accordance with time clock, schedule as determined by the owner.

B. Unit shall modulate gas-fired burner/stage compressors to maintain space setpoint temperatures 68 deg F heating/75 deg F cooling (adjustable) as measured by room mounted sensor. Outdoor air shall be controlled as required based upon CO_2 monitoring in the space.

C. Economizer shall be controlled by a total enthalpy controller.

3.4 PACKAGED ROOFTOP AIR CONDITIONING SYSTEMS, RTU-2 & 3

A. Units shall operate continuously and maintain space setpoint temperatures 68 deg F heating/75 deg F cooling (adjustable) as measured by room mounted sensor.

B. Unit shall modulate gas-fired burner/stage compressors to maintain discharge setpoint temperatures 90 deg F heating/55 deg F cooling (adjustable) as measured by duct mounted sensor.

C. The RTUs shall be interlocked to run with their respective ERVs.

D. Upon loss of airflow in RTU-3 an alarm shall processed and lights above the entrance doors shall be activated.

3.5 EXHAUST FANS

A. EF-1, 2&5 shall be locally controlled. The exhaust fan bypass damper for each fan shall be controlled by their respective duct mounted static pressure controller to maintain total airflow under all conditions of hood operation.
B. EF-3 serving the toilet rooms shall operate in accordance with a time clock.
C. EF-4 serving the janitor closet shall operate in accordance with a time clock.
D. EF-6 serving the mechanical room shall operate in accordance with a room temperature sensor set to activate the fan above 85F (adjustable).

3.6 ERV FANS

ERV supply fans shall be interlocked to run with their respective RTU. The ERV exhaust fans shall be controlled by total air flow monitors located in each hood exhaust duct and the return air ductwork. The ERV exhaust quantity shall be reduced to accommodate the exhaust from the process hoods when they are running..

END OF SECTION

SECTION 230923 – BUILDING AUTOMATION SYSTEM

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Standalone Digital Controllers

B. Network Interface Modules

C. Application Specific Controllers

D. Integrating Subsystem Controllers

E. Control Devices, Components, Wiring and Material

F. Instructions for Owners

1.2 RELATED SECTIONS

A. Section 01 91 13 - General Commissioning Requirements

B. *Section 23 08 00 - Commissioning of HVAC*

C. Section 28 30 00 - Fire and Smoke Detection System

1.3 REFERENCES

A. UL508A – Standard for Industrial Control Panels

B. NEMA 250 Enclosures for Electrical Equipment (1000 volts Maximum)

C. ASHRAE 85 Automatic Control Terminology for Heating, Ventilating, Air Conditioning

D. NFPA 70

E. National Electrical Code

F. UL 864 - Standard For Safety For Control Units For Fire Protective Signaling Systems

1.4 ACRONYMS

A. Acronyms used in this specification are as follows:

1. ASD Application Specific Device
2. ALN Area Level Network
3. BAS Building Automation System
4. BLN Building Level Network
5. CER Communication Equipment Room
6. CITES Campus Information and Technology Services
7. CSMA/CD Carrier Sense Multiple Access / Collision Detect
8. DDC Direct Digital Control
9. HHOT Hand Held Operator's Terminal
10. IP Internet Protocol
11. FLN Field Level Network
12. LAN Local Area Network
13. LEED Leadership in Energy and Environmental Design
14. NEC National Electric Code
15. NCU Network Control Unit
16. NIM Network Interface Module
17. P&ID Piping & Instrument Diagrams
18. PID Proportional, Integral, Derivative
19. SDC Stand-alone Digital Controller

1.5 DEFINITIONS

A. BAS (Building Automation System)
   a. Devices, conduit, wire, programming and protocols required for operation of a building's environmental control systems. Major systems and units controlled include items such as Roof Top Units, Air Handling Units, Hot Water Distribution.

B. Networks: in order of speed / hierarchy.
   1. LAN (Local Area Network) Ethernet Communications Network by CITES
   2. BLN (Building Level Network) / ALN (Area Level Network)
      a. Communication Network between SDC's inside the building.
      b. Acceptable Protocols used for communication include:
         (a) Andover: BACnet I/P
      c. Used to communicate between BAS devices installed within the building.
      d. Higher Speed
   3. FLN – Field Level Network
      a. Communications network between ASD's, SDC's
      b. Acceptable Protocols used for communication include:
         (b) Andover: INFINET (RS-485)

C. Specific Control Component Devices
   1. ASD (Application Specific Device)
      a. Communicates on the FLN
      b. Contains Analog / Digital I/O points.
      c. Typically used on Terminal Units such as VAV's, Fan Coils.
      d. Can "Fully Load", e.g. does not need spare I/O Point capacity.

2. NCU (Network Control Unit)
   a. Device which communicates between LAN and BLN
   b. May have capability to directly control Analog / Digital I/O points.
3. NIM (Network Interface Module)
   a. Device which communicates between LAN and BLN.
   b. Has no capability to directly control Analog / Digital I/O points.
4. SDC (Stand-alone Digital Controller)
   a. Device which communicates between LAN and BLN
   b. May also communicate to devices on FLN.
   c. Has capability to directly control Analog / Digital I/O points.
   d. Design so that unit uses only 80% of total I/O capacity to allow for future expansion without immediate need for an additional I/O module.

1.6 LEED REQUIREMENTS

A. This project shall meet the requirements of the current U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) program.

B. Carefully examine the LEED portion of the Project Specification for full compliance with the following applicable LEED points

1. "Energy & Atmosphere": Prerequisite 1, "Fundamental Commissioning of Building Energy Systems", Prerequisite 2, "Minimum Energy Performance," Credit 3 - "Enhanced Commissioning", and Credit 5 - "Measurement and Verification", as described by LEED

2. "Indoor Environmental Quality": Prerequisite 1 - "Minimum Indoor Air Quality Performance", Credit 1 - "Outdoor Air Delivery Monitoring", Credit 2 – "Increased Ventilation", Credit 6.1 - "Controllability of Systems – Lighting", and Credit 6.2 - "Controllability of Systems - Thermal Comfort."

3. All labor and materials required for these and any other LEED initiatives shall be provided without additional cost to the Owner.

1.7 SYSTEM DESCRIPTION

A. DDC System: The BAS shall be a direct digital control (DDC) system which can, without additional equipment, perform all of the automatic temperature control and energy management functions as required in this specification. DDC shall be defined as a control technique through which the process is continuously monitored by a digital computer that accomplishes loop control by calculating a control solution for output to a control device. The system, as specified, shall independently control the building's HVAC equipment to maintain a comfortable environment in an energy efficient manner. The building operator shall communicate with the system and control the sequence of operation within the building via an operator workstation. System components shall be fully compatible with existing systems from the same vendor on the campus of the University of Illinois at Urbana-Champaign.

B. Site License: Approved vendors have systems at this campus with a site license covering all system software which has been documented, approved and signed by all parties. The site license shall be maintained by the University with the vendor in contracts negotiated outside of this project contract. Client Licenses shall be utilized and provided by vendor under this contract where required by this project's system.

C. Client License: Where required by the system architecture, the vendor shall provide a Client License for utilization at the project site. In addition, a client license shall also be provided to the Owner with each new project added to the system.

1.8 SUBMITTALS

A. General: Submit documents under provisions of Division 01. Two (2) printed copies of the materials shall be delivered directly to the Owner, in addition to the copies required by other Sections. In addition, an electronic version of the completed materials shall be provided on CD or DVD. Refer to *Section 01 91 13 – General Commissioning Requirements* and *Section 23 08 00 – Commissioning of HVAC* for additional Commissioning submittal requirements.

B. Electronic Submittals: While all requirements for hard copy submittal apply, control submittals and operation and maintenance (O&M) information shall also be provided in electronic format as follows:

   1. Drawings and Diagrams: Shop Drawings shall be provided on electronic media as an AutoCAD drawing per Owner's CAD standards. All 'x reference' and font files must be provided with AutoCAD files.

   2. Other Submittals: All other submittals shall be provided in Adobe Portable Document Format.

C. Equipment Coordination:

   1. The Building Automation Systems (BAS) Contractor shall obtain approved equipment submittals from other contractors to determine equipment wiring connections, to choose appropriate controllers, and to provide programming.

   2. Coordinate the control interface of all equipment with the equipment manufacturers prior to submittal submission.

D. Shop Drawings Grouped into Separately Phased Submissions: Submit Shop Drawings in groups to be reviewed at appropriate phases of the construction execution.

E. Shop Drawings: Submit Shop Drawings electronically on AutoCAD software for each control system, including a complete drawing for each air handling unit, system, pump, device, etc. with all point descriptors, addresses and point names indicated. Shop Drawings shall contain the following information:

   1. Cross-reference all control components and point names in a single table located at the beginning of the submittal with the identical nomenclature used in this section.

   2. Submittal shall include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media and protocol.

   3. System Architecture and System Layout: Provide One-line diagram indicating schematic locations of all control units, workstations, LAN interface devices, gateways, etc. Indicate Ethernet backbone number, network number, device ID, address, device instance, MAC address, object ID (object type, instance number), drawing reference number, and controller type for each control unit. Indicate media, protocol, baud rate, and type of each LAN. All optical isolators, repeaters, end-of-line resistors, junctions, ground locations etc. shall be located on the diagram. Include interface requirements with other systems, including but not limited to, security and surveillance systems, lighting control, elevator status, power monitoring systems and door access systems.

   4. Diagrams shall include:

      a. Wiring diagrams and layouts for each control panel showing all termination numbers.

      b. Schematic diagrams for all control, communication and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show all interface wiring to the control system.

      c. Identification of all control components connected to emergency power.

d. Schematic diagrams for all field sensors and controllers.

e. A schematic diagram of each controlled system. The schematics shall have all control points labeled. The schematics shall graphically show the location of all control elements in the system.

f. A schematic *wring* diagram for each controlled system. Each schematic shall have all elements labeled. Where a control element is the same as that shown on the control system schematic, label it with the same name. Label all terminals.

g. A tabular instrumentation list for each controlled system. The table shall show element name, type of device, manufacturer, model number and product data sheet number.

h. All installation details and any other details required to demonstrate that the system will function properly.

i. All interface requirements with other systems.

5. With each schematic, provide a point summary table listing building number and abbreviation, system type, equipment type, full point name, point description, If this information is not available at the time of Shop Drawings submittals, furnish with O&M manual documentation for Owner review and approval. See *Section 01 33 23 – Shop Drawings, Product Data, and Samples* and *Section 01 78 23 – Operation and Maintenance Data* for additional requirements.

6. The network infrastructure shall conform to the published guidelines for wire type, length, number of nodes per channel, termination, and other relevant wiring and infrastructure criteria as published. The number of nodes per channel shall be no more than 80% of the defined segment (logical or physical) limit in order to provide future system enhancement with minimal infrastructure modifications.

7. Sequences: Submit a complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.

8. Points List Schedule: Submit a complete points list of all points to be connected to the BAS. The points list for each system controller shall include both inputs and outputs (I/O), point number, the controlled device associated with the I/O point, the location of the I/O device, and reference drawings. Where a control point is the same as that shown on the control system schematic, label it with the same name. Points list shall specifically identify alarms, trends, event history, archive, totalization, graphic points, and all mapped points from other systems (security systems, lighting control, fire alarm, etc.). Provide points list, point naming convention, and factory support information for systems provided and integrated into the BAS.

9. Schematic flow diagram of each air and water system showing fans, coils, dampers, valves, pumps, heat exchange equipment and control devices.

   a. Include written description of sequence of operation on the Schematic Flow diagram to match components and system shown.

   b. All physical points on the schematic flow diagram shall be indicated with names, descriptors, and point addresses identified as listed in the point summary table

10. Damper Schedule: Schedule shall include a separate line for each damper and a column for each of the damper attributes:
    a. Damper Identification Tag.
    b. Location.
    c. Damper Type.
    d. Damper Size & Quantity.
    e. Duct Size.

f. Arrangement.
g. Blade Type.
h. Velocity Pressure Drop.
i. Fail Position
j. Actuator Identification Tag
k. Actuator Type & Quantity.
l. Mounting.

11. Airflow Measuring Station (AFMS) Schedule:
    a. The manufacturer's authorized representative shall prepare the airflow measuring station submittal, or review and approve in writing the submittal prepared by the BAS Contractor prior to submission to the AE and prior to installation. The representative shall review air handling equipment submittals and duct fabrication drawings to ensure that all AFMS locations meet the appropriate parameters to achieve proper installation and the specified accuracy. Comply with all manufacturer's installation requirements including straight up and downstream duct lengths. Install airflow straighteners if required by the manufacturer based on installation constraints. The AE shall be notified for approval of any deviations.
    b. Submit product data sheets for airflow measuring devices indicating minimum placement requirements, sensor density, sensor distribution, and installed accuracy to the host control system.
    c. Submit installation, operation, and maintenance documentation.
    d. Air flow monitoring stations shall be provided the exhaust ductwork for RTU#2 and #3 as well as the exhaust fans EF#1,2,5. Monitoring stations serving RTU#3 and EF #2 and #5 shall be rated for Class 1 Div 1 classification or intrinsically safe.

12. Product Data: Submit manufacturer's engineering and technical product data for each control device, panel, and accessory furnished, indicating dimensions, capacities, performance and electrical characteristics, and material finishes. Include installation and start-up instructions for each BAS system component.

13. Provide Graphics Pages to be utilized on Operator Work Stations and Web Access. Sample shall be submitted and approved prior to deployment to system components. See Part 2 of this specification for requirements.

14. Provide copy of program to be utilized in each device for approval by the Owner prior to deployment. Submit information in block diagram format (VISIO) as well as in native program language. Submittal shall include all appropriate documentation, commenting and notation to facilitate understanding and troubleshooting the system.

15. Label each control device with setting or adjustable range of control.

16. Label each input and output with the appropriate range.

17. Provide a Bill of Materials with each schematic. Indicate device identification to match schematic and actual field labeling, quantity, actual product ordering number, manufacturer, description, size, voltage range, pressure range, temperature range, etc. as applicable.

18. With each schematic, provide valve and actuator information including size, Cv, design flow, design pressure drop, manufacturer, model number, close off rating, etc. Indicate normal positions of spring return valves and dampers.

19. Indicate all required electrical wiring. Electrical wiring diagrams shall include both ladder logic type diagram for motor starter, control, and safety circuits and detailed digital interface panel point termination diagrams with all wire numbers and terminal block numbers identified. Provide panel termination Drawings on separate Drawings.

Ladder diagrams shall appear on system schematic. Clearly differentiate between portions of wiring that are existing, factory-installed and portions to be field-installed.

20. Details of control panels, including controls, instruments, and labeling shown in plan or elevation indicating the installed locations.
21. Sheets shall be consecutively numbered.
22. Each sheet shall have a title indicating the type of information included and the HVAC system controlled.
23. Table of Contents listing sheet titles and sheet numbers.
24. Legend and list of abbreviations.

F. Training Manual:

1. Provide Course Outline and training manuals for each class. Refer to the paragraph entitled “Training” in Part 3 of this section.

G. Record Documents:

1. Update and include all information noted in the Shop Drawing section.
2. Record copies of product data, as built control Shop Drawings and final sequence of operation updated to reflect the final installed condition.

H. Provide as-built network architecture Drawings showing all nodes including a description field with specific controller identification, description and location information.

I. As-Built Control Diagram: Provide complete operating data, system drawings, wiring diagrams, and written detailed descriptions of sequences. One copy of the as-built control diagram shall be placed inside each control panel. Provide metallic pocket inside the door large enough to hold complete drawings. Electronic set to be provided to the Owner commencing with start of Warranty period.

J. Operation and Maintenance Data:

1. Submit maintenance instructions and spare parts lists for each type of control device, control unit, and accessory.
   a. Include systems descriptions, setpoints, and controls settings and adjustments.
   b. Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
2. Submit BAS User’s Guides (Operating Manuals) for each controller type and for all workstation hardware and software and workstation peripherals.
3. Submit BAS advanced Programming Manuals for each controller type and for all workstation software.
4. Manufacturer’s Certificates: For all listed and/or labeled products, provide certificate of conformance.
5. Product Warranty Certificates: Submit manufacturer’s product warranty certificates covering the hardware provided.

K. Actual Locations: Include actual location of control components, including panels, thermostats, and sensors, not already included in as-built drawings. Include revised shop drawings to reflect actual installation and operating sequences.

L. Calibration Report: The BAS Contractor shall submit to the Owner a calibration report of all final slopes, intercepts and/or offsets for all devices prior to final witnessing by the Owner. See Part 3 of this specification for requirements.

M. Commissioning Report: At completion of Work, submit commissioning report of automatic control system.

1.9 QUALIFICATIONS

A. Manufacturer: Andover

1.10 WARRANTY

A. Components: Provide one-year warranty on all materials and labor, after commissioning is complete and accepted by Owner.

B. Software Upgrades: Requirements shall include furnishing and installing all BAS software upgrades issued by the manufacturer for one year beyond the warranty period.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Andover

Fan Arrays Controllers – "Third Party" controllers / vendors shall not be allowed as part of HVAC AHU equipment which includes PLC Programmable Logic Controllers. The Architect & Engineer shall provide Non – proprietary sequence of operation for the Fan Array equipment controls as part of AHU system sequence of operation. Standard UIUC controller, VFD (Variable Frequency Drive) control and instrumentation shall be provided by Temperature Controls Contractor.

Fan Array specifics – The number of Variable Frequency Drives in a given fan array/fan wall shall not exceed six (6). Exception: motor size above 10 HP. Other VFD and motor combination may be applied through the variance process and UIUC approval. Standard UIUC approved Variable Frequency Drive shall be specified and shall comply with the UIUC division 26 standard.

2.2 SYSTEM ARCHITECTURE

A. SDC: The system shall be a network of independent stand-alone digital controllers (SDCs). Each SDC shall provide full control either as a completely independent unit or as a part of a building-wide control system. Each SDC shall be capable of and provide peer-to-peer communication without the use of a central host computer within the building level network. Systems that use a master/slave arrangement shall have all master units communicating with each other. New systems shall communicate directly to existing SDCs, application specific devices (ASDs), network interface modules (NIMs), or network control units (NCUs) within the building. They shall be backward compatible with existing systems of the same manufacturer, or they shall provide a new network interface and all associated hardware.

B. Communication: Each NCU shall directly communicate to the campus Ethernet via an IEEE 802.3 compliant Ethernet connection. Each NCU or NIM shall communicate with the central host computer located at the U of I Physical Plant Service Building (PPSB) and other NIMs on the system via an Ethernet connection. Communication to all primary SDCs within the building shall be via native Ethernet network interfaces using TCP/IP protocols and manufacturer's native UDP protocols to exchange information in a peer to peer network. All communications shall be complete and fully operational before the commissioning is started. Location of all NCU's and NIM's shall be coordinated with the U of I Campus Information Technologies (F&S) and the Educational Services (CITES) network design engineer. Two network connections shall be provided at each NCU or NIM.

No locations may be presumed acceptable. The building control network architecture provided by the BAS Contractor on the project shall meet and satisfy all LEED project requirements for reporting and trending as per project documents. . Two network jacks shall be installed at each panel containing a NCU or NIM unless a variance is granted by the Variance Approval Committee.

C. NCU's shall connect SDC's or floor level ASD devices via a manufacturer's approved native RS-485 protocol or via a BACnet MSTP (Master-Slave Token Passing Bus).

D. Programming: A single control programming language shall be used and shall be fully programmable from the central host computer, which shall also function as the database server. The system shall utilize client/server architecture, with all points and program databases stored on the server central host computer. All operator workstations shall serve as clients.

E. **Licensing**: Provide additional client licenses, programming and engineering tools for the installed Systems to the Owner. A Project Variance Request shall be approved by the Variance Approval Committee prior to deviation from this requirement.

2.3 BAS CONTROLLERS AND ACCESSORIES

A. General

1. Multiple Building Functions: BAS Contractor shall furnish and install a BAS capable of integrating multiple building functions, including equipment supervision and control, alarm management, energy management, and historical data collection and archiving.

2. System Components: BAS shall consist of, but not be limited to, the following:

   a. Standalone DDC Panel(s). See definition of SDC, ASD, NIM, and NCU.

3. Future Expansion: System shall be modular in nature, and permit expansion of both capacity and functions through addition of sensors, actuators, panels, and operator devices. System architecture shall support expansion capacity of all types of DDC panels, and all point types included in the initial installation. There shall be a minimum of 10 percent of each type of I/O point available for expansion on each of the SDCs. If multiple SDCs are mounted in a single location,10percent of each type of I/O point type must be available in the group.

4. Primary Operator's Workstation: Primary Operator's Workstation shall be a client machine to the database server located at the Physical Plant Services Building.

5. Self-Diagnostics: The BAS shall contain self-diagnostics that continuously monitor the integrity of the system. Any malfunction of the system shall be reported to the Central Host Computer to inform the operator of the nature of the malfunction and the NIMs, NCUs, or SDCs affected.

6. Battery: Each SDC shall include its own microprocessor-based controller, power supply, input/output modules, termination modules and a rechargeable Lithium battery. The battery shall be capable of supporting all memory and the real time clock within the control unit for a minimum of 72 hours if the external power to the unit is interrupted or lost.

7. 72 Hour Memory: Upon loss of external power to any SDC, the other units within the network shall not be affected, and the loss of operation of that unit shall be reported at the designated operator's terminal. All control strategies and energy management routines defined for the SDC shall be retained during a power failure via the battery within the unit for a minimum of 72 hours. Upon resumption of commercial power, the SDC shall resume operation without operator intervention. The unit shall automatically reset its clock such that proper operation of timed sequences is possible without the need for manual reset of the clock.

8. Local Operator Interface: All SDCs and NCUs shall contain the necessary equipment for direct interface to the sensors and actuators connected to it from a portable operator's terminal.

9. Safety: The control unit shall be listed by Underwriters Laboratories (UL KK864) against fire, smoke control, and shock hazard as a signal system appliance unit. All SDCs, NIMs, and NCUs shall be enclosed in a hinged metal enclosure. All control panels shall be located away from sources of heat and humidity and away from the primary equipment room entry and exit paths.

10. Power Conditioner: Each SDC, NCU, and NIM shall receive isolated conditioned power from a 120 volt power conditioning constant voltage transformer manufactured by Sola/Hevi-Duty. Unit shall be a hevi-duty CVS series unit or pre-approved equal. One power conditioner may be used to power multiple controllers. The power conditioner shall be sized to allow for the addition of at least 1 controller, but sized no greater than 150% of the connected load. Isolated/un-isolated power shall not be mixed in the same conduit or raceway. The Line side of the conditioner shall be protected by a Class RK1 fuse, Bussmann model LPN or equivalent, sized per manufacturers requirements. The Load side of the conditioner shall be protected by a Class CC fuse, Bussmann model KTK, or equivalent. Load side fuse holder shall be Bussmann Model CHCC, or equivalent.

11. Wiring by BAS Contractor: All wiring for the BAS panels, including power and sensor wiring, shall be by the BAS Contractor. All internal control panel wiring shall conform to the UL508A standard. All external wiring entering BAS panels shall terminate on a terminal strip within the panel and be labeled appropriately. All internal wiring within panel shall be labeled on both ends.

12. NEC Compliant Wiring: All wiring shall be installed in conduit and shall conform to *Division 26 - Electrical* of these specifications and the National Electrical Code. Conduits shall not be filled more than 75 percent of the NEC rating to allow for future expansion. Rigid Conduit shall be used in Utility Plants.

13. Standard Non-Proprietary Components: System shall include all hardware, software, equipment, accessories, wiring, piping, relays, sensors, power supplies, and instrumentation required for a complete and operational system. All materials and equipment shall be standard non-proprietary components regularly manufactured for this and/or other systems and not custom-designed specifically for this project. All components shall have been thoroughly tested and proven in actual use.

14. Graphical Representation: The BAS shall monitor and control equipment as called for by the "Sequence of Operation" including, but not limited to, the points list. Any additional system components required for proper operation but not necessarily mentioned shall also be included. A graphical representation of each system shall be made available on all operator workstations displaying all control and monitoring points and alarms. Graphical representation shall be web accessible. See paragraph entitled "GRAPHICAL REPRESENTATION" below for specific requirements.

15. Independent Panel Operation: System design shall eliminate dependence on any single device for alarm reporting and control execution.

    a. Each BAS panel shall operate independently in performing its own specified control, alarm management, operator I/O, and historical data collection. The failure of any single component or network connection shall not interrupt execution of control strategies.

    b. Critical Loop I/O Control Functions shall have the devices wired directly to the controller. Owner shall have final authority regarding definition of what constitutes a Critical Loop.

B. Programmability

1. Point Termination: All primary inputs and outputs of control loops shall be terminated on the SDC performing the loop calculations. Secondary inputs, such as reset inputs, may be shared via the RS-485 bus. The control action taken by the SDC upon loss of communications to the source of the shared input shall be clearly defined if these points are not terminated on the SDC.
2. SDC Fully Programmable: All SDCs shall be fully programmable from any operator workstation and from the Central Host Computer located in the Physical Plant Services Building.

C. Network Interface Modules (NIMs)

1. NIM: The BAS Contractor shall provide a minimum of 1 high speed Network Interface Module (NIM) for each building which supports both of the following types of communication standards between SDCs and other NIMs on the network: Two IEEE 802.3 compliant Ethernet network connections shall be provided at each NIM allowing campus Ethernet connection
   a. Ethernet: The BAS-LAN shall employ Carrier Sense Multiple Access/Collision Detect (CSMA/CD) contention type protocol, which adheres to the industry standard format IEEE 802.3. The content of messages shall be the manufacturer's standard. The BAS-LAN components shall be manufacturer's standard or available from third party vendors that utilize the same chip implementation as used by the manufacturer. In addition Ethernet NIMs shall be fully Internet Protocol (IP) compliant allowing connection to currently installed IEEE 802.3 compliant Ethernet Networks. Ethernet NIMs shall directly support connectivity to 10/100 twisted pair RJ-45 terminated UTP category 6 cabling.
2. RS-485: At data rates of up to 19.2 Kbaud, the trunk distance shall be extendible to distances of up to 20,000 feet using RS-485 communication wire or fiber optic repeaters. A repeater shall be used each 4,000 feet of linear distance for wire or every 6,500 feet for fiber optics or at intervals as required by the manufacturer for proper system operation. Repeating devices shall contain separate LED indication for each communication interface trunk to indicate proper operation of the repeater as well as the communication trunks. Contractors shall provide devices that are of the BAS control system manufacturer's design, and shall provide a trunk riser diagram showing end to end distances and locations of system topology necessary to meet the trunk diagram shown on the plans. Each multi-drop shall support a minimum of 24 SDCs. Systems that communicate on a current loop or any other industry standard communication link will be accepted.
3. Transient Surge Protection: The manufacturer's catalog data sheet shall provide evidence that all BAS products offered by the manufacturer are tested and comply with the standard for Transient Surge, and can withstand capabilities for electrical devices ANSI C62.41, IEEE-587-1980, Categories A and B. Such testing shall have included power and communication trunk wiring. Compliance with IEEE-587 shall imply conformance with IEEE-472 transient standards based on the stated position of ANSI and IEEE regarding applicability of the rated standards. In addition, at each building entry and exit point, the wire communications trunk wiring shall be protected with a transient surge protection device providing the minimal protection specifications of the General semiconductor, Model #422E device. Transient surge protection is not necessary if the communication trunk, external to the building, is fiber optic in nature. The communications circuitry, including phone, and input/output circuitry, of the SDCs shall provide protection against a 1000 volt, 3 amp transient signal, directly applied to the communication or input/output terminations. The manufacturer's catalog data sheet shall provide evidence of conformance with this requirement. Systems not complying with this requirement shall provide equivalent protection external to the BAS controller. Protection shall be provided for the individual communications and input/output terminations for each BAS controller. Submittal documentation shall

clearly define how this requirement will be met and how the external protection will not affect the performance of the controllers.

D. Standalone Digital Controllers (SDC)

1. Independent SDC at All Times: Standalone Digital Controllers (SDCs) shall be minimum 16 bit microprocessor based, utilizing a multi-tasking, multi-user operating system. The SDCs shall permit the simultaneous operation of all control, communication facilities management and operator interface software, as programmed by the Contractor or Owner. Modification of the on-board SDC controller database shall be performed on-line using a laptop computer connected via a local RS-232 port or Ethernet via Host System.

2. True Floating Point Arithmetic Capabilities: SDCs shall utilize true floating point arithmetic capabilities. To accommodate totalization of large totalized values, SDCs with reporting capability shall support the calculation, accumulation and display of values within the range of +/-10 to the 10th power.

3. Operator Service Port: SDCs shall be equipped with an operator service port for the connection of a laptop computer. The service ports shall be a built-in RS-232 data terminal port. An optional RJ-11 type jack that connects to the manufacturer's standard HHOT may be included in addition to the RS-232. Connection of a service device to a service port shall not cause the SDC controller to lose communications with its peers or other networked device controllers. The service ports shall allow utilization of the same laptop computer program or HHOT (hand held operator's terminal) from any location. The same laptop computer program or HHOT shall be utilized for any SDC or NIM. Systems that utilize more than one variety of laptop computer program or HHOT are not acceptable.

4. Override Capability: The SDC shall provide commanded override capability from the laptop computer or HHOT. Such overrides shall be annunciated to the Central Host Computer. Such overrides shall be valid as long as power is applied to the controller. SDC indication of such manual override actions shall be provided as feedback status indication points shown on the Drawings, in conjunction with the application programs within the SDC. H/O/A switches remotely located at the SDC controller shall be behind a locked panel or capable of being disabled through the control program.

5. Adjustments: Every SDC shall provide adjustments for the functions specified. In general, adjustments shall be provided for all setpoints used by controllers within each control panel, or adjustments to other parameters as specified. Adjustments shall be integral to each individual SDC. From a single SDC user interface, any other SDC on the network shall be accessible and full adjustment capabilities shall be provided.

6. Metal Enclosures: All SDCs, or any device not classified as an ASD controller, shall be enclosed in metal enclosures with suitable brackets for either wall or floor mounting and shall be furnished and installed with each system. They shall be fabricated from either steel or extruded aluminum and shall be equipped with hinged door and lock. Panels shall not be secured to any item of equipment.

E. Network Control Unit (NCU)

1. A Network Control Unit (NCU) is a SDC incorporating a built-in NIM. The NCU shall incorporate all of the features of the SDCs and NIMs as outlined above.

F. Application Specific Devices (ASD)

1. Independent ASD Operation At All Times: Application Specific Devices (ASD) shall utilize a multi-tasking, multi-user operating system. The ASDs shall permit the simultaneous operation of all control, communication facilities management and operator interface software, as programmed by the Contractor or Owner. Modification of the on-board ASD controller database shall be performed on-line using a laptop

computer connected via a local port or from an Operator Workstation. Systems that require the ASD to be removed from service while BAS control sequences are modified are not acceptable.

2. Power Loss Protection: All programming defining the functions to be performed by the ASD, including but not limited to application programs and point database within each ASD, shall be protected from loss due to power failure. Systems providing non-volatile memory for these functions are preferred. Systems not providing non-volatile memory shall provide a system rechargeable battery backup system sufficient to provide protection. Systems not in compliance shall provide for uninterrupted power to each ASD.

3. Operator Service Port: ASDs shall be equipped with an operator service port for the connection of a laptop computer. The service ports shall be a built-in data terminal port. Connection of a service device, to a service port, shall not cause the ASD controller to lose communications with its peers or other networked device controllers. The service ports shall allow utilization of the same laptop computer program or HHOT from any location. The same laptop computer program or HHOT shall be utilized for any ASD or NIM.

4. Adjustments: Every ASD shall provide adjustments for the functions specified. In general, adjustments shall be provided for all setpoints used by controllers within each control panel, or adjustments to other parameters as specified. Adjustments shall be integral to each individual ASD. From a single ASD user interface, any other ASD on the network shall be accessible and full adjustment capabilities shall be provided.

G. Communications

1. NIMs and NCUs: NIMs and NCUs shall communicate to the central server at the physical plant. NIMs and NCUs shall be capable of peer-to-peer communications to all other controllers from the same manufacturer connected to the campus Ethernet system.

2. SDCs and ASDs: SDCs and ASDs shall be capable of peer-to-peer communications at the building network level. Primary SDC's shall be capable of peer-to-peer communications at the building network level and have capability to communicate to the central server at the physical plant via campus Ethernet system.

3. Sensor Input Signals

a. Each SDC and ASD shall be capable of direct interface to industry standard sensors and input signals. All signal inputs shall be compatible with the controllers used, and with the requirements for readout of variables in true scaled engineering units as specified. Temperature, humidity, differential pressure signals, and other signal inputs shall be one of the following types:

(a) 0-20 mA

(b) 4-20 mA

(c) 0-5 VDC

(d) 0-10 VDC

(e) 1000 ohm platinum (at O◦ C, 2.62 ohms/ ◦C)

(f) 1000 ohm Balco (2.2 ohms/◦F)

(g) 10 k ohm Thermistor (at 25◦C/77◦F)

(h) Custom, definable input signals (accept sensor inputs from RTD devices, other than those of the manufacturer).

b. The SDC and ASD shall also be capable of monitoring 2 and 3 state status of starters, fans, H-O-A switches, etc. Isolation relays with bifurcated gold contacts shall be used on all digital or binary inputs (Tyco KHAU17A16 or pre-approved equal).

c. The SDC and ASD shall also be capable of monitoring pulse accumulator inputs from sources such as power meters and flow meters which provide a scaled pulse output.

d. Each electronic analog input shall have the capability of accepting 2 wire inputs and shall be terminated on screw type terminals.

e. Sensors based on proprietary equipment shall not be acceptable.

f. Thermocouples are not acceptable.

4. Actuators Output Signals

a. Each SDC shall directly control electronic actuators and controlled devices. Standard analog output signals that shall be provided are:

(a) 4-20 mA

(b) 0-10 VDC

b. Pneumatic devices shall be controlled through an E/P Device. The E/P Device shall have output scaled to 0-15 psi. The E/P device shall utilize 4-20 mA / 0-10 VDC.

c. The SDC shall be capable of performing 2 and 3 state output functions to emulate H-O-A switches, contact closures, etc. Isolation relays shall be used to drive fan and pump starters piloted by the digital outputs of the SDC. See *Section 23 09 13 - Instrumentation and Control Devices for HVAC* for device specifications.

d. Modulating outputs shall be industry standard 0-5 VDC, or 0-12 VDC with definable output spans, to adapt to industry available control products. Milliamp outputs of 0-20 mA or 4-20 mA are also acceptable. Drive open/Drive closed type modulating outputs are acceptable provided that they also comply with the following requirements. All modulating outputs shall provide within the control panel, a meter gauge, or display indication via on board display or HHOT, the commanded position signal for the actuating device. This meter, gauge, or display shall provide either a 0-100 percent position indication, or read out directly in the engineering units of the signal being used. Drive open/drive closed type controllers shall include sufficient components and control algorithms to comply with this requirement. In the case of drive open/closed technology, position feedback or a software calibration sequence shall ensure that the controlled device is at the commanded position.

e. Pilot positioners shall be installed on all valve and damper actuators serving primary mechanical equipment such as AHUs, heat exchangers, etc.

H. Proprietary Software

1. If the BAS Contractor wants a signed licensing agreement for proprietary software, he shall develop one that is mutually agreeable to both parties, prior to requesting its execution. Failure to initiate this process in a timely fashion shall not interfere with progress and completion.

2.4 GRAPHICAL REPRESENTATION

A. General Requirements:

1. Graphics Title: Provide a prominent, descriptive title on each graphics page.

2. System Status: To facilitate the debugging / testing phase and final delivery of graphics screens to the Owner, each graphics screen shall indicate system function as follows:
   a. UNDER CONSTRUCTION.
   b. INSTALLATION AND START-UP.
   c. SYSTEM OFF-LINE.
   d. SYSTEM ON-LINE.
3. Dynamic Update: When the workstation is on-line, all graphic I/O object values shall be updated with change-of-value services, or by operator selected discrete intervals.
4. Graphic Linking: Forward and backward linking shall be provided between floor plans, sub-plans, summaries and equipment down to application-specific screen.
5. Resolution and Color Representation: Graphics shall be clear and legible to a screen resolution of 1280 x 1024 pixels. Background shall be teal; RGB value 0/128/128.

B. Building Main Navigation Screen:

1. Provide at least one Building Main Navigation Screen that contains links to all mechanical systems including Air Handling Units, Heat Exchangers, Heat Recovery Systems, and Central Systems (like Chilled Water Load, Condensate Flow, Utility Consumption, etc.) in the building. The Building Main Navigation Screen shall show system mode and alarm status. See *Exhibits 23 09 23-1a* and *23 0923-1b* for *Example Building Main Navigation Screens*.
2. A link shall be provided from the Building Main Navigation Screen to an accurate AHU zone plan (floor plan). See paragraph below for AHU zone plan requirements.
3. A link shall be provided from the Building Main Navigation Screen to the VAV Navigation Screen. See paragraph below for the VAV Navigation Screen requirements.
4. The upper right hand corner of this Building Main Navigation Screen shall contain a dynamic display of the following information:
   a. Global Outside Air Temperature.
   b. Global Outdoor Air Humidity.
   c. Global Outdoor Air Dew Point.
   d. Global Outdoor Air Enthalpy.
5. The top middle of the page shall list the Building Name and Building Number. Also, a link shall be provided to the main “Illinois” BAS home page, which contains a list of active links to all the campus buildings.

C. AHU and Other Mechanical Equipment Graphics Screens (Heat Exchangers, Enthalpy Wheels, Boilers, Chillers, etc.)

(Graphic details provided for AHU as an example).

1. Provide at least one Graphic display for each Air Handling Unit. Indicate in the top of the screen (above the graphics): Building Name, Building Number, Air Handling Unit Name, Air Handling Unit Number, and Unit Location (mechanical room number). See *Exhibits 23 09 23-2a* and *23 09 23-2b* for *Example AHU Graphics Screens*. Graphically show the mechanical systems in as-built condition (i.e. do not use generic drop-in graphics). Include a standard AHU graphics library with all of the controls instruments and mechanical devices and associated set points. Locate all instruments and control objects on the drawing (e.g. By-Pass Dampers, Control Dampers, Control Valves, Freeze-Stats, etc.) as they are installed in the field.

2. Control Set Points shall be clearly listed and exposed in a box above each instrument.
3. Each control set point shall have override capability.
4. Show all Controls Inputs and Controls Outputs (AO, DO) on the screen.
5. The Owner shall be able to perform troubleshooting from this graphics screen.
6. The upper right hand corner of this screen shall contain information related to following: AHU scheduling, AHU start-up, and any mode change such as cooling lock out, economizer lock out, etc.
7. This graphics screen shall have a link to the most current version of the written Sequence of Operations. The Sequence of Operations shall be updated at the end of the Project to reflect as-built conditions. A printable version of the Sequence of Operations shall be supplied as part of the graphics.
8. Provide color-coded floor (zone) plan with AHU service zones including hallways, etc. Multiple floor plans shall have a consistent color-code among floor plans. Distinct colors shall be used to clearly differentiate between zones, and a legend shall be provided if needed for clarity. If used, indicate and provide links to sub-plan areas. Emulate the project's drawings for the zone plan backgrounds. Where applicable, include the mechanical room, HVAC equipment and control components locations, with corresponding links to the main mechanical pieces of equipment and AHU. Links to these zone plans shall be provided from the Building Main Navigation Screen. These floor plans (zone drawings) shall reside in the control system database. See *Exhibit 23 09 23-3, Example AHU Zone Plan*.

D. VAV / Terminal Units, Fan Coil Units and/or other HVAC Equipment Graphics Screens:

(Graphic details provided for VAV Boxes as an example.)

1. A VAV Main Navigation Screen shall be provided, containing links to all VAV Summary Tables and VAV Small Scale Zone Plans. A link to this VAV Main Navigation Screen shall be provided from the Building Navigation Screen. See *Exhibits 23 09 23-04a* and *23 09 23-04b* for *Example VAV Navigation Screens*.
2. VAV box and other HVAC equipment listing shall be provided in a form of a matrix or table on a summary table page. The table header shall include the following: Building number, AHU number servicing the associated VAV boxes, Room Number (location of VAV box), and all main performance parameters including VAV Flow (CFM), Room Set Point, Room Temperature, VAV Discharge Air Temperature (Auxiliary Temp), and Occupancy Mode. On this same page, provide an AHU operation information box which displays the AHU discharge (supply) air temperature, occupancy mode and supply static. A link to each VAV Summary Table shall be provided from the VAV Navigation Screen. See *Exhibits 23 09 23-5a* and *23 09 23-5b* for *Example VAV Summary Tables*.
3. In addition, small scale floor plans shall be provided to show a graphical presentation of AHU locations and service areas. A link to each VAV small scale zone plan shall be provided from the VAV Navigation Screen See *Exhibit 23 09 23-6, Example VAV Small Scale Zone Plan*.
4. A link (from both the VAV summary table and the VAV small scale zone plan) to each individual VAV box shall be provided, showing a two or three dimensional drawing (i.e. a zoomed in view of the VAV /Terminal Unit controls detailed drawing). This detailed VAV / Terminal Unit graphic screen shall have all control details including control set points, alarm condition, and signals going IN and OUT of VAV box /Terminal Unit. Each set point shall have override capability (dampers modulation, re-heat valve, etc.). See *Exhibits 23 09 23-7a* and *23 09 23-7b* for *Example VAV Graphic Screens*.

E. Trends:

1. Trending will be determined based on project needs. As a minimum, fan operation, control valve actuation, dampers actuation, safeties and system temperatures shall be trended. All physical IN and OUT points shall be trended.

2.5 EXTENDED BAS SYSTEM COMPONENTS

A. Complete Operating System: The Contractor shall provide all hardware, cards, network controllers, transducers, software, programs, communications wiring, modems, devices and any other components required to make a complete operating system.

PART 3 - EXECUTION

3.1 COORDINATION WITH IT and F&S DESIGN SERVICES

A. The Contractor shall contact Campus Information and Technology Services and provide them with the location of their control panels requiring the installation of network interface jacks.

B. Plant Design will assign an engineer to review the proposed panel location and determine if network connections can be provided.

C. The Contractor shall install the necessary conduit for the installation of network interface jacks as per the instructions of the Plant Design engineer.

D. The Contractor shall forward the installed jack numbers to the Control System Manager at the Facilities and Services Division.

E. The Control System Manager shall make arrangements to have the network jacks activated.

F. The Control System Manager will notify the Contractor when the jacks are activated and assign IP addresses and host names.

3.2 CONFIRMATION OF POINT NAMES

A. The Contractor shall submit their proposed point names to the Owner for review and approval prior to beginning any programming. The Contractor shall not begin their programming effort until the Owner has approved the point names.

3.3 EXAMINATION

A. Acceptance of Conditions: Verify that systems are ready to receive Work. Beginning of installation means Installer accepts existing conditions.

B. Integrate Existing System: Identify existing BAS controllers within the building and include an integration plan to utilize the existing system if it is from the current approved vendor list.

3.4 INSTALLATION

A. Manufacturers Instruction: Install in accordance with manufacturers instruction.

B. Verify Locations: Verify locations of thermostats, humidistats, and other exposed sensors with Drawings and room details before installation. Locate top of each room thermostat a maximum of 48 inches above the floor.

C. Controller Installation: Mount controllers on freestanding angle iron or uni-strut supports in areas away from direct sources of heat or water and out of high traffic areas. One rack may be expanded to accommodate multiple controllers in the same equipment room.

D. Adjacent to Associated Equipment: Mount controllers and control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in the same equipment room.

E. NEC Compliant: Provide NEC compliant conduit and electrical wiring for all temperature control wiring per *Division 26 – Electrical* of these specifications. All low voltage wiring (0-40 Volts), control/power wiring (110 - 120 Volts), and pneumatic tubing shall be run in their own separate raceways. All wiring shall be plenum rated if a cable tray is used. Rigid conduit shall be used in Utility Plants.

F. Test and Adjust: After completion of installation, test and adjust control equipment and programming.

G. Calibration: Check calibration of instruments. Recalibrate or replace noncompliant equipment.

H. All Low voltage cable shall be 6300 FE BELDEN CABLE used for all analog input, analog output and digital input signal wiring.

3.5 COMMISSIONING

A. Utility metering systems shall be in place, functional, and commissioned prior to start-up of utility services by the University. The utility service shall not be activated until the University has the means to measure the utility. The DDC Controls System shall be functional, the utility signals trended, and its operation validated to accurately meter the Utility service by the University prior to the utility service being activated. This can be accomplished by means of a functional permanent panel or, at a minimum, with a temporary meter.

B. Calibration Report: The BAS Contractor shall submit to the Owner a calibration report of all final slopes, intercepts and/or offsets for all devices prior to final witnessing by the Owner. Documentation shall include all Contractor notes and verifications such as point-to-point checkout sheets and shall be appended to contractor-completed Functional Performance Procedures (FPPs). The calibration report shall include all real and virtual points, including energy calculations when included in vendor's equipment (such as for energy recovery wheels). Follow this specification and coordinate with all Commissioning Specification Sections in the Project.

3.6 TRAINING

A. Upon completion of the work and after User acceptance of Functional Performance testing, 8 hours of on-site training shall be provided by an instructor thoroughly familiar with the installed system. Training will be provided to the Owner's operating personnel who have responsibility for the mechanical and control systems. The training shall focus on operation and maintenance of the installed system.

END OF SECTION

SECTION 232300 – REFRIGERANT PIPING

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-134a:

1. Suction Lines for Air-Conditioning Applications: 115 psig.

2. Suction Lines for Heat-Pump Applications: 225 psig.

3. Hot-Gas and Liquid Lines: 225 psig.

B. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.

2. Suction Lines for Heat-Pump Applications: 535 psig.

3. Hot-Gas and Liquid Lines: 535 psig.

1.3 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.5 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L, ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.

2. End Connections: Socket ends.

3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly.

4. Pressure Rating: Factory test at minimum 500 psig.

5. Maximum Operating Temperature: 250 deg F.

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.

2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.

3. Operator: Rising stem and hand wheel.

4. Seat: Nylon.

5. End Connections: Socket, union, or flanged.

6. Working Pressure Rating: 500 psig.

7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.

2. Packing: Molded stem, back seating, and replaceable under pressure.

3. Operator: Rising stem.

4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.

5. Seal Cap: Forged-brass or valox hex cap.

6. End Connections: Socket, union, threaded, or flanged.

7. Working Pressure Rating: 500 psig.

8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.

2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.

3. Piston: Removable polytetrafluoroethylene seat.

4. Closing Spring: Stainless steel.

5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.

6. End Connections: Socket, union, threaded, or flanged.

7. Maximum Opening Pressure: 0.50 psig.

8. Working Pressure Rating: 500 psig.

9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.

2. Core: Removable ball-type check valve with stainless-steel spring.

3. Seat: Polytetrafluoroethylene.

4. End Connections: Copper spring.

5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.

2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.

3. Seat: Polytetrafluoroethylene.

4. End Connections: Threaded.

5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24 and 115-V ac coil.

6. Working Pressure Rating: 400 psig.

7. Maximum Operating Temperature: 240 deg F.

8. Manual operator.

F. Moisture/Liquid Indicators:

1. Body: Forged brass.

2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.

3. Indicator: Color coded to show moisture content in ppm.

4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.

5. End Connections: Socket or flare.

6. Working Pressure Rating: 500 psig.

7. Maximum Operating Temperature: 240 deg F.

G. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.

2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.

3. Desiccant Media: Activated charcoal.

4. Designed for reverse flow (for heat-pump applications).

5. End Connections: Socket.

6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.

7. Maximum Pressure Loss: 2 psig.

8. Working Pressure Rating: 500 psig.

9. Maximum Operating Temperature: 240 deg F.

2.3 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.

2. DuPont Company; Fluorochemicals Div.

3. Honeywell, Inc.; Genetron Refrigerants.

4. INEOS Fluor Americas LLC.

C. Acceptable Refrigerants: 134A, 410A, 407C

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Suction Lines for Conventional Air-Conditioning Applications: Copper, Type ACR L, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

C. Hot-Gas and Liquid Lines[, and Suction Lines for Heat-Pump Applications:

1. Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless or packed-angle valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at strainers if they are not an integral part of strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless or packed-angle valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.

2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.

3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.

2. Thermostatic expansion valves.

3. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

L. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.

2. Install horizontal suction lines with a uniform slope downward to compressor.

3. Install traps and double risers to entrain oil in vertical runs.

4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

A. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

B. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.

2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.

2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.

3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.

4. Spring hangers to support vertical runs.

5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.

2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.

3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.

4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.

5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.

6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.

7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.

9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.

2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.

3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
   a. Fill system with nitrogen to the required test pressure.
   b. System shall maintain test pressure at the manifold gage throughout duration of test.
   c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
   d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.

2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.

3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.

4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning controllers to the system Design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Verify that compressor oil level is correct.

2. Open compressor suction and discharge valves.

3. Open refrigerant valves except bypass valves that are used for other purposes.

4. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 233100 – DUCTWORK

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Metal ductwork.

B. Nonmetal ductwork.

C. Nonmetal ductwork.

D. Duct cleaning.

1.2 RELATED SECTIONS

A. Section 099000 - Painting.

B. Section 220000 – Basic Mechanical Requirements.

C. Section 220501 - Supports and Anchors: Sleeves.

D. Section 230700 - Duct Insulation.

E. Section 233300 - Ductwork Accessories.

F. Section 233700 - Air Inlets and Outlets.

G. Section 230500 - Testing, Adjusting and Balancing.

1.3 REFERENCES

A. ASTM A36 - Structural Steel.

B. ASTM A90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.

C. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

D. ASTM A366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality.

E. ASTM A480 - General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

F. ASTM A525 - General Requirements for Steel Sheet, Zinc- Coated (Galvanized) by the Hot-Dip Process.

G. ASTM A527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.

H. ASTM A569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.

I. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

J. AWS D9.1 - Welding of Sheet Metal.

K. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

L. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.

M. NFPA 91 - Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying.

N. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment.

O. SMACNA - HVAC Air Duct Leakage Test Manual.

P. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

Q. SMACNA - Fibrous Glass Duct Construction Standards.

R. SMACNA - Rectangular or Round Industrial Duct Construction Standards.

S. SMACNA - Thermoplastic Duct (PVC) Construction Manual.

T. UL 181 - Factory-Made Air Ducts and Connectors.

1.4 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.5 SUBMITTALS

A. Submit under provisions of Section 013300.

A. Sheet Metal Shop Drawings: Provide drawings at minimum 1/4" = 1'0" scale indicating duct fittings, gages, sizes, welds, and configuration prior to start of work. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.

B. Product Data: Provide data for manufactured ductwork and flexible ducts. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113..

C. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.

D. Manufacturers installation instructions.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017700.

B. Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with applicable SMACNA publication as scheduled in Part 3 - Execution.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing the work of this section with minimum three years documented experience.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures during and after installation of duct sealants.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Square Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having G90 zinc coating in conformance with ASTM A90.

B. Round Galvanized Steel Ducts and Fittings:
   1. Manufacturers:
      a. SEMCO Type SS (85).
      b. Other acceptable manufacturers offering equivalent products include:
         1) United McGill.
   2. Tangent Air.
   3. ASTM A527 galvanized steel sheet, spiral lock seam construction, with G90 zinc coating in conformance with ASTM A90.
   4. Elbows shall have a radius of not less than 1-1/2 times width of duct on centerline.

C. Round Galvanized Steel Ducts and Fittings:
   1. Manufacturer: United McGill longitudinal seam duct or approved equal. Spiral ductwork is <u>not</u> acceptable.
   2. ASTM A527 galvanized steel sheet with G60 zinc coating in conformance with ASTM A90.
   3. Elbows shall have a radius of not less than 1-1/2 times width of duct on centerline.
   4. All connections shall be welded and flanged type, Van Stone connections are <u>not</u> acceptable.

D. Insulated Flexible Ducts:
   1. Manufacturers:
      a. Thermaflex Model M-KF

b. Other acceptable manufacturers offering equivalent products include:
1) Technaflex.
2) Buckley.

2. UL 181, Class 1, CPE inner liner bonded to helically wound spring steel wire; fiberglass insulation; metalized polyester vapor barrier film.
3. Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
4. Maximum Velocity: 4000 fpm (20.3 m/sec).
5. Thermal Conductance: 0.23 BTU/hr/sf/deg F maximum.
6. Insulation: 1 1/2" thick; 3/4 lb.density.
7. Temperature Range: -20 degrees F to 250 degrees F (-28 degrees C to 121 degrees C).

E. Flexible Ducts:
1. Manufacturers:
a. Thermaflex Model S-LD.
b. Other acceptable manufacturers offering equivalent products include:
1) Technaflex.
2) Buckley.
2. UL 181, Class 1, foil reinforced film laminate supported by helically wound spring steel wire; complying with NFPA 90A and NFPA 90B.
3. Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
4. Maximum Velocity: 4000 fpm (20.3 m/sec).
5. Temperature Range: 0 degrees F to 250 degrees F (-18 degrees C to 121 degrees C).

F. Stainless Steel Ducts: ASTM A167, Type 316.

G. Fasteners: Rivets, bolts, or sheet metal screws.

H. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

I. Hanger Rod: ASTM A36; steel [, galvanized]; threaded both ends, threaded one end, or continuously threaded.

2.2 METAL DUCTWORK FABRICATION

A. Fabricate and support in accordance with standards scheduled at Part 3 - EXECUTION. Provide duct material, gages, reinforcing, and sealing for static pressures classifications listed in Part 3 - EXECUTION.

B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide double bladed

air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch (100 mm) cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

2.3 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for static pressures classifications listed in Part 3 - EXECUTION.

B. Flat Oval Ducts:
   1. Manufacturers:
      a. United McGill UNI-SEAL ductwork and UNI-FORM fittings.
      b. Other acceptable manufacturers offering equivalent products include:
         1) Semco.
   2. Tangent Air.
   3. Machine made from round spiral lock seam duct with light reinforcing corrugations; fittings manufactured of at least two gages heavier metal than duct.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install and seal ducts in accordance with applicable SMACNA publication as scheduled below.

C. Duct Sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.

D. Provide openings in ductwork where required to accommodate control devices. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

F. Use double nuts and lock washers on threaded rod supports.

G. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct usable space or block access for servicing building and its equipment.

H. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.

I. Coordinate layout with suspended ceiling and lighting layouts and similar finish work.

J. Connect diffusers to supply ducts directly. In lab and storage areas

K. Connect diffusers to low pressure ducts with 8 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp in office area.

L. Connect supply registers and return and exhaust grilles directly to ductwork. Flexible duct shall not be allowed for connection to these air outlets and inlets.

M. Connect flexible ducts to metal ducts with draw bands plus adhesive.

N. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.2 CLEANING

A. Clean work under provisions of 01700.

B. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.3 SCHEDULES

A. Ductwork Material Schedule:

Air System	Material
Supply, Return, and General Exhaust.	Galvanized Steel

Toilet Exhaust	Galvanized Steel
Outside Air Intake	Galvanized Steel
Fume Hood Exhaust	Stainless Steel

B. Ductwork Pressure Class Schedule:

Air System	Pressure Class
Supply	1 inch (250 Pa)
Return and Relief	1/2 inch (125 Pa)
General and Toilet Exhaust	1/2 inch (125 Pa)
Fume Hood Exhaust	2 inch (500 Pa)
Outside Air Intake	1/2 inch (125 Pa)

C. Ductwork Seal Class Schedule:

Pressure Class	Seal Class
2 inch (125 Pa) and less	C

Construction Standards Schedule:

Air System	Construction Standard
Supply and outside air and toilet exhaust	SMACNA - HVAC Duct Construction Standards Metal and Flexible.

END OF SECTION

SECTION 233300 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

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1.1 SECTION INCLUDES

A. Counterbalanced dampers.

B. Backdraft dampers.

C. Combination fire and smoke dampers.

D. Duct access doors.

E. Duct test holes.

F. Fire dampers.

G. Volume control dampers.

H. Flexible connections.

I. Stack caps.

J. Wall caps.

1.2 RELATED SECTIONS

A. Section 220000 – Basic Mechanical Requirements.

B. Section 230700 - Ductwork Insulation.

C. Section 233100 - Ductwork.

1.3 REFERENCES

A. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

B. NFPA 92A - Smoke Control Systems.

C. NFPA 70 - National Electrical Code.

D. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

E. SMACNA - Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems.

F. UL 33 - Heat Responsive Links for Fire-Protection Service.

G. UL 555 - Fire Dampers and Ceiling Dampers.

H. UL 555S - Leakage Rated Dampers for Use in Smoke Control Systems.

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Indicate dimensions, required clearances and construction details for dampers.

C. Product Data:
   1. For counterbalanced and backdraft dampers indicate pressure drop and minimum static pressure required to open.
   2. For combination fire and smoke dampers indicate fusible link rating, UL listing and electrical characteristics.
   3. For fire dampers indicate fusible link rating and UL listing.

D. Manufacturer's Installation Instructions.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017700.

B. Record actual locations of dampers, access doors and test holes.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories Inc., as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016000.

B. Protect dampers from damage to operating linkages and blades.

1.9 EXTRA MATERIALS

A. Furnish under provisions of Section 017700.

B. Provide one of each size and type of fusible link.

PART 2 - PRODUCTS

2.1 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers:
   1. Ruskin Model FSD60.
   2. Other acceptable manufacturers offering equivalent products include:
      a. Air Balance.
      b. Greenheck.
      c. Prefco.

B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

C. Provide factory sleeve, minimum 20 gage, and collar for each damper.

D. Multiple Blade Dampers: Fabricate with minimum 16 gage (1.5 mm) galvanized steel frame and airfoil-shaped blades, stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch (12.7 mm) actuator shaft.

E. Operators: UL listed and labelled spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on exterior of duct and link to damper operating shaft.

F. Damper shall have 1 1/2 hour fire rating.

G. Electro Fuse Link: Electric automatically resettable link set at 165 degrees F .

2.2 DUCT ACCESS DOORS

A. Manufacturers:
   1. Ruskin.
   2. Air Balance.
   3. Greenheck.
   4. Buckley.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch (25 mm) thick insulation with sheet metal cover.
   1. Less Than 12 Inches (300 mm) Square: Secure with sash locks.
   2. Up to 18 Inches (450 mm) Square: Provide two hinges or continuous hinge and two sash locks.
   3. Up to 24 x 48 Inches (600 x 1200 mm): Three hinges or continuous hinge and two compression latches [with outside and inside handles].
   4. Larger Sizes: Provide an additional hinge.

D. Access doors with sheet metal screw fasteners are not acceptable.

2.3 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.4 FIRE DAMPERS

A. Manufacturers:
   1. Ruskin models noted below.

2. Other acceptable manufacturers offering equivalent products include:
   a. Air Balance.
   b. Greenheck.
   c. Prefco.

B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

C. Ceiling Dampers: Galvanized steel, minimum 22 gage (0.76 mm) frame and 22 gage (0.76 mm) insulated blades. Provide with adjustable air flow balancing device and thermal insulation blanket for diffusers. Dampers shall be Ruskin Model CFD.

D. Curtain Type Dampers: Galvanized steel minimum 22 gage (0.76 mm) frame and interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Damper shall be Ruskin Model IBD.

E. Multiple Blade Dampers: 16 gage (1.5 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch (3.2 x 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock. Damper shall be Ruskin Model FD31.

F. Fusible Links: UL 33, separate at 165 degrees F.

G. Fire rating of dampers shall be 1 1/2 hour unless noted otherwise on the drawings.

2.5 VOLUME CONTROL DAMPERS

A. Manufacturers:
   1. Ruskin models listed below.
   2. Other acceptable manufacturers offering equivalent products include:
      a. Air Balance.
      b. Greenheck.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Single Blade Dampers: For duct sizes up to 12 x 36 inch (305 x 915 mm) and 20 inch (510 mm) diameter with minimum 20 gage frame and blade and molded synthetic bearings. Damper shall be Ruskin Model MD25 and MDRS25.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 48 inch (200 x 1200 mm). Provide with minimum 16 gage frame and blades and molded synthetic bearings. Dampers shall be Ruskin Model MD35.

E. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches (750 mm) provide regulator at both ends.

2.6 FLEXIBLE CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Connector: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions, NFPA 90A, and SMACNA publications and guidelines. Refer to Section 15890 for duct construction and pressure class.

B. Provide backdraft dampers on all exhaust fans where damper is not provided as an accessory to the fan and where shown on the drawings.

C. Provide duct access doors for inspection and cleaning before and/or after filters, coils, manual dampers, control dampers, control devices,[fire dampers, combination fire and smoke dampers, and where shown on the drawings. Minimum door size shall be 10 x 12 inches (250 x 300 mm) except where limited by duct size.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers , combination fire and smoke dampers at locations indicated, and where ducts and outlets pass through fire rated components. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Install combination smoke and fire dampers in accordance with NFPA 92A.

G. Demonstrate re-setting of fire dampers to Owner's representative.

H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing and where shown on the drawings. Install minimum 2 duct widths from duct take-off.

I. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment and supported by vibration isolators.

J. Install air flow switches in horizontal ductwork wherever possible. Installation in vertical ductwork is permitted where air flow is upward. Install minimum ten duct diameters from fan discharge and seven duct diameters downstream of a duct elbow or other source of turbulence wherever possible.

END OF SECTION

SECTION 233400 - CENTRIFUGAL FANS

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Inline centrifugal fans.

B. Roof mounted centrifugal fans.

C. Cabinet type inline centrifugal fans.

1.2 RELATED WORK

A. Section 220000 – Basic Mechanical Requirements.

B. Section 220504 - Vibration Isolation and Seismic Restraints.

C. Section 233100 - Ductwork.

D. Division 26000 - Electrical.

1.3 REFERENCES

A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

C. AMCA 99 - Standards Handbook.

D. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes

E. AMCA 300 - Test Code for Sound Rating Air Moving Devices.

F. AMCA 301 - Method of Calculating Fan Sound Ratings from Laboratory Test Data.

G. NFPA 70 - National Electrical Code.

H. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Indicate assembly of centrifugal fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

C. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions.

E. Equipment shall be Energy Star rated.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01770.

B. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016000.

B. Protect motors, shafts, and bearings from weather and construction dust.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

1.8 EXTRA MATERIALS

A. Furnish under provisions of Section 017700.

B. Provide two sets of belts for each fan.

PART 2 - PRODUCTS

2.1 ROOF MOUNTED CENTRIFUGAL FANS – EF-1, EF-2, EF-5

A. Manufacturers:
   1. Greenheck Type VHK.
   2. Other acceptable manufacturers offering equivalent products include:
      a. Loren Cook Co.
      b. Penn Ventilator Co.

B. General:
   1. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
   2. Sound Ratings: AMCA 301, tested to AMCA 300 and bear AMCA Certified Sound Rating Seal.
   3. Fabrication: Conform to AMCA 99.
   4. Performance and model shall be as scheduled on the drawings.
   5. Units to be of spark resistant construction with TEFC motors. Motors mounted out of the air stream, or explosion proof if mounted in the air stream.

C. Wheel and Inlet: Aluminum construction with backward inclined blades; statically and dynamically balanced.

D. Housing and frame: Heavy gauge aluminum with galvanized steel internal support structure. Motor housing shall be separate removable shroud. Fan shall be configured for downflow configuration. Entire drive assembly and fan shall be mounted on internal vibration isolators.

E. Bearings and Drives:
   1. Bearings: AFBMA 9, L-50 life at 200,000 hours, pillow block type, grease-lubricated ball bearings with extended grease lines.
   2. Shafts: Hot rolled polished steel.
   3. V-Belt Drive: Cast iron or steel sheaves.

F. Electrical Characteristics and Components:
   1. Electrical Characteristics: As scheduled on the drawings.
   2. Motor: Open drip proof (ODP). Refer to Section 15170.
   3. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70. Provide conduit chase for installing wiring through the roof curb.

G. Accessories:
   1. Backdraft Dampers: Gravity, parallel blade, galvanized steel frame with aluminum blades.
   2. Bypass Dampers: Motorized, parallel blade, galvanized steel frame with aluminum blades controlled by hood sash mounted airflow monitor.
   3. Roof curb: 18" high, insulated.
   4. Birdscreen: 1/2" galvanized steel mesh at discharge.
   5. Disconnect switch: NEMA 1 factory wired to the motor.

2.2 ROOF MOUNTED CENTRIFUGAL FANS – EF-3, EF-4

A. Manufacturers:
   1. Greenheck Type CUE.
   2. Other acceptable manufacturers offering equivalent products include:
      a. Loren Cook Co.
      b. Penn Ventilator Co.

B. General:
   1. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
   2. Sound Ratings: AMCA 301, tested to AMCA 300 and bear AMCA Certified Sound Rating Seal.
   3. Fabrication: Conform to AMCA 99.
   4. Performance and model shall be as scheduled on the drawings.

C. Wheel and Inlet: Aluminum construction with backward inclined blades; statically and dynamically balanced.

D. Housing and frame: Heavy gauge aluminum with galvanized steel internal support structure. Motor housing shall be separate removable shroud. Fan shall be configured for downflow configuration. Entire drive assembly and fan shall be mounted on internal vibration isolators.

E. Bearings and Drives:
   1. Bearings: AFBMA 9, L-50 life at 200,000 hours, pillow block type, grease-lubricated ball bearings with extended grease lines.
   2. Shafts: Hot rolled polished steel.
   3. V-Belt Drive: Cast iron or steel sheaves.

F. Electrical Characteristics and Components:
   1. Electrical Characteristics: As scheduled on the drawings.
   2. Motor: Open drip proof (ODP). Refer to Section 15170.
   3. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70. Provide conduit chase for installing wiring through the roof curb.

G. Accessories:
   1. Backdraft Dampers: Gravity, parallel blade, galvanized steel frame with aluminum blades. Dampers shall be shipped loose for mounting in the roof curb.
   2. Roof curb: 12" high, insulated.
   3. Birdscreen: 1/2" galvanized steel mesh at discharge.
   4. Disconnect switch: NEMA 1 factory wired to the motor.

2.3 WALL MOUNTED PROPELLER FAN – EF-6

A. Manufacturers:
   1. Greenheck Type SS1.
   2. Other acceptable manufacturers offering equivalent products include:
      a. Loren Cook Co.
      b. Penn Ventilator Co.

B. General:
   1. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
   2. Sound Ratings: AMCA 301, tested to AMCA 300 and bear AMCA Certified Sound Rating Seal.
   3. Fabrication: Conform to AMCA 99.
   4. Performance and model shall be as scheduled on the drawings.

C. Housing and frame: Heavy gauge aluminum with galvanized steel internal support structure. Motor housing shall be separate removable shroud. Entire drive assembly and fan shall be mounted on internal vibration isolators.

D. Electrical Characteristics and Components:
   1. Electrical Characteristics: As scheduled on the drawings.
   2. Motor: Open drip proof (ODP). Refer to Section 15170.
   3. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70. Provide conduit chase for installing wiring through the roof curb.

E. Accessories:
   1. Backdraft Dampers: Gravity, parallel blade, galvanized steel frame with aluminum blades. Dampers shall be shipped loose for mounting in the roof curb.
   2. Wall Frame Housing with weatherhood and OSHA fan and motor guards.
   3. Birdscreen: 1/2" galvanized steel mesh at discharge.
   4. Disconnect switch: NEMA 1 factory wired to the motor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide safety screen where inlet or outlet is exposed.

C. Provide backdraft dampers on discharge of all exhaust fans.

END OF SECTION

SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Diffusers.

B. Registers.

C. Grilles.

1.2 RELATED SECTIONS

A. Section 099000 - Painting: Painting of exposed ductwork and ductwork, visible behind outlets and inlets.

B. Section 220000 – Basic Mechanical Requirements.

C. Section 233100 - Ductwork.

D. Section 233300 - Ductwork Accessories.

1.3 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.

C. ARI 650 - Air Outlets and Inlets.

D. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

E. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

F. NFPA 70 - National Electrical Code.

G. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

1.4 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level. Provide printed statement of VOC content.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 017700.

B. Record actual locations of air outlets and inlets.

1.6 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate louvered penthouse performance in accordance with AMCA 500.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 GENERAL

A. For all diffusers, grilles and registers, Noise Criteria (NC) shall not exceed 30 unless noted otherwise on drawings. NC rating shall be for diffuser/neck assembly.

B. For schedule of sizes, airflows, etc. refer to schedule on the drawings.

C. Substitutions: Under provisions of Section 01600.

2.2 ROUND CEILING DIFFUSERS, SCHEDULED

A. Manufacturers:
   1. Price
   2. Other acceptable manufacturers offering equivalent products:
      a. Metal Aire.
      b. Carnes Co.

B. Type: Round, stamped or spun, multi-core diffuser to discharge air in 360 degree pattern, with removable inner cores and round neck. Diffuser shall have adjustable pattern with capability of being adjusted from the face of the diffuser without removing the inner core (rotating adjustment).

C. Fabrication: Steel with baked enamel off-white finish.

D. Accessories: Model AG-75 opposed blade damper for round neck with damper adjustable from diffuser face.

2.3 SQUARE CEILING DIFFUSERS, SCHEDULED

A. Manufacturers:
   1. Price.
   2. Other acceptable manufacturers offering equivalent products:
      a. Metal Aire.
      b. Carnes Co.

B. Type: Square, adjustable pattern, stamped, multi-core, multi-louvered diffuser to discharge air in 360 degree pattern with removable inner core and round neck.

C. Frame: Compatible with ceiling to be mounted in.

D. Fabrication: Steel with baked enamel off-white finish.

E. Accessories: Model AG-75 opposed blade damper for round neck with damper adjustable from diffuser face without removing inner core.

2.4 EXHAUST AND RETURN GRILLES , SCHEDULED

A. Manufacturers:
   1. Price.
   2. Other acceptable manufacturers offering equivalent products:
      a. Metal Aire.

b. Carnes Co.

B. Type: Fixed grilles of 1/2 x 1/2 x 1/2 inch (13 x 13 x 13 mm) louvers.
C. Frame: Compatible with ceiling to be mounted in.

D. Fabrication: Aluminum with factory off-white enamel finish.

E. Damper: Model AG-35-AA aluminum, integral, gang-operated, opposed blade type with removable key operator, operable from face.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to each air inlet or outlet, despite whether dampers are specified as part of the air inlet or outlet assembly.

E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 099000.

F. Air inlets and outlets installed in suspended ceilings where the size of the air inlet or outlet is less than the grid (ie. less than 24"x24") shall be provided with borders for flush mounting.

G. Support air inlets and outlets independent of the ceiling structure.

END OF SECTION

SECTION 237400 - PACKAGED ROOF-TOP AIR CONDITIONING UNITS

PART 1 - GENERAL

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1.1 SECTION INCLUDES

A. Packaged roof-top unit.

B. Unit controls.

C. Roof curb.

D. Split Systems

1.2 RELATED SECTIONS

A. Section 220000 - Basic Mechanical Requirements.

B. Section 220504 - Vibration Isolation and Seismic Restraints.

C. Section 233100 - Ductwork.

D. Division 260000 - Electrical.

1.3 REFERENCES

A. ARI 210 - Unitary Air-Conditioning Equipment.

B. ARI 270 - Sound Rating of Outdoor Unitary Equipment.

C. NFPA 70 - National Electrical Code.

D. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

1.4 SUBMITTALS

A. Submit as defined in Division 1.

B. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

C. Product Data:
   1. Provide literature which indicates dimensions, weights, capacities, ratings, fan performance, gages and finishes of materials, accessories and electrical characteristics and connection requirements.
   2. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.
   3. Equipment to be Energy Star rated.

D. Manufacturer's Installation Instructions.

E. “Green” Building Submittals:
   1. Product data indicating percentage by weight of post-consumer and pre-consumer recycled content for products having recycled content.
   2. Product Data on Regional Materials:
      a. Provide distance between project site and final manufacturing location.
      b. Products in the section do not need to comply with LEED MR credits.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit documents under provisions of Division 1.

B. Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.8 WARRANTY

A. Provide a five year warranty to include coverage for refrigeration compressors.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.10 EXTRA MATERIALS

A. Provide one set of extra filters for unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Trane with capacities as scheduled on the drawings.

B. Other acceptable manufacturers offering equivalent products include:
   1. Carrier.
   2. York.

2.2 PERFORMANCE

A. Evaporator fan capacity shall be as scheduled on the drawings.

B. Cooling capacity for units shall be as scheduled on the drawings.

C. Natural gas-fired heating capacity shall be as scheduled on the drawings.

D. Electrical Characteristics: As scheduled on the drawings.
   1. Provide factory mounted disconnect switch.
   2. Provide factory mounted motor starter.

2.3 GENERAL

A. Units shall be roof mounted, constant volume with gas fired heating, electric cooling, integrated economizer, heat recovery where noted and packaged controls.

B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, gas fired heating section, controls, air filters, refrigerant cooling coil and compressors, condenser coil, condenser fan, motor starter and fused disconnect. Independent curb mounted fan assisted plate type heat recovery units are provided for each RTU serving the lab area. **Exhaust fan for ERV serving RTU #3 shall be of spark resistant construction, airside components meeting Class 1 Div 1 classification – see RTU schedule.** Refer to schedule on drawings.

2.4 FABRICATION

A. Cabinet: Galvanized steel with baked enamel finish and hinged access doors. Structural members shall be minimum 18 gage (1.20 mm) and access doors shall be minimum 20 gage (0.90 mm).

B. Insulation: One inch (25 mm) thick neoprene coated glass fiber with edges protected from erosion.

C. Supply Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive.

D. Convenience Outlet: Provide factory mount GFI (Ground Fault Convenience Outlet), manual reset with weatherproof enclosure.

E. Air Filters: 2 inch (50 mm) thick glass fiber disposable media in metal frames. Provide one set of extra filters.

2.5 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with fins mechanically bonded to seamless copper tubes; all joints brazed. Provide galvanized steel drain pan and pipe connection.

B. Evaporator coil shall be of the full face active design with intertwined circuiting to provide 2 independent refrigeration systems.

C. Provide thermal expansion valves, filter driers and sight glasses at refrigerant circuits.

2.6 COMPRESSOR

A. Provide (2) semi-hermetic compressors, 1750 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gage ports.

B. Provide five minute timed off circuit to delay compressor start.

2.7 CONDENSER OUTDOOR COIL

A. Provide copper tube aluminum fin coil assembly with fins mechanically bonded to seamless copper tubes; all joints brazed.

B. Provide direct-drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor.

C. Provide refrigerant pressure switches and "hail guard" condenser fan outlet.

2.8 HEATING COIL

A. Provide indirect gas fired heating coil with modulating gas burner and controls.

2.9 ECONOMIZER PACKAGE - FACTORY INSTALLED

A. Dampers: Provide outside and return dampers with damper operator and control package to automatically vary outside air quantity based upon space CO2 levels. Outside air damper shall be normally closed type.

B. Gaskets: Provide low leakage dampers with blade and edge seals; maximum leakage 5 percent at 2 inches (500 Pa) pressure differential.

C. Damper Operator: 24 volt with gear train sealed in oil with spring return.

D. Power Exhaust: Integral, propeller type exhaust fan with fan drive and low leakage damper, factory installed.

E. Differential Enthalpy Economizer Cycle: Temperature and humidity of return air and outside air shall be monitored and respective dampers shall be modulated. When enthalpy of the outside air is less than the return air, outside air and exhaust dampers shall open and power exhaust fan shall start.

2.10 OPERATING CONTROLS

A. Controls shall be self-contained, demand orientated, solid state. Unit shall have minimum two stages of cooling and heating. Provide unit with remote duct mounted temperature and CO2 sensors.

B. Central panel shall incorporate:
1. Staging of heating and cooling.
2. Automatic changeover between heating and cooling.
3. Dual setpoint with adjustable dead band.
4. Programming based on weekdays, Saturday and Sunday.
5. 24 hour clock.
6. Fan/off/auto operation.
7. Room temperature display.
8. Programmed temperature display.
9. Programmed time display.
10. Duration of timed override display.
11. Day of week display.
12. Display of system mode: heating, cooling, auto, off, fan.

2.11 ROOF CURB

A. Curbs shall be isolated Seismic Rooftop Spring Curb; type B-3.

B. Curbs shall be designed to mate with the unit and provide support and complete weathertight installation.

C. Roof curb shall accommodate any offsets in unit casing such that all piping through roof remains internal to the roof curb.

D. Interface between curb and unit base shall be fully gasketed to prevent water penetration.

2.12 SPLIT SYSTEMS

A. Refer to equipment schedule on drawing for IT room and refrigerator units.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in conformance with ARI 90A.

C. Mount units on roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

D. Provide transition between distribution ductwork and unit flexible connector within the roof curb where required to coordinate with steel joist layout and spacing.

E. Lubricate units before start-up.

F. After testing and startup has been completed, replace filters with extra set of clean filters.

3.2 DEMONSTRATION

A. Provide systems demonstration under provisions of Division1.

END OF SECTION

SECTION 23 9010 - BUILDING CONTROL SYSTEM COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements commissioning the building control systems, assemblies, equipment, software, graphic displays and programming.

B. General commissioning requirements are described in Division 01 Section 01 9110 and are therefore not repeated in this Section.

C. In addition to the drawings and general provisions of the contract, commissioning requirements are defined in the following sections:

Section 01 9110 – General Commissioning Requirements
Section 01 9115 – Facility Exterior Envelope Commissioning Requirements
Section 22 0800 – Plumbing System Commissioning Requirements
Section 23 0800 – HVAC System Commissioning Requirements
Section 23 9010 – Building Control System Commissioning Requirements
Section 26 0800 – Electrical System Commissioning Requirements

1.2 DEFINITIONS

A. Definitions are listed in Section 01 9110 – General Commissioning Requirements

1.3 SUBMITTALS

A. Refer to Section 01 9010 for submittal requirements.

B. In addition, provide the following:

1. The control drawings shall have a key to all abbreviations.
2. The control drawings shall contain graphic schematic depictions of the systems and each component.
3. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
4. Provide a full points list with at least the following included for each point:

    a. Controlled system
    b. Point abbreviation
    c. Point description
    d. Operator displays

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment being tested. For example, the controls contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the BAS system and controls system. A sufficient quantity of two-way radios shall be provided by each subcontractor.

B. Refer to Division 01 Section 019110 "General Commissioning Requirements" for a detailed description of test equipment requirements.

PART 3 - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

A. With assistance from the installing contractors, the CxA will prepare Construction Checklists for all commissioned components, equipment, and systems

1. Checklists will be developed by the CxA and provided to the contractors.
2. Contractors will complete the construction checklists and provide completed copies to the CxA prior to beginning system functional testing
3. To avoid duplication of effort, contractors may document testing and start-up activities using their own checklists, and provide them as attachments to the checklists issued by the CxA.

B. The Controls Contractor shall document all BAS testing and startup activities using their own forms. Completed test and startup forms shall be submitted to the CxA for review.

C. Red-lined Drawings:

1. The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
4. The contracted party, as defined in the Contract Documents will create the as-built CAD drawings.
5. All red-lined drawings are to be available on-site for review by the Owner and the CxA.

D. Operation and Maintenance Data:

1. The contractor will provide a copy of O&M literature for use during the commissioning process for all commissioned equipment and systems.

2. The CxA will review the O&M literature for conformance to project requirements.
3. The CxA shall have access to a copy of the final approved O&M literature once corrections have been made by the Contractor.

3.2 COMMISSIONING TEAM RESPONSIBILITIES

A. Refer to Section 01 9110 "General Commissioning Requirements" for commissioning team member roles and responsibilities.

3.3 TESTING PREPARATION

A. Certify in writing to the CxA that BAS systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Inspect and verify the position of each device and interlock identified on the construction documents and equipment vendor's submittals.

C. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

D. Inspect and verify the position of each device and interlock identified on checklists.

E. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

F. Verify that all operator displays, graphics, trending and alarms are fully functional.

G. If the failure rate of a similar family of equipment or devices is greater than 10%, then the Owner shall be notified. The matter shall be addressed by the Owner, CM, CxA, and other applicable parties. The failure issue shall be resolved to the Owner's satisfaction.

3.4 TESTING, ADJUSTING AND BALANCING VERIFICATION

A. The Controls Contractor shall provide support to the Testing & Balancing Contractor as required for TAB activities.

3.5 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to support the CxA in performing systems functional testing.

B. Scope of BAS testing shall include entire BAS installation, including control system hardware, wiring, sensors, operator terminals, software programming, graphic displays, alarms and data storage. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of BAS controllers and sensors.

C. The CxA along with the BAS contractor, testing and balancing Subcontractor, and BAS Instrumentation and Control Subcontractor shall prepare detailed testing plans, procedures, and checklists for BAS systems, subsystems, and equipment.

D. Tests will be performed using design conditions whenever possible.

E. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

F. The CxA may direct that set points be altered when simulating conditions is not practical.

G. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

H. If tests cannot be completed because of a deficiency outside the scope of the BAS system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

I. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.6 RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

A. Refer to Division 01 Section 019110 “General Commissioning Requirements” for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.7 APPROVAL

A. Refer to Division 01 Section 019110 “General Commissioning Requirements” for approval procedures.

3.8 DEFERRED TESTING

A. Refer to Division 01 Section 019110 “General Commissioning Requirements” for requirements pertaining to deferred testing.

3.9 OPERATION AND MAINTENANCE MANUALS

A. Refer to Division 01 Section 019110 “General Commissioning Requirements” for requirements pertaining to operation & maintenance manuals.

3.10 TRAINING OF OWNER PERSONNEL

A. Refer to Division 01 Section 019110 “General Commissioning Requirements” for requirements pertaining to training of owner personnel.

END OF SECTION 239010

SECTION 26 05 11

REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section applies to all sections of Division 26.

B. Furnish and install electrical systems, materials, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, conductors and cable, switchboards, switchgear, panel boards and other items and arrangements for the specified items are shown on the drawings.

C. Electrical service, coordinate fuses, circuit breakers and relays with the electric utility company's system, and if required obtain electric utility company approval for sizes and settings of these devices.

D. Conductor ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways sized per NEC. Aluminum conductors are prohibited.

1.2 MINIMUM REQUIREMENTS

A. The International Building Code (IBC), National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), and National Fire Protection Association (NFPA) codes and standards are the minimum requirements for materials and installation.

B. The drawings and specifications shall govern in those instances where requirements are greater than those stated in the above codes and standards.

C. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.3 TEST STANDARDS

A. All materials and equipment shall be listed, labeled, or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise determined to meet the safety requirements of a NRTL. Materials and equipment which no NRTL accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in

accordance with national industrial standards, such as ANSI, NEMA, and NETA. Evidence of compliance shall include certified test reports and definitive shop drawings.

B. Definitions:
   1. Listed: Materials and equipment included in a list published by an organization that is acceptable to the Authority Having Jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production or listed materials and equipment or periodic evaluation of services, and whose listing states that the materials and equipment either meets appropriate designated standards or has been tested and found suitable for a specified purpose.
   2. Labeled: Materials and equipment to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled materials and equipment, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
   3. Certified: Materials and equipment which:
      a. Have been tested and found by a NRTL to meet nationally recognized standards or to be safe for use in a specified manner.
      b. Are periodically inspected by a NRTL.
      c. Bear a label, tag, or other record of certification.
   4. Nationally Recognized Testing Laboratory: Testing laboratory which is recognized and approved by the Secretary of Labor in accordance with OSHA regulations.

1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)

A. Manufacturer’s Qualifications: The manufacturer shall regularly and currently produce, as one of the manufacturer's principal products, the materials and equipment specified for this project, and shall have manufactured the materials and equipment for at least three years.

B. Product Qualification:
   1. Manufacturer's materials and equipment shall have been in satisfactory operation, on three installations of similar size and type as this project, for at least three years.
   2. The Owner’s reserves the right to require the Contractor to submit a list of installations where the materials and equipment have been in operation before approval.

C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.5 APPLICABLE PUBLICATIONS

A. Applicable publications listed in all Sections of Division 26 are the latest issue, unless otherwise noted.

B. Products specified in all sections of Division 26 shall comply with the applicable publications listed in each section.

1.6 MANUFACTURED PRODUCTS

A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, and for which replacement parts shall be available.

B. When more than one unit of the same class or type of materials and equipment is required, such units shall be the product of a single manufacturer.

C. Equipment Assemblies and Components:

1. Components of an assembled unit need not be products of the same manufacturer.
2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
3. Components shall be compatible with each other and with the total assembly for the intended service.
4. Constituent parts which are similar shall be the product of a single manufacturer.

D. Factory wiring and terminals shall be identified on the equipment being furnished and on all wiring diagrams.

E. When Factory Testing Is Specified:

1. The Owner shall have the option of witnessing factory tests. The Contractor shall notify the owner a minimum of 15 working days prior to the manufacturer's performing the factory tests.
2. Four copies of certified test reports shall be furnished to the owner two weeks prior to final inspection and not more than 90 days after completion of the tests.
3. When materials and equipment fail factory tests, and re-testing and re-inspection is required, the Contractor shall be liable for all additional expenses for the Owner to witness re-testing.

1.7 VARIATIONS FROM CONTRACT REQUIREMENTS

A. Where the Owner or the Contractor requests variations from the contract requirements, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

1.8 MATERIALS AND EQUIPMENT PROTECTION

A. Materials and equipment shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
   1. Store materials and equipment indoors in clean dry space with uniform temperature to prevent condensation.
   2. During installation, equipment shall be protected against entry of foreign matter, and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.
   3. Damaged equipment shall be repaired or replaced, as determined by the Engineer.
   4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
   5. Damaged paint on equipment shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.9 WORK PERFORMANCE

A. All electrical work shall comply with the requirements of NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J – General Environmental Controls, OSHA Part 1910 subpart K – Medical and First Aid, and OSHA Part 1910 subpart S – Electrical, in addition to other references required by contract.

B. Job site safety and worker safety is the responsibility of the Contractor.

C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished in this manner for the required work, the following requirements are mandatory:
   1. Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.

2. Before initiating any work, a job specific work plan must be developed by the Contractor with a peer review conducted and documented by the A/E staff. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used, and exit pathways.
3. Work on energized circuits or equipment cannot begin until prior written approval is obtained from the owner.

D. For work that affects existing electrical systems, arrange, phase and perform work to assure minimal interference with normal functioning of the facility. Refer to Article OPERATIONS AND STORAGE AREAS under Section 01 00 00, GENERAL REQUIREMENTS.

E. New work shall be installed and connected to existing work neatly, safely and professionally. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 00 00, GENERAL REQUIREMENTS.

F. Coordinate location of equipment and conduit with other trades to minimize interference.

1.10 EQUIPMENT INSTALLATION AND REQUIREMENTS

A. Equipment location shall be as close as practical to locations shown on the drawings.

B. Working clearances shall not be less than specified in the NEC.

C. Inaccessible Equipment:

1. Where the Owner’s determines that the Contractor has installed equipment not readily accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Owner’s.
2. "Readily accessible” is defined as being capable of being reached quickly for operation, maintenance, or inspections without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

D. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company’s system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company’s system, and obtain electric utility company approval for sizes and settings of these devices.

1.11 EQUIPMENT IDENTIFICATION

A. In addition to the requirements of the NEC, install an identification sign which clearly indicates information required for use and maintenance of items such as switchboards and switchgear, panelboards, cabinets, motor controllers, fused and non-fused safety switches, separately enclosed

circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.

B. Identification signs for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Identification signs for Essential Electrical System (EES) equipment, as defined in the NEC, shall be laminated red phenolic resin with a white core with engraved lettering. Lettering shall be a minimum of 12 mm (1/2 inch) high. Identification signs shall indicate equipment designation, rated bus amperage, voltage, number of phases, number of wires, and type of EES power branch as applicable. Secure nameplates with screws.

C. Install adhesive arc flash warning labels on all equipment as required by NFPA 70E. Label shall indicate the arc hazard boundary (inches), working distance (inches), arc flash incident energy at the working distance (calories/cm2), required PPE category and description including the glove rating, voltage rating of the equipment, limited approach distance (inches), restricted approach distance (inches), prohibited approach distance (inches), equipment/bus name, date prepared, and manufacturer name and address.

1.12 SUBMITTALS

A. Submit to the A/E in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. The Owner's approval shall be obtained for all materials and equipment before delivery to the job site. Delivery, storage or installation of materials and equipment which has not had prior approval will not be permitted.

C. All submittals shall include six copies of adequate descriptive literature, catalog cuts, shop drawings, test reports, certifications, samples, and other data necessary for the Owner’s to ascertain that the proposed materials and equipment comply with drawing and specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify specific materials and equipment being submitted.

D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.

1. Mark the submittals, "SUBMITTED UNDER SECTION_____".
2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
3. Submit each section separately.

E. The submittals shall include the following:
   1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, manuals, pictures, nameplate data, and test reports as required.
   2. Submittals are required for all equipment anchors and supports. Submittals shall include weights, dimensions, center of gravity, standard connections, manufacturer's recommendations and behavior problems (e.g., vibration, thermal expansion, etc.) associated with equipment or piping so that the proposed installation can be properly reviewed. Include sufficient fabrication information so that appropriate mounting and securing provisions may be designed and attached to the equipment.
   3. Elementary and interconnection wiring diagrams for communication and signal systems, control systems, and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
   4. Parts list which shall include information for replacement parts and ordering instructions, as recommended by the equipment manufacturer.

F. Maintenance and Operation Manuals:
   1. Submit as required for systems and equipment specified in the technical sections. Furnish in hardcover binders or an approved equivalent.
   2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, material, equipment, building, name of Contractor, and contract name and number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the material or equipment.
   3. Provide a table of contents and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
   4. The manuals shall include:
      a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
      b. A control sequence describing start-up, operation, and shutdown.
      c. Description of the function of each principal item of equipment.
      d. Installation instructions.

e. Safety precautions for operation and maintenance.
f. Diagrams and illustrations.
g. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers.
h. Performance data.
i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare and replacement parts, and name of servicing organization.
j. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.

G. Approvals will be based on complete submission of shop drawings, manuals, test reports, certifications, and samples as applicable.

H. After approval and prior to installation, furnish the A / E staff with one sample of each of the following:
1. A minimum 300 mm (12 inches) length of each type and size of wire and cable along with the tag from the coils or reels from which the sample was taken. The length of the sample shall be sufficient to show all markings provided by the manufacturer.
2. Each type of conduit coupling, bushing, and termination fitting.
3. Conduit hangers, clamps, and supports.
4. Duct sealing compound.
5. Each type of receptacle, toggle switch, lighting control sensor, outlet box, manual motor starter, device wall plate, engraved nameplate, wire and cable splicing and terminating material, and branch circuit single pole molded case circuit breaker.

1.13 SINGULAR NUMBER

A. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.14 ACCEPTANCE CHECKS AND TESTS

A. The Contractor shall furnish the instruments, materials, and labor for tests.

B. Where systems are comprised of components specified in more than one section of Division 26, the Contractor shall coordinate the installation, testing, and adjustment of all components between

various manufacturer's representatives and technicians so that a complete, functional, and operational system is delivered to the Owner's.

C. When test results indicate any defects, the Contractor shall repair or replace the defective materials or equipment, and repeat the tests. Repair, replacement, and retesting shall be accomplished at no additional cost to the Owner's.

1.15 WARRANTY

A. All work performed and all equipment and material furnished under this Division shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation by the Contracting Officer for the Owner's.

1.16 INSTRUCTION

A. Instruction to designated Owner's personnel shall be provided for the particular equipment or system as required in each associated technical specification section.

B. Furnish the services of competent instructors to give full instruction in the adjustment, operation, and maintenance of the specified equipment and system, including pertinent safety requirements. Instructors shall be thoroughly familiar with all aspects of the installation, and shall be trained in operating theory as well as practical operation and maintenance procedures.

C. A training schedule shall be developed and submitted by the Contractor and approved by the A / E staff at least 30 days prior to the planned training.

1.17 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 26 05 13
MEDIUM-VOLTAGE CABLES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, and connection of medium-voltage cables, indicated as cable or cables in this section, and medium-voltage cable splices and terminations.

1.2 RELATED WORK

A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.

B. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

C. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for medium-voltage cables.

D. Section 26 05 41, UNDERGROUND ELECTRICAL CONSTRUCTION: Manholes and ducts for medium-voltage cables.

E. Section 26 12 19, PAD-MOUNTED, LIQUID-FILLED, MEDIUM-VOLTAGE TRANSFORMERS: Medium-voltage cable terminations for use in pad-mounted, liquid-filled, medium-voltage transformers.

F. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.3 QUALITY ASSURANCE

A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 FACTORY TESTS

A. Medium-voltage cables shall be thoroughly tested at the factory per NEMA WC 74 to ensure that there are no electrical defects. Factory tests shall be certified.

1.5 SUBMITTALS

A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Shop Drawings:

a. Submit sufficient information to demonstrate compliance with drawings and specifications.
b. Submit the following data for approval:
   1) Complete electrical ratings.
   2) Installation instructions.

2. Samples:
   a. After approval and prior to installation, furnish the Engineer with a sample of each type and size of cable per the requirements of Section 25 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

3. Certifications:
   a. Factory Test Reports: Submit certified factory production test reports for approval.
   b. Field Test Reports: Submit field test reports for approval.
   c. Compatibility: Submit a certificate from the cable manufacturer that the splices and terminations are approved for use with the cable.
   d. Two weeks prior to final inspection, submit the following.
      1) Certification by the manufacturer that the cables, splices, and terminations conform to the requirements of the drawings and specifications.
      2) Certification by the Contractor that the cables, splices, and terminations have been properly installed and tested.
      3) Certification by the Contractor that each splice and each termination were completely installed in a single continuous work period by a single qualified worker without any overnight interruption.

4. Qualified Worker Approval:
   a. Qualified workers who install and test cables, splices, and terminations shall have not fewer than five years of experience splicing and terminating cables equivalent to those being spliced and terminated, including experience with the materials in the approved splices and terminations.
   b. Furnish satisfactory proof of such experience for each qualified worker who splices or terminates the cables.

5. Electric Utility Company Approval:
   a. Prior to construction, obtain written approval from the electric utility company for the following items:
      1) Service entrance cables, splices, and terminations.

2) A list of qualified workers who will install, splice, and terminate the service entrance cables.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. American Society for Testing and Materials (ASTM):

B3-01 (2007).....Standard Specification for Soft or Annealed Copper Wire

C. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

48-09 .....Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV

386-95 .....Separable Insulated Connector Systems for Power Distribution Systems above 600 V

400-01 .....Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems

400.2-04 .....Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)

400.3-06 .....Guide for Partial Discharge Testing of Shielded Power Cable Systems in a Field Environment

404-00 .....Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 V to 500,000 V

D. National Electrical Manufacturers Association (NEMA):

WC 71-99.....Non-Shielded Cables Rated 2001-5000 Volts for Use in the Distribution of Electric Energy

WC 74-06.....5-46 KV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy

E. National Fire Protection Association (NFPA):

70-11 .....National Electrical Code (NEC)

F. Underwriters Laboratories (UL):

1072-06 .....Medium-Voltage Power Cables

1.7 SHIPMENT AND STORAGE

A. Cable shall be shipped on reels such that it is protected from mechanical injury. Each end of each length of cable shall be hermetically sealed with manufacturer's end caps and securely attached to the reel.

B. Cable stored and/or cut on site shall have the ends turned down, and sealed with cable manufacturer's standard cable end seals, or field-installed heat-shrink cable end seals.

1.8 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 CABLE

A. Cable shall be in accordance with the NEC and NEMA WC 71, WC 74, and UL 1072.

B. Single conductor stranded copper conforming to ASTM B3.

C. Voltage Rating:

1. 25,000 V cable shall be used on this distribution systems.

D. Insulation:

1. Insulation level shall be 133%.
2. Types of insulation:
   a. Cable type abbreviation, EPR: Ethylene propylene rubber insulation shall be thermosetting, light and heat stabilized.
   b. Cable type abbreviation, XLP or XLPE: cross-linked polyethylene insulation shall be thermosetting, light and heat stabilized, and chemically cross-linked.

E. Insulation shield shall be semi-conducting. Conductor shield shall be semi-conducting.

F. Insulation shall be wrapped with copper shielding tape, helically-applied over semi-conducting insulation shield.

G. Heavy duty, overall protective polyvinyl chloride jacket shall enclose every cable. The manufacturer's name, cable type and size, and other pertinent information shall be marked or molded clearly on the overall protective jacket.

H. Cable temperature ratings for continuous operation, emergency overload operation, and short circuit operation shall be not less than the NEC, NEMA WC 71, or NEMA WC 74 standard for the respective cable.

2.2 SPLICES AND TERMINATIONS

A. Materials shall be compatible with the cables being spliced and terminated, and shall be suitable for the prevailing environmental conditions.

B. In locations where moisture might be present, the splices shall be watertight. In manholes and pullboxes, the splices shall be submersible.

C. Splices:
   1. Shall comply with IEEE 404. Include all components required for complete splice, with detailed instructions.

D. Terminations:
   1. Shall comply with IEEE 48. Include shield ground strap for shielded cable terminations.
   2. Class 3 terminations for outdoor use: Kit with stress cone and compression-type connector.
   3. Load-break terminations for indoor and outdoor use: 200 A loadbreak premolded rubber elbow connectors with bushing inserts, suitable for submersible applications. Separable connectors shall comply with the requirements of IEEE 386, and shall be interchangeable between suppliers. Allow sufficient slack in medium-voltage cable, ground, and drain wires to permit elbow connectors to be moved to their respective parking stands.

4. Dead-break terminations for indoor and outdoor use: 600 A deadbreak premolded rubber elbow connectors with bushing inserts, suitable for submersible applications. Separable connectors shall comply with the requirements of IEEE 386, and shall be interchangeable between suppliers. Allow sufficient slack in medium-voltage cable, ground, and drain wires to permit elbow connectors to be moved to their respective parking stands.
5. Ground metallic cable shields with a device designed for that purpose, consisting of a solderless connector enclosed in watertight rubber housing covering the entire assembly.
6. Provide insulated cable supports to relieve any strain imposed by cable weight or movement. Ground cable supports to the grounding system.

2.3 FIREPROOFING TAPE

A. Fireproofing tape shall be flexible, non-corrosive, self-extinguishing, arcproof, and fireproof intumescent elastomer. Securing tape shall be glass cloth electrical tape not less than 0.18 mm (7 mils) thick, and 19 mm (0.75 inch) wide.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall be in accordance with the NEC, as shown on the drawings, and per manufacturer's instructions.
B. Cable shall be installed in conduit above grade and duct bank below grade.
C. All cables of a feeder shall be pulled simultaneously.
D. Conductors of different systems (e.g., 5kV and 15kV) shall not be installed in the same raceway.
E. Splice the cables only in manholes and pullboxes.
F. Ground shields in accordance with Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
G. Cable maximum pull length, maximum pulling tension, and minimum bend radius shall conform with the recommendations of the manufacturer.
H. Use suitable lubricating compounds on the cables to prevent pulling damage. Provide compounds that are not injurious to the cable jacket and do not harden or become adhesive.
I. Seal the cable ends prior to pulling, to prevent the entry of moisture or lubricant.

3.2 PROTECTION DURING SPLICING OPERATIONS

A. Blowers shall be provided to force fresh air into manholes where free movement or circulation of air is obstructed. Waterproof protective coverings shall be available on the work site to provide

protection against moisture while a splice is being made. Pumps shall be used to keep manholes dry during splicing operations. Under no conditions shall a splice or termination be made that exposes the interior of a cable to moisture. A manhole ring at least 150 mm (6 inches) above ground shall be used around the manhole entrance to keep surface water from entering the manhole. Unused ducts shall be plugged and water seepage through ducts in use shall be stopped before splicing.

3.3 PULLING CABLES IN DUCTS AND MANHOLES

A. Cables shall be pulled into ducts with equipment designed for this purpose, including power-driven winches, cable-feeding flexible tube guides, cable grips, pulling eyes, and lubricants. A sufficient number of qualified workers and equipment shall be employed to ensure the careful and proper installation of the cable.

B. Cable reels shall be set up at the side of the manhole opening and above the duct or hatch level, allowing cables to enter through the opening without reverse bending. Flexible tube guides shall be installed through the opening in a manner that will prevent cables from rubbing on the edges of any structural member.

C. Cable shall be unreeled from the top of the reel. Pay-out shall be carefully controlled. Cables to be pulled shall be attached through a swivel to the main pulling wire by means of a suitable cable grip and pulling eye.

D. Woven-wire cable grips shall be used to grip the cable end when pulling small cables and short straight lengths of heavier cables.

E. Pulling eyes shall be attached to the cable conductors to prevent damage to the cable structure.

F. Cables shall be liberally coated with a suitable lubricant as they enter the tube guide or duct. Rollers, sheaves, or tube guides around which the cable is pulled shall conform to the minimum bending radius of the cable.

G. Cables shall be pulled into ducts at a reasonable speed. Cable pulling using a vehicle shall not be permitted. Pulling operations shall be stopped immediately at any indication of binding or obstruction, and shall not be resumed until the potential for damage to the cable is corrected. Sufficient slack shall be provided for free movement of cable due to expansion or contraction.

H. Splices in manholes shall be firmly supported on cable racks. Cable ends shall overlap at the ends of a section to provide sufficient undamaged cable for splicing.

I. Cables cut in the field shall have the cut ends immediately sealed to prevent entrance of moisture.

3.4 SPLICES AND TERMINATIONS

A. Install the materials as recommended by the manufacturer, including precautions pertaining to air temperature and humidity during installation.

B. Installation shall be accomplished by qualified workers trained to perform medium-voltage equipment installations. Use tools as recommended or provided by the manufacturer. All manufacturer's instructions shall be followed.

C. Splices in manholes shall be located midway between cable racks on walls of manholes, and supported with cable arms at approximately the same elevation as the enclosing duct.

D. Where the Government determines that unsatisfactory splices and terminations have been installed, the Contractor shall replace the unsatisfactory splices and terminations with approved material at no additional cost to the Government.

3.5 FIREPROOFING

A. Cover all cable segments exposed in manholes and pullboxes with fireproofing tape.

B. Apply the tape in a single layer, wrapped in a half-lap manner, or as recommended by the manufacturer. Extend the tape not less than 25 mm (1 inch) into each duct.

C. At each end of a taped cable section, secure the fireproof tape in place with glass cloth tape.

3.6 CIRCUIT IDENTIFICATION OF FEEDERS

A. In each manhole and pullbox, install permanent identification tags on each circuit's cables to clearly designate the circuit identification and voltage. The tags shall be the embossed brass type, 40 mm (1.5 inches) in diameter and 40 mils thick. Attach tags with plastic ties. Position the tags so they will be easy to read after the fireproofing tape is installed.

3.7 ACCEPTANCE CHECKS AND TESTS

A. Perform tests in accordance with the manufacturer's recommendations. Include the following visual and electrical inspections.

B. Test equipment, labor, and technical personnel shall be provided as necessary to perform the acceptance tests. Arrangements shall be made to have tests witnessed by the Engineer.

C. Visual Inspection:

1. Inspect exposed sections of cables for physical damage.
2. Inspect shield grounding, cable supports, splices, and terminations.
3. Verify that visible cable bends meet manufacturer's minimum bending radius requirement.
4. Verify installation of fireproofing tape and identification tags.

D. Electrical Tests:

1. Acceptance tests shall be performed on new and service-aged cables as specified herein.

2. Test new cable after installation, splices, and terminations have been made, but before connection to equipment and existing cable.

E. Service-Aged Cable Tests:

1. Maintenance tests shall be performed on service-aged cable interconnected to new cable.
2. After new cable test and connection to an existing cable, test the interconnected cable. Disconnect cable from all equipment that could be damaged by the test.

F. Insulation-Resistance Test: Test all new and service-aged cables with respect to ground and adjacent conductors.

1. Test data shall include megohm readings and leakage current readings. Cables shall not be energized until insulation-resistance test results have been approved by the //Resident Engineer// //COTR//. Test voltages and minimum acceptable resistance values shall be:

Voltage Class	Test Voltage	Min. Insulation Resistance
5kV	2,500 VDC	1,000 megohms
15kV	2,500 VDC	5,000 megohms
25kV	5,000 VDC	20,000 megohms
35kV	15,000 VDC	100,000 megohms

2. Submit a field test report to the Resident Engineer that describes the identification and location of cables tested, the test equipment used, and the date tests were performed; identifies the persons who performed the tests; and identifies the insulation resistance and leakage current results for each cable section tested. The report shall provide conclusions and recommendations for corrective action.

G. Online Partial Discharge Test: Comply with IEEE 400 and 400.3. Test all new and service-aged cables. Perform tests after cables have passed the insulation-resistance test, and after successful energization.

1. Testing shall use a time or frequency domain detection process, incorporating radio frequency current transformer sensors with a partial discharge detection range of 10 kHz to 300 MHz.
2. Submit a field test report to the Engineer that describes the identification and location of cables tested, the test equipment used, and the date tests were performed; identifies the persons who performed the tests; and numerically and graphically identifies the magnitude of partial discharge detected for each cable section tested. The report shall provide conclusions and recommendations for corrective action.

H. Final Acceptance: Final acceptance shall depend upon the satisfactory performance of the cables under test. No cable shall be put into service until all tests are successfully passed, and field test reports have been approved by the Engineer.

---END OF SECTION ---

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, connection, and testing of the electrical conductors and cables for use in electrical systems rated 600 V and below, indicated as cable(s), conductor(s), wire, or wiring in this section.

1.2 RELATED WORK

A. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire-resistant rated construction.

B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.

C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

D. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits for conductors and cables.

E. Section 26 05 41, UNDERGROUND ELECTRICAL CONSTRUCTION: Installation of conductors and cables in manholes and ducts.

F. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.3 QUALITY ASSURANCE

A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 FACTORY TESTS

A. Conductors and cables shall be thoroughly tested at the factory per NEMA to ensure that there are no electrical defects. Factory tests shall be certified.

1.5 SUBMITTALS

A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Shop Drawings:
   a. Submit sufficient information to demonstrate compliance with drawings and specifications.
   b. Submit the following data for approval:
      1) Electrical ratings and insulation type for each conductor and cable.
      2) Splicing materials and pulling lubricant.
2. Certifications: Two weeks prior to final inspection, submit the following.
   a. Certification by the manufacturer that the conductors and cables conform to the requirements of the drawings and specifications.
   b. Certification by the Contractor that the conductors and cables have been properly installed, adjusted, and tested.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are reference in the text by designation only.

B. American Society of Testing Material (ASTM):

D2301-10 ..... Standard Specification for Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape

D2304-10 ..... Test Method for Thermal Endurance of Rigid Electrical Insulating Materials

D3005-10 ..... Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape

C. National Electrical Manufacturers Association (NEMA):

WC 70-09..... Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy

D. National Fire Protection Association (NFPA):

70-11 ..... National Electrical Code (NEC)

E. Underwriters Laboratories, Inc. (UL):

44-10 ..... Thermoset-Insulated Wires and Cables

83-08 .....Thermoplastic-Insulated Wires and Cables

467-07 .....Grounding and Bonding Equipment

486A-486B-03 .....Wire Connectors

486C-04 .....Splicing Wire Connectors

486D-05 .....Sealed Wire Connector Systems

486E-09.....Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors

493-07 .....Thermoplastic-Insulated Underground Feeder and Branch Circuit Cables

514B-04 .....Conduit, Tubing, and Cable Fittings

1.7 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Conductors and cables shall be in accordance with NEMA, UL, as specified herein, and as shown on the drawings.

B. All conductors shall be copper.

C. Single Conductor and Cable:

1. No. 12 AWG: Minimum size, except where smaller sizes are specified herein or shown on the drawings.
2. No. 8 AWG and larger: Stranded.
3. No. 10 AWG and smaller: Solid; except shall be stranded for final connection to motors, transformers, and vibrating equipment.
4. Insulation: THHN-THWN and XHHW-2. XHHW-2 shall be used for isolated power systems.

D. Color Code:

1. No. 10 AWG and smaller: Solid color insulation or solid color coating.
2. No. 8 AWG and larger: Color-coded using one of the following methods:
   a. Solid color insulation or solid color coating.
   b. Stripes, bands, or hash marks of color specified.
   c. Color using 19 mm (0.75 inches) wide tape.
4. For modifications and additions to existing wiring systems, color coding shall conform to the existing wiring system.
5. Conductors shall be color-coded as follows:

208/120 V	Phase	480/277 V
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray *
* or white with colored (other than green) tracer.		

6. Lighting circuit “switch legs”, and 3-way and 4-way switch “traveling wires,” shall have color coding that is unique and distinct (e.g., pink and purple) from the color coding indicated

above. The unique color codes shall be solid and in accordance with the NEC. Coordinate color coding in the field with the A / E staff.

7. Color code for isolated power system wiring shall be in accordance with the NEC.

2.2 SPLICES

A. Splices shall be in accordance with NEC and UL.

B. Above Ground Splices for No. 10 AWG and Smaller:

1. Solderless, screw-on, reusable pressure cable type, with integral insulation, approved for copper and aluminum conductors.
2. The integral insulator shall have a skirt to completely cover the stripped conductors.
3. The number, size, and combination of conductors used with the connector, as listed on the manufacturer's packaging, shall be strictly followed.

C. Above Ground Splices for No. 8 AWG to No. 4/0 AWG:

1. Compression, hex screw, or bolt clamp-type of high conductivity and corrosion-resistant material, listed for use with copper and aluminum conductors.
2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
3. Splice and insulation shall be product of the same manufacturer.
4. All bolts, nuts, and washers used with splices shall be //zinc-plated//cadmium-plated// steel.

D. Above Ground Splices for 250 kcmil and Larger:

1. Long barrel “butt-splice” or “sleeve” type compression connectors, with minimum of two compression indents per wire, listed for use with copper and aluminum conductors.
2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
3. Splice and insulation shall be product of the same manufacturer.

SPEC WRITER NOTE: Delete the paragraphs below if underground splices types are not required.

//E. Underground Splices for No. 10 AWG and Smaller:

1. Solderless, screw-on, reusable pressure cable type, with integral insulation. Listed for wet locations, and approved for copper and aluminum conductors.
2. The integral insulator shall have a skirt to completely cover the stripped conductors.
3. The number, size, and combination of conductors used with the connector, as listed on the manufacturer's packaging, shall be strictly followed.

F. Underground Splices for No. 8 AWG and Larger:
   1. Mechanical type, of high conductivity and corrosion-resistant material. Listed for wet locations, and approved for copper and aluminum conductors.
   2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
   3. Splice and insulation shall be product of the same manufacturer.//
G. Plastic electrical insulating tape: Per ASTM D2304, flame-retardant, cold and weather resistant.

2.3 CONNECTORS AND TERMINATIONS

A. Mechanical type of high conductivity and corrosion-resistant material, listed for use with copper and aluminum conductors.
B. Long barrel compression type of high conductivity and corrosion-resistant material, with minimum of two compression indents per wire, listed for use with copper and aluminum conductors.
C. All bolts, nuts, and washers used to connect connections and terminations to bus bars or other termination points shall be //zinc-plated//cadmium-plated// steel.

2.4 CONTROL WIRING

A. Unless otherwise specified elsewhere in these specifications, control wiring shall be as specified herein, except that the minimum size shall be not less than No. 14 AWG.
B. Control wiring shall be sized such that the voltage drop under in-rush conditions does not adversely affect operation of the controls.

2.5 WIRE LUBRICATING COMPOUND

A. Lubricating compound shall be suitable for the wire insulation and conduit, and shall not harden or become adhesive.
B. Shall not be used on conductors for isolated power systems.

PART 3 - EXECUTION

3.1 GENERAL

A. Install conductors in accordance with the NEC, as specified, and as shown on the drawings.
B. Install all conductors in raceway systems.
C. Splice conductors only in outlet boxes, junction boxes, pullboxes, manholes, or handholes.
D. Conductors of different systems (e.g., 120 V and 277 V) shall not be installed in the same raceway.

E. Install cable supports for all vertical feeders in accordance with the NEC. Provide split wedge type which firmly clamps each individual cable and tightens due to cable weight.

F. In panelboards, cabinets, wireways, switches, enclosures, and equipment assemblies, neatly form, train, and tie the conductors with non-metallic ties.

G. For connections to motors, transformers, and vibrating equipment, stranded conductors shall be used only from the last fixed point of connection to the motors, transformers, or vibrating equipment.

H. Use expanding foam or non-hardening duct-seal to seal conduits entering a building, after installation of conductors.

I. Conductor and Cable Pulling:

1. Provide installation equipment that will prevent the cutting or abrasion of insulation during pulling. Use lubricants approved for the cable.
2. Use nonmetallic pull ropes.
3. Attach pull ropes by means of either woven basket grips or pulling eyes attached directly to the conductors.
4. All conductors in a single conduit shall be pulled simultaneously.
5. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

J. No more than three branch circuits shall be installed in any one conduit.

K. When stripping stranded conductors, use a tool that does not damage the conductor or remove conductor strands.

3.2 INSTALLATION IN MANHOLES

A. Train the cables around the manhole walls, but do not bend to a radius less than six times the overall cable diameter.

//B. Fireproofing:

1. Install fireproofing on low-voltage conductors where the low-voltage conductors are installed in the same manholes with medium-voltage conductors.
2. Use fireproofing tape as specified in Section 26 05 13, MEDIUM-VOLTAGE CABLES, and apply the tape in a single layer, half-lapped, or as recommended by the manufacturer. Install the tape with the coated side towards the cable and extend it not less than 25 mm (1 inch) into each duct.

3. Secure the fireproofing tape in place by a random wrap of glass cloth tape.

3.3 SPLICE AND TERMINATION INSTALLATION

A. Splices and terminations shall be mechanically and electrically secure, and tightened to manufacturer's published torque values using a torque screwdriver or wrench.

B. Where the Government determines that unsatisfactory splices or terminations have been installed, replace the splices or terminations at no additional cost to the Government.

3.4 CONDUCTOR IDENTIFICATION

A. When using colored tape to identify phase, neutral, and ground conductors larger than No. 8 AWG, apply tape in half-overlapping turns for a minimum of 75 mm (3 inches) from terminal points, and in junction boxes, pullboxes, and manholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable, stating size and insulation type.

3.5 FEEDER CONDUCTOR IDENTIFICATION

A. In each interior pullbox and each underground manhole and handhole, install brass tags on all feeder conductors to clearly designate their circuit identification and voltage. The tags shall be the embossed type, 40 mm (1-1/2 inches) in diameter and 40 mils thick. Attach tags with plastic ties.

3.6 EXISTING CONDUCTORS

A. Unless specifically indicated on the plans, existing conductors shall not be reused.

3.7 CONTROL WIRING INSTALLATION

A. Unless otherwise specified in other sections, install control wiring and connect to equipment to perform the required functions as specified or as shown on the drawings.

B. Install a separate power supply circuit for each system, except where otherwise shown on the drawings.

3.8 CONTROL WIRING IDENTIFICATION

A. Install a permanent wire marker on each wire at each termination.

B. Identifying numbers and letters on the wire markers shall correspond to those on the wiring diagrams used for installing the systems.

C. Wire markers shall retain their markings after cleaning.

D. In each manhole and handhole, install embossed brass tags to identify the system served and function.

3.10 ACCEPTANCE CHECKS AND TESTS

A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
   1. Visual Inspection and Tests: Inspect physical condition.
   2. Electrical tests:
      a. After installation but before connection to utilization devices, such as fixtures, motors, or appliances, test conductors phase-to-phase and phase-to-ground resistance with an insulation resistance tester. Existing conductors to be reused shall also be tested.
      b. Applied voltage shall be 500 V DC for 300 V rated cable, and 1000 V DC for 600 V rated cable. Apply test for one minute or until reading is constant for 15 seconds, whichever is longer. Minimum insulation resistance values shall not be less than 25 megohms for 300 V rated cable and 100 megohms for 600 V rated cable.
      c. Perform phase rotation test on all three-phase circuits.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, connection, and testing of grounding and bonding equipment, indicated as grounding equipment in this section.

B. "Grounding electrode system" refers to grounding electrode conductors and all electrodes required or allowed by NEC, as well as made, supplementary, and lightning protection system grounding electrodes.

C. The terms "connect" and "bond" are used interchangeably in this section and have the same meaning.

1.2 RELATED WORK

A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.

B. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.

C. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduit and boxes.

D. Section 26 22 00, LOW-VOLTAGE TRANSFORMERS: Low-voltage transformers.

E. Section 26 24 13, DISTRIBUTION SWITCHBOARDS: Low-voltage distribution switchboards.

F. Section 26 24 16, PANELBOARDS: Low-voltage panel boards.

1.3 QUALITY ASSURANCE

A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Shop Drawings:
   a. Submit sufficient information to demonstrate compliance with drawings and specifications.
   b. Submit plans showing the location of system grounding electrodes and connections, and the routing of aboveground and underground grounding electrode conductors.
2. Test Reports:
   a. Two weeks prior to the final inspection, submit ground resistance field test reports to the A / E staff.
3. Certifications:
   a. Certification by the Contractor that the grounding equipment has been properly installed and tested.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. American Society for Testing and Materials (ASTM):

B1-07 .....Standard Specification for Hard-Drawn Copper Wire

B3-07 .....Standard Specification for Soft or Annealed Copper Wire

B8-11 .....Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

C. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

81-83 .....IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System Part 1: Normal Measurements

D. National Fire Protection Association (NFPA):

70-11 .....National Electrical Code (NEC)

70E-12.....National Electrical Safety Code

99-12 .....Health Care Facilities

E. Underwriters Laboratories, Inc. (UL):

44-10 .....Thermoset-Insulated Wires and Cables

83-08 .....Thermoplastic-Insulated Wires and Cables

467-07 ..... Grounding and Bonding Equipment

1.6 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment grounding conductors shall be insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be identified per NEC.

B. Bonding conductors shall be bare stranded copper, except that sizes No. 10 AWG and smaller shall be bare solid copper. Bonding conductors shall be stranded for final connection to motors, transformers, and vibrating equipment.

C. Conductor sizes shall not be less than shown on the drawings, or not less than required by the NEC, whichever is greater.

D. Insulation: THHN-THWN and XHHW-2. XHHW-2 shall be used for isolated power systems.

2.2 GROUND RODS

A. Steel or copper clad steel, 19 mm (0.75 inch) diameter by 3 M (10 feet) long.

B. Quantity of rods shall be as shown on the drawings, and as required to obtain the specified ground resistance.

2.3 CONCRETE ENCASED ELECTRODE

A. Concrete encased electrode shall be No. 4 AWG bare copper wire, installed per NEC.

2.4 GROUND CONNECTIONS

A. Below Grade and Inaccessible Locations: Exothermic-welded type connectors.

B. Above Grade:

1. Bonding Jumpers: Listed for use with aluminum and copper conductors. For wire sizes No. 8 AWG and larger, use compression-type connectors. For wire sizes smaller than No. 8 AWG, use mechanical type lugs. Connectors or lugs shall use //zinc-plated//cadmium-plated// steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.
2. Connection to Building Steel: Exothermic-welded type connectors.
3. Connection to Grounding Bus Bars: Listed for use with aluminum and copper conductors. Use mechanical type lugs, with //zinc-plated//cadmium-plated// steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.
4. Connection to Equipment Rack and Cabinet Ground Bars: Listed for use with aluminum and copper conductors. Use mechanical type lugs, with //zinc-plated//cadmium-plated// steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.

2.5 EQUIPMENT RACK AND CABINET GROUND BARS

A. Provide solid copper ground bars designed for mounting on the framework of open or cabinet-enclosed equipment racks. Ground bars shall have minimum dimensions of 6.3 mm (0.25 inch) thick x 19 mm (0.75 inch) wide, with length as required or as shown on the drawings. Provide insulators and mounting brackets.

2.6 GROUND TERMINAL BLOCKS

A. At any equipment mounting location (e.g., backboards and hinged cover enclosures) where rack-type ground bars cannot be mounted, provide mechanical type lugs, with //zinc-plated//cadmium-plated// steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.

2.7 GROUNDING BUS BAR

A. Pre-drilled rectangular copper bar with stand-off insulators, minimum 6.3 mm (0.25 inch) thick x 100 mm (4 inches) high in cross-section, length as shown on the drawings, with hole size, quantity, and spacing per detail shown on the drawings. Provide insulators and mounting brackets.

PART 3 - EXECUTION

3.1 GENERAL

A. Install grounding equipment in accordance with the NEC, as shown on the drawings, and as specified herein.
B. System Grounding:
   1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformer.
   2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.

C. Equipment Grounding: Metallic piping, building structural steel, electrical enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits, shall be bonded and grounded.

D. For patient care area electrical power system grounding, conform to NFPA 99 and NEC.

3.2 INACCESSIBLE GROUNDING CONNECTIONS

A. Make grounding connections, which are normally buried or otherwise inaccessible, by exothermic weld.

3.3 SECONDARY VOLTAGE EQUIPMENT AND CIRCUITS

A. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.

B. Metallic Piping, Building Structural Steel, and Supplemental Electrode(s):

1. Provide a grounding electrode conductor sized per NEC between the service equipment ground bus and all metallic water pipe systems, building structural steel, and supplemental or made electrodes. Provide jumpers across insulating joints in the metallic piping.
2. Provide a supplemental ground electrode as shown on the drawings and bond to the grounding electrode system.

C. Switchgear, Switchboards, Unit Substations, Panelboards, Motor Control Centers, Engine-Generators, Automatic Transfer Switches, and other electrical equipment:

1. Connect the equipment grounding conductors to the ground bus.
2. Connect metallic conduits by grounding bushings and equipment grounding conductor to the equipment ground bus.

D. Transformers:

1. Exterior: Exterior transformers supplying interior service equipment shall have the neutral grounded at the transformer secondary. Provide a grounding electrode at the transformer.
2. Separately derived systems (transformers downstream from service equipment): Ground the secondary neutral at the transformer. Provide a grounding electrode conductor from the transformer to the ground bar at the service equipment.

3.4 RACEWAY

A. Conduit Systems:

1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor.
2. Non-metallic conduit systems, except non-metallic feeder conduits that carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment, shall contain an equipment grounding conductor.
3. Metallic conduit that only contains a grounding conductor, and is provided for its mechanical protection, shall be bonded to that conductor at the entrance and exit from the conduit.
4. Metallic conduits which terminate without mechanical connection to an electrical equipment housing by means of locknut and bushings or adapters, shall be provided with grounding

bushings. Connect bushings with a equipment grounding conductor to the equipment ground bus.

B. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders, and power and lighting branch circuits.

C. Boxes, Cabinets, Enclosures, and Panelboards:
   1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes (except for special grounding systems for intensive care units and other critical units shown).
   2. Provide lugs in each box and enclosure for equipment grounding conductor termination.

D. Wireway Systems:
   1. Bond the metallic structures of wireway to provide electrical continuity throughout the wireway system, by connecting a No. 6 AWG bonding jumper at all intermediate metallic enclosures and across all section junctions.
   2. Install insulated No. 6 AWG bonding jumpers between the wireway system, bonded as required above, and the closest building ground at each end and approximately every 16 M (50 feet).
   3. Use insulated No. 6 AWG bonding jumpers to ground or bond metallic wireway at each end for all intermediate metallic enclosures and across all section junctions.
   4. Use insulated No. 6 AWG bonding jumpers to ground cable tray to column-mounted building ground plates (pads) at each end and approximately every 15 M (49 feet).

E. Receptacles shall not be grounded through their mounting screws. Ground receptacles with a jumper from the receptacle green ground terminal to the device box ground screw and a jumper to the branch circuit equipment grounding conductor.

F. Ground lighting fixtures to the equipment grounding conductor of the wiring system. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.

G. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.

H. Raised Floors: Provide bonding for all raised floor components as shown on the drawings.

I. Panelboard Bonding in Patient Care Areas: The equipment grounding terminal buses of the normal and essential branch circuit panel boards serving the same individual patient vicinity shall

be bonded together with an insulated continuous copper conductor not less than No. 10 AWG, installed in rigid metal conduit.

3.6 CORROSION INHIBITORS

A. When making grounding and bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

3.7 CONDUCTIVE PIPING

A. Bond all conductive piping systems, interior and exterior, to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.
B. In operating rooms and at intensive care and coronary care type beds, bond the medical gas piping and medical vacuum piping at the outlets directly to the patient ground bus.

3.8 EXTERIOR LIGHT POLES

A. Provide 6.1 M (20 feet) of No. 4 AWG bare copper coiled at bottom of pole base excavation prior to pour, plus additional unspliced length in and above foundation as required to reach pole ground stud.

3.9 GROUND RESISTANCE

A. Grounding system resistance to ground shall not exceed 5 ohms. Make any modifications or additions to the grounding electrode system necessary for compliance without additional cost to the Government. Final tests shall ensure that this requirement is met.
B. Grounding system resistance shall comply with the electric utility company ground resistance requirements.

3.10 GROUND ROD INSTALLATION

A. For outdoor installations, drive each rod vertically in the earth, until top of rod is 610 mm (24 inches) below final grade.
B. For indoor installations, leave 100 mm (4 inches) of each rod exposed.
C. Where buried or permanently concealed ground connections are required, make the connections by the exothermic process, to form solid metal joints. Make accessible ground connections with mechanical pressure-type ground connectors.

D. Where rock or impenetrable soil prevents the driving of vertical ground rods, install angled ground rods or grounding electrodes in horizontal trenches to achieve the specified ground resistance.

3.11 ACCEPTANCE CHECKS AND TESTS

A. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE 81. Ground resistance measurements shall be made before the electrical distribution system is energized or connected to the electric utility company ground system, and shall be made in normally dry conditions not fewer than 48 hours after the last rainfall.

B. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

C. Below-grade connections shall be visually inspected by the A / E staff prior to backfilling. The Contractor shall notify the A / E staff 24 hours before the connections are ready for inspection.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, and connection of conduit, fittings, and boxes, to form complete, coordinated, grounded raceway systems. Raceways are required for all wiring unless shown or specified otherwise.

B. Definitions: The term conduit, as used in this specification, shall mean any or all of the raceway types specified.

1.2 RELATED WORK

A. Section 06 10 00, ROUGH CARPENTRY: Mounting board for telephone closets.

B. Section 07 60 00, FLASHING AND SHEET METAL: Fabrications for the deflection of water away from the building envelope at penetrations.

C. Section 07 84 00, FIRESTOPPING: Sealing around penetrations to maintain the integrity of fire rated construction.

D. Section 07 92 00, JOINT SEALANTS: Sealing around conduit penetrations through the building envelope to prevent moisture migration into the building.

E. Section 09 91 00, PAINTING: Identification and painting of conduit and other devices.

F. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Conduits bracing.

G. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.

H. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

I. Section 26 05 41, UNDERGROUND ELECTRICAL CONSTRUCTION: Underground conduits.

J. Section 31 20 00, EARTHWORK: Bedding of conduits.

1.3 QUALITY ASSURANCE

Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
   1. Shop Drawings:
      a. Size and location of main feeders.
      b. Size and location of panels and pull-boxes.
      c. Layout of required conduit penetrations through structural elements.
      d. Submit the following data for approval:
         1) Raceway types and sizes.
         2) Conduit bodies, connectors and fittings.
         3) Junction and pull boxes, types and sizes.
   2. Certifications: Two weeks prior to final inspection, submit the following:
      a. Certification by the manufacturer that raceways, conduits, conduit bodies, connectors, fittings, junction and pull boxes, and all related equipment conform to the requirements of the drawings and specifications.
      b. Certification by the Contractor that raceways, conduits, conduit bodies, connectors, fittings, junction and pull boxes, and all related equipment have been properly installed.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. American National Standards Institute (ANSI):
   C80.1-05 .....Electrical Rigid Steel Conduit
   C80.3-05 .....Steel Electrical Metal Tubing
   C80.6-05 .....Electrical Intermediate Metal Conduit

C. National Fire Protection Association (NFPA):
   70-11 .....National Electrical Code (NEC)

D. Underwriters Laboratories, Inc. (UL):

1-05 .....Flexible Metal Conduit
5-11 .....Surface Metal Raceway and Fittings
6-07 .....Electrical Rigid Metal Conduit - Steel
50-95 .....Enclosures for Electrical Equipment
360-13 .....Liquid-Tight Flexible Steel Conduit
467-13 .....Grounding and Bonding Equipment
514A-13 .....Metallic Outlet Boxes
514B-12 .....Conduit, Tubing, and Cable Fittings
514C-07 .....Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers
651-11 .....Schedule 40 and 80 Rigid PVC Conduit and Fittings
651A-11 .....Type EB and A Rigid PVC Conduit and HDPE Conduit
797-07 .....Electrical Metallic Tubing
1242-06 .....Electrical Intermediate Metal Conduit - Steel

E. National Electrical Manufacturers Association (NEMA):
TC-2-13.....Electrical Polyvinyl Chloride (PVC) Tubing and Conduit
TC-3-13.....PVC Fittings for Use with Rigid PVC Conduit and Tubing
FB1-12 .....Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
FB2.10-13 .....Selection and Installation Guidelines for Fittings for use with Non-Flexible Conduit or Tubing (Rigid Metal Conduit, Intermediate Metallic Conduit, and Electrical Metallic Tubing)
FB2.20-12 .....Selection and Installation Guidelines for Fittings for use with Flexible Electrical Conduit and Cable

F. American Iron and Steel Institute (AISI):
S100-2007.....North American Specification for the Design of Cold-Formed Steel Structural Members

1.6 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Conduit Size: In accordance with the NEC, but not less than ¾" unless otherwise shown. Where permitted by the NEC, 13 mm flexible conduit may be used for tap connections to recessed lighting fixtures.

B. Conduit:
   1. Size: In accordance with the NEC, but not less than ¾".
   2. Rigid Steel Conduit (RMC): Shall conform to UL 6 and ANSI C80.1.

   4. Rigid Intermediate Steel Conduit (IMC): Shall conform to UL 1242 and ANSI C80.6.
   5. Electrical Metallic Tubing (EMT): Shall conform to UL 797 and ANSI C80.3. Maximum size not to exceed 105 mm (4 inches) and shall be permitted only with cable rated 600 V or less.
   6. Flexible Metal Conduit: Shall conform to UL 1.
   7. Liquid-tight Flexible Metal Conduit: Shall conform to UL 360.

C. Conduit Fittings:
   1. Rigid Steel and Intermediate Metallic Conduit Fittings:
      a. Fittings shall meet the requirements of UL 514B and NEMA FB1.

b. Standard threaded couplings, locknuts, bushings, conduit bodies, and elbows: Only steel or malleable iron materials are acceptable. Integral retractable type IMC couplings are also acceptable.
c. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
d. Bushings: Metallic insulating type, consisting of an insulating insert, molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
e. Erickson (Union-Type) and Set Screw Type Couplings: Approved for use in concrete are permitted for use to complete a conduit run where conduit is installed in concrete. Use set screws of case-hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
f. Sealing Fittings: Threaded cast iron type. Use continuous drain-type sealing fittings to prevent passage of water vapor. In concealed work, install fittings in flush steel boxes with blank cover plates having the same finishes as that of other electrical plates in the room.

3. Electrical Metallic Tubing Fittings:
   a. Fittings and conduit bodies shall meet the requirements of UL 514B, ANSI C80.3, and NEMA FB1.
   b. Only steel or malleable iron materials are acceptable.
   c. Compression Couplings and Connectors: Concrete-tight and rain-tight, with connectors having insulated throats.
   c. Setscrew Couplings and Connectors: Use setscrews of case-hardened steel with hex head and cup point, to firmly seat in wall of conduit for positive grounding.
   d. Indent-type connectors or couplings are prohibited.
   e. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.
4. Flexible Metal Conduit Fittings:
   a. Conform to UL 514B. Only steel or malleable iron materials are acceptable.
   b. Clamp-type, with insulated throat.
5. Liquid-tight Flexible Metal Conduit Fittings:
   a. Fittings shall meet the requirements of UL 514B and NEMA FB1.
   b. Only steel or malleable iron materials are acceptable.

c. Fittings must incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening. Connectors shall have insulated throats.

6. Direct Burial Plastic Conduit Fittings: Fittings shall meet the requirements of UL 514C and NEMA TC3.
7. Surface Metal Raceway Fittings: As recommended by the raceway manufacturer. Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, conduit entry fittings, accessories, and other fittings as required for complete system.
8. Expansion and Deflection Couplings:
   a. Conform to UL 467 and UL 514B.
   b. Accommodate a 19 mm (0.75-inch) deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.
   c. Include internal flexible metal braid, sized to guarantee conduit ground continuity and a low-impedance path for fault currents, in accordance with UL 467 and the NEC tables for equipment grounding conductors.
   d. Jacket: Flexible, corrosion-resistant, watertight, moisture and heat-resistant molded rubber material with stainless steel jacket clamps.

D. Conduit Supports:
1. Parts and Hardware: Zinc-coat or provide equivalent corrosion protection.
2. Individual Conduit Hangers: Designed for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod.
3. Multiple Conduit (Trapeze) Hangers: Not less than 38 mm x 38 mm (1.5 x 1.5 inches), 12-gauge steel, cold-formed, lipped channels; with not less than 9 mm (0.375-inch) diameter steel hanger rods.
4. Solid Masonry and Concrete Anchors: Self-drilling expansion shields, or machine bolt expansion.

E. Outlet, Junction, and Pull Boxes:
1. UL-50 and UL-514A.
2. Rustproof cast metal where required by the NEC or shown on drawings.
3. Sheet Metal Boxes: Galvanized steel, except where shown on drawings.

F. Metal Wireways: Equip with hinged covers, except as shown on drawings. Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for a complete system.

PART 3 - EXECUTION

3.1 PENETRATIONS

A. Cutting or Holes:
   1. Cut holes in advance where they should be placed in the structural elements, such as ribs or beams. Obtain the approval of the A / E staff prior to drilling through structural elements.
   2. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammers, impact electric, hand, or manual hammer-type drills are not allowed, except when permitted by the A / E staff where working space is limited.

B. Firestop: Where conduits, wireways, and other electrical raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING.

C. Waterproofing: At floor, exterior wall, and roof conduit penetrations, completely seal the gap around conduit to render it watertight, as specified in Section 07 92 00, JOINT SEALANTS.

3.2 INSTALLATION, GENERAL

A. In accordance with UL, NEC, NEMA, as shown on drawings, and as specified herein.

B. Raceway systems used for Essential Electrical Systems (EES) shall be entirely independent of other raceway systems.

C. Install conduit as follows:
   1. In complete mechanically and electrically continuous runs before pulling in cables or wires.
   2. Unless otherwise indicated on the drawings or specified herein, installation of all conduits shall be concealed within finished walls, floors, and ceilings.
   3. Flattened, dented, or deformed conduit is not permitted. Remove and replace the damaged conduits with new conduits.
   4. Assure conduit installation does not encroach into the ceiling height head room, walkways, or doorways.
   5. Cut conduits square, ream, remove burrs, and draw up tight.
   6. Independently support conduit at 2.4 M (8 feet) on centers with specified materials and as shown on drawings.
   7. Do not use suspended ceilings, suspended ceiling supporting members, lighting fixtures, other conduits, cable tray, boxes, piping, or ducts to support conduits and conduit runs.

8. Support within 300 mm (12 inches) of changes of direction, and within 300 mm (12 inches) of each enclosure to which connected.
9. Close ends of empty conduits with plugs or caps at the rough-in stage until wires are pulled in, to prevent entry of debris.
10. Conduit installations under fume and vent hoods are prohibited.
11. Secure conduits to cabinets, junction boxes, pull-boxes, and outlet boxes with bonding type locknuts. For rigid steel and IMC conduit installations, provide a locknut on the inside of the enclosure, made up wrench tight. Do not make conduit connections to junction box covers.
12. Flashing of penetrations of the roof membrane is specified in Section 07 60 00, FLASHING AND SHEET METAL.
13. Conduit bodies shall only be used for changes in direction, and shall not contain splices.
14. Do not use aluminum conduits.

D. Conduit Bends:
1. Make bends with standard conduit bending machines.
2. Conduit hickey may be used for slight offsets and for straightening stubbed out conduits.
3. Bending of conduits with a pipe tee or vise is prohibited.

E. Layout and Homeruns:
1. Install conduit with wiring, including homeruns, as shown on drawings.
2. Deviations: Make only where necessary to avoid interferences and only after drawings showing the proposed deviations have been submitted and approved by the A / E staff.

3.3 CONCEALED WORK INSTALLATION

A. In Concrete:
1. Conduit: Rigid steel, IMC, or EMT. Do not install EMT in concrete slabs that are in contact with soil, gravel, or vapor barriers.
2. Align and run conduit in direct lines.
3. Install conduit through concrete beams only:
   a. Where shown on the structural drawings.
   b. As approved by the A / E staff prior to construction, and after submittal of drawing showing location, size, and position of each penetration.
4. Installation of conduit in concrete that is less than 75 mm (3 inches) thick is prohibited.
   a. Conduit outside diameter larger than one-third of the slab thickness is prohibited.

b. Space between conduits in slabs: Approximately six conduit diameters apart, and one conduit diameter at conduit crossings.
c. Install conduits approximately in the center of the slab so that there will be a minimum of 19 mm (0.75-inch) of concrete around the conduits.

5. Make couplings and connections watertight. Use thread compounds that are UL approved conductive type to ensure low resistance ground continuity through the conduits. Tightening setscrews with pliers is prohibited.

B. Above Furred or Suspended Ceilings and in Walls:
1. Conduit for Conductors Above 600 V: Rigid steel. Mixing different types of conduits in the same system is prohibited.
2. Conduit for Conductors 600 V and Below: Rigid steel, IMC, or EMT. Mixing different types of conduits in the same system is prohibited.
3. Align and run conduit parallel or perpendicular to the building lines.
4. Connect recessed lighting fixtures to conduit runs with maximum 1.8 M (6 feet) of flexible metal conduit extending from a junction box to the fixture.
5. Tightening set screws with pliers is prohibited.
6. For conduits running through metal studs, limit field cut holes to no more than 70% of web depth. Spacing between holes shall be at least 457 mm (18 inches). Cuts or notches in flanges or return lips shall not be permitted.

3.4 EXPOSED WORK INSTALLATION

A. Unless otherwise indicated on drawings, exposed conduit is only permitted in mechanical and electrical rooms.

B. Conduit for Conductors Above 600 V: Rigid steel. Mixing different types of conduits in the system is prohibited.
C. Conduit for Conductors 600 V and Below: Rigid steel, IMC, or EMT. Mixing different types of conduits in the system is prohibited.
D. Align and run conduit parallel or perpendicular to the building lines.
E. Install horizontal runs close to the ceiling or beams and secure with conduit straps.
F. Support horizontal or vertical runs at not over 2.4 M (8 feet) intervals.
G. Surface Metal Raceways: Use only where shown on drawings.

H. Painting:
   1. Paint exposed conduit as specified in Section 09 91 00, PAINTING.
   2. Paint all conduits containing cables rated over 600 V safety orange. Refer to Section 09 91 00, PAINTING for preparation, paint type, and exact color. In addition, paint legends, using 50 mm (2 inch) high black numerals and letters, showing the cable voltage rating. Provide legends where conduits pass through walls and floors and at maximum 6 M (20 feet) intervals in between.

3.5 HAZARDOUS LOCATIONS

A. Use rigid steel conduit only.
B. Install UL approved sealing fittings that prevent passage of explosive vapors in hazardous areas equipped with explosion-proof lighting fixtures, switches, and receptacles, as required by the NEC.

3.6 WET OR DAMP LOCATIONS

A. Use rigid steel or IMC conduits unless as shown on drawings.
B. Provide sealing fittings to prevent passage of water vapor where conduits pass from warm to cold locations, i.e., refrigerated spaces, constant-temperature rooms, air-conditioned spaces, building exterior walls, roofs, or similar spaces.
C. Use rigid steel or IMC conduit within 1.5 M (5 feet) of the exterior and below concrete building slabs in contact with soil, gravel, or vapor barriers, unless as shown on drawings. Conduit shall be half-lapped with 10 mil PVC tape before installation. After installation, completely recoat or retape any damaged areas of coating.
D. Conduits run on roof shall be supported with integral galvanized lipped steel channel, attached to UV-inhibited polycarbonate or polypropylene blocks every 2.4 M (8 feet) with 9 mm (3/8-inch) galvanized threaded rods, square washer and locknut. Conduits shall be attached to steel channel with conduit clamps.

3.7 MOTORS AND VIBRATING EQUIPMENT

A. Use flexible metal conduit for connections to motors and other electrical equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission.
B. Use liquid-tight flexible metal conduit for installation in exterior locations, moisture or humidity laden atmosphere, corrosive atmosphere, water or spray wash-down operations, inside airstream of HVAC units, and locations subject to seepage or dripping of oil, grease, or water.

C. Provide a green equipment grounding conductor with flexible and liquid-tight flexible metal conduit.

3.8 EXPANSION JOINTS

A. Conduits 75 mm (3 inch) and larger that are secured to the building structure on opposite sides of a building expansion joint require expansion and deflection couplings. Install the couplings in accordance with the manufacturer's recommendations.

B. Provide conduits smaller than 75 mm (3 inch) with junction boxes on both sides of the expansion joint. Connect flexible metal conduits to junction boxes with sufficient slack to produce a 125 mm (5 inch) vertical drop midway between the ends of the flexible metal conduit. Flexible metal conduit shall have a green insulated copper bonding jumper installed. In lieu of this flexible metal conduit, expansion and deflection couplings as specified above are acceptable.

C. Install expansion and deflection couplings where shown.

3.9 CONDUIT SUPPORTS

A. Safe working load shall not exceed one-quarter of proof test load of fastening devices.

B. Use pipe straps or individual conduit hangers for supporting individual conduits.

C. Support multiple conduit runs with trapeze hangers. Use trapeze hangers that are designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger itself, and an additional 90 kg (200 lbs). Attach each conduit with U-bolts or other approved fasteners.

D. Support conduit independently of junction boxes, pull-boxes, fixtures, suspended ceiling T-bars, angle supports, and similar items.

E. Fasteners and Supports in Solid Masonry and Concrete:

1. New Construction: Use steel or malleable iron concrete inserts set in place prior to placing the concrete.
2. Existing Construction:
   a. Steel expansion anchors not less than 6 mm (0.25-inch) bolt size and not less than 28 mm (1.125 inch) in embedment.
   b. Power set fasteners not less than 6 mm (0.25-inch) diameter with depth of penetration not less than 75 mm (3 inch).
   c. Use vibration and shock-resistant anchors and fasteners for attaching to concrete ceilings.

F. Hollow Masonry: Toggle bolts.

G. Bolts supported only by plaster or gypsum wallboard are not acceptable.

H. Metal Structures: Use machine screw fasteners or other devices specifically designed and approved for the application.

I. Attachment by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.

J. Chain, wire, or perforated strap shall not be used to support or fasten conduit.

K. Spring steel type supports or fasteners are prohibited for all uses except horizontal and vertical supports/fasteners within walls.

L. Vertical Supports: Vertical conduit runs shall have riser clamps and supports in accordance with the NEC and as shown. Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

3.10 BOX INSTALLATION

A. Boxes for Concealed Conduits:
   1. Flush-mounted.
   2. Provide raised covers for boxes to suit the wall or ceiling, construction, and finish.

B. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling-in operations or where more than the equivalent of 4-90 degree bends are necessary.

C. Locate pullboxes so that covers are accessible and easily removed. Coordinate locations with piping and ductwork where installed above ceilings.

D. Remove only knockouts as required. Plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.

E. Outlet boxes mounted back-to-back in the same wall are prohibited. A minimum 600 mm (24 inch) center-to-center lateral spacing shall be maintained between boxes.

F. Flush-mounted wall or ceiling boxes shall be installed with raised covers so that the front face of raised cover is flush with the wall. Surface-mounted wall or ceiling boxes shall be installed with surface-style flat or raised covers.

G. Minimum size of outlet boxes for ground fault circuit interrupter (GFCI) receptacles is 100 mm (4 inches) square x 55 mm (2.125 inches) deep, with device covers for the wall material and thickness involved.

H. Stencil or install phenolic nameplates on covers of the boxes identified on riser diagrams; for example "SIG-FA JB No. 1."

I. On all branch circuit junction box covers, identify the circuits with black marker.

END OF SECTION

SECTION 26 05 41

UNDERGROUND ELECTRICAL CONSTRUCTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, and connection of underground ducts and raceways, and precast manholes and pullboxes to form a complete underground electrical raceway system.

B. The terms “duct” and “conduit” are used interchangeably in this section.

1.2 RELATED WORK

A. Section 07 92 00, JOINT SEALANTS: Sealing of conduit penetrations.

B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.

C. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

D. //Section 31 20 00, EARTH MOVING// //Section 31 20 11, EARTH MOVING (SHORT FORM)//: Trenching, backfill, and compaction.

1.3 QUALITY ASSURANCE

A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

B. Coordinate layout and installation of ducts, manholes, and pullboxes with final arrangement of other utilities, site grading, and surface features.

1.4 SUBMITTALS

A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Shop Drawings:

   a. Submit sufficient information to demonstrate compliance with drawings and specifications.

b. Submit information on manholes, pullboxes, ducts, and hardware. Submit manhole plan and elevation drawings, showing openings, pulling irons, cable supports, cover, ladder, sump, and other accessories.

c. Proposed deviations from the drawings shall be clearly marked on the submittals. If it is necessary to locate manholes, pullboxes, or duct banks at locations other than shown on the drawings, show the proposed locations accurately on scaled site drawings, and submit to the A / E stafffor approval prior to construction.

2. Certifications: Two weeks prior to the final inspection, submit the following.

a. Certification by the manufacturer that the materials conform to the requirements of the drawings and specifications.

b. Certification by the Contractor that the materials have been properly installed, connected, and tested.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. American Concrete Institute (ACI):
Building Code Requirements for Structural Concrete
318-11/318M-11 .....Building Code Requirements for Structural Concrete & Commentary
SP-66-04 .....ACI Detailing Manual

C. American National Standards Institute (ANSI):
77-10 .....Underground Enclosure Integrity

D. American Society for Testing and Materials (ASTM):
C478-12 .....Standard Specification for Precast Reinforced Concrete Manhole Sections
C858-10e1.....Underground Precast Concrete Utility Structures
C990-09 .....Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants.

E. National Electrical Manufacturers Association (NEMA):
TC 2-03 .....Electrical Polyvinyl Chloride (PVC) Conduit

TC 3-04 ..... Polyvinyl Chloride (PVC) Fittings for Use With Rigid PVC Conduit And Tubing

TC 6 & 8-03 ..... Polyvinyl Chloride (PVC) Plastic Utilities Duct For Underground Installations

TC 9-04 ..... Fittings For Polyvinyl Chloride (PVC) Plastic Utilities Duct For Underground Installation

F. National Fire Protection Association (NFPA):

70-11 ..... National Electrical Code (NEC)

70E-12 ..... National Electrical Safety Code

G. Underwriters Laboratories, Inc. (UL):

6-07 ..... Electrical Rigid Metal Conduit-Steel

467-07 ..... Grounding and Bonding Equipment

651-11 ..... Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

651A-11 ..... Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit

651B-07 ..... Continuous Length HDPE Conduit

1.6 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 PRE-CAST CONCRETE MANHOLES AND HARDWARE

A. Structure: Factory-fabricated, reinforced-concrete, monolithically-poured walls and bottom. Frame and cover shall form top of manhole.

B. Cable Supports:
   1. Cable stanchions shall be hot-rolled, heavy duty, hot-dipped galvanized "T" section steel, 56 mm (2.25 inches) x 6 mm (0.25 inch) in size, and punched with 14 holes on 38 mm (1.5 inches) centers for attaching cable arms.
   2. Cable arms shall be 5 mm (0.1875 inch) gauge, hot-rolled, hot-dipped galvanized sheet steel, pressed to channel shape. Arms shall be approximately 63 mm (2.5 inches) wide x 350 mm (14 inches) long.
   3. Insulators for cable supports shall be porcelain, and shall be saddle type or type that completely encircles the cable.
   4. Equip each cable stanchion with one spare cable arm, with three spare insulators for future use.

C. Ladder: //Aluminum// //Fiberglass// with 400 mm (16 inches) rung spacing. Provide securely-mounted ladder for every manhole over 1.2 M (4 feet) deep.

D. Ground Rod Sleeve: Provide a 75 mm (3 inches) PVC sleeve in manhole floors so that a driven ground rod may be installed.

E. Sump: Provide 305 mm x 305 mm (12 inches x 12 inches) covered sump frame and grated cover.

2.2 PULLBOXES

A. General: Size as indicated on the drawings. Provide pullboxes with weatherproof, non-skid covers with recessed hook eyes, secured with corrosion- and tamper-resistant hardware. Cover material shall be identical to pullbox material. Covers shall have molded lettering, ELECTRIC or SIGNAL as applicable. Pullboxes shall comply with the requirements of ANSI 77 loading.

Provide pulling irons, 22 mm (0.875 inch) diameter galvanized steel bar with exposed triangular-shaped opening.

B. Polymer Concrete Pullboxes: Shall be molded of sand, aggregate, and polymer resin, and reinforced with steel, fiberglass, or both. Pullbox shall have open bottom.

C. Fiberglass Pullboxes: Shall be sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.

2.3 DUCTS

A. Number and sizes shall be as shown on the drawings.

B. Ducts (concrete-encased):

1. Plastic Duct:

a. NEMA TC6 & 8 and TC9 plastic utilities duct UL 651 and 651A Schedule 40 PVC conduit.

b. Duct shall be suitable for use with 90˚ C (194˚ F) rated conductors.

2. Conduit Spacers: Prefabricated plastic.

C. Ducts (direct-burial):

1. Plastic duct:

a. NEMA TC2 and TC3 UL 651, 651A, and 651B, Schedule 40 PVC or HDPE conduit Schedule 80 PVC or HDPE conduit.

b. Duct shall be suitable for use with 75˚ C (167˚ F) rated conductors.

2. Rigid metal conduit: UL6 and NEMA RN1 galvanized rigid metal, half-lap wrapped with 10 mil PVC tape.

2.4 GROUNDING

A. Ground Rods and Ground Wire: Per Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

2.5 WARNING TAPE

A. 4-mil polyethylene 75 mm (3 inches) wide detectable tape, red with black letters, imprinted with “CAUTION - BURIED ELECTRIC CABLE BELOW” or similar.

2.6 PULL ROPE FOR SPARE DUCTS

A. Plastic with 890 N (200 lb) minimum tensile strength.

PART 3 - EXECUTION

3.1 MANHOLE AND PULLBOX INSTALLATION

A. Assembly and installation shall be per the requirements of the manufacturer.
   1. Install manholes and pullboxes level and plumb.
   2. Units shall be installed on a 300 mm (12 inches) thick level bed of 90% compacted granular fill, well-graded from the 25 mm (1 inches) sieve to the No. 4 sieve. Granular fill shall be compacted with a minimum of four passes with a plate compactor.
B. Access: Ensure the top of frames and covers are flush with finished grade.
C. Grounding in Manholes:
   1. Ground Rods in Manholes: Drive a ground rod into the earth, through the floor sleeve, after the manhole is set in place. Fill the sleeve with sealant to make a watertight seal. Rods shall protrude approximately 100 mm (4 inches) above the manhole floor.
   2. Install a No. 3/0 AWG bare copper ring grounding conductor around the inside perimeter of the manhole and anchor to the walls with metallic cable clips.
   3. Connect the ring grounding conductor to the ground rod by an exothermic welding process.
   4. Bond the ring grounding conductor to the duct bank equipment grounding conductors, the exposed non-current carrying metal parts of racks, sump covers, and like items in the manholes with a minimum No. 6 AWG bare copper jumper using an exothermic welding process.

3.2 TRENCHING

A. Refer to //Section 31 20 00, EARTH MOVING Section 31 20 11 for trenching, backfilling, and compaction.
B. Before performing trenching work at existing facilities, a Ground Penetrating Radar Survey shall be carefully performed by a certified technician to reveal all existing underground ducts, conduits, cables, and other utility systems.
C. Work with extreme care near existing ducts, conduits, and other utilities to avoid damaging them.
D. Cut the trenches neatly and uniformly.
E. For Concrete-Encased Ducts:

1. After excavation of the trench, stakes shall be driven in the bottom of the trench at 1.2 M (4 foot) intervals to establish the grade and route of the duct bank.
2. Pitch the trenches uniformly toward manholes or both ways from high points between manholes for the required duct line drainage. Avoid pitching the ducts toward buildings wherever possible.
3. The walls of the trench may be used to form the side walls of the duct bank, provided that the soil is self-supporting and that the concrete envelope can be poured without soil inclusions. Forms are required where the soil is not self-supporting.
4. After the concrete-encased duct has sufficiently cured, the trench shall be backfilled to grade with earth, and appropriate warning tape installed.

F. Individual conduits to be installed under existing paved areas and roads that cannot be disturbed shall be jacked into place using rigid metal conduit, or bored using plastic utilities duct or PVC conduit, as approved by the A/E Staff.

3.3 DUCT INSTALLATION

A. General Requirements:
1. Ducts shall be in accordance with the NEC, as shown on the drawings, and as specified.
2. Join and terminate ducts with fittings recommended by the manufacturer.
3. Slope ducts to drain towards manholes and pullboxes, and away from building and equipment entrances. Pitch not less than 100 mm (4 inch) in 30 M (100 feet).
4. Underground conduit stub-ups and sweeps to equipment inside of buildings shall be galvanized rigid metal conduit half-lap wrapped with PVC tape, and shall extend a minimum of 1.5 M (5 feet) outside the building foundation. Tops of conduits below building slab shall be minimum 610 mm (24 inches) below bottom of slab.
5. Stub-ups and sweeps to equipment mounted on outdoor concrete slabs shall be galvanized rigid metal conduit half-lap wrapped with PVC tape, and shall extend a minimum of 1.5 M (5 feet) away from the edge of slab.
6. Install insulated grounding bushings on the conduit terminations.
7. Radius for sweeps shall be sufficient to accomplish pulls without damage. Minimum radius shall be six times conduit diameter.
8. All multiple conduit runs shall have conduit spacers. Spacers shall securely support and maintain uniform spacing of the duct assembly a minimum of 75 mm (3 inches) above the

bottom of the trench during the concrete pour. Spacer spacing shall not exceed 1.5 M (5 feet). Secure spacers to ducts and earth to prevent floating during concrete pour. Provide nonferrous tie wires to prevent displacement of the ducts during concrete pour. Tie wires shall not act as substitute for spacers.

9. Duct lines shall be installed no less than 300 mm (12 inches) from other utility systems, such as water, sewer, chilled water.
10. Clearances between individual ducts:
    a. For similar services, not less than 75 mm (3 inches).
    b. For power and signal services, not less than 150 mm (6 inches).
11. Duct lines shall terminate at window openings in manhole walls as shown on the drawings. All ducts shall be fitted with end bells.
12. Couple the ducts with proper couplings. Stagger couplings in rows and layers to ensure maximum strength and rigidity of the duct bank.
13. Keep ducts clean of earth, sand, or gravel, and seal with tapered plugs upon completion of each portion of the work.
14. Spare Ducts: Where spare ducts are shown, they shall have a nylon pull rope installed. They shall be capped at each end and labeled as to location of the other end.
15. Duct Identification: Place continuous strip of warning tape approximately 300 mm (12 inches) above ducts before backfilling trenches. Warning tape shall be preprinted with proper identification.
16. Duct Sealing: Seal ducts, including spare ducts, at building entrances and at outdoor terminations for equipment, with a suitable non-hardening compound to prevent the entrance of foreign objects and material, moisture, and gases.
17. Use plastic ties to secure cables to insulators on cable arms. Use minimum two ties per cable per insulator.

B. Concrete-Encased Ducts:
    1. Install concrete-encased ducts for medium-voltage systems, low-voltage systems, and signal systems, unless otherwise shown on the drawings.
    2. Duct banks shall be single or multiple duct assemblies encased in concrete. Ducts shall be uniform in size and material throughout the installation.
    3. Tops of concrete-encased ducts shall be:

a. Not less than 600 mm (24 inches) and not less than shown on the drawings, below finished grade.
b. Not less than 750 mm (30 inches) and not less than shown on the drawings, below roads and other paved surfaces.
c. Additional burial depth shall be required in order to accomplish NEC-required minimum bend radius of ducts.
d. Conduits crossing under grade slab construction joints shall be installed a minimum of 1.2 M (4 feet) below slab.

4. Extend the concrete envelope encasing the ducts not less than 75 mm (3 inches) beyond the outside walls of the outer ducts.
5. Within 3 M (10 feet} of building and manhole wall penetrations, install reinforcing steel bars at the top and bottom of each concrete envelope to provide protection against vertical shearing.
6. Install reinforcing steel bars at the top and bottom of each concrete envelope of all ducts underneath roadways and parking areas.
7. Where new ducts and concrete envelopes are to be joined to existing manholes, pullboxes, ducts, and concrete envelopes, make the joints with the proper fittings and fabricate the concrete envelopes to ensure smooth durable transitions.
8. Duct joints in concrete may be placed side by side horizontally, but shall be staggered at least 150 mm (6 inches) vertically.
9. Pour each run of concrete envelope between manholes or other terminations in one continuous pour. If more than one pour is necessary, terminate each pour in a vertical plane and install 19 mm (0.75 inch) reinforcing rod dowels extending 450 mm (18 inches) into concrete on both sides of joint near corners of envelope.
10. Pour concrete so that open spaces are uniformly filled. Do not agitate with power equipment unless approved by A/E Staff.

D. Connections to Manholes: Ducts connecting to manholes shall be flared to have an enlarged cross-section to provide additional shear strength. Dimensions of the flared cross-section shall be larger than the corresponding manhole opening dimensions by no less than 300 mm (12 inches) in each direction. Perimeter of the duct bank opening in the manhole shall be flared toward the inside or keyed to provide a positive interlock between the duct and the wall of the manhole. Use

vibrators when this portion of the encasement is poured to ensure a seal between the envelope and the wall of the structure.

E. Connections to Existing Manholes: For duct connections to existing manholes, break the structure wall out to the dimensions required and preserve the steel in the structure wall. Cut steel and extend into the duct bank envelope. Chip the perimeter surface of the duct bank opening to form a key or flared surface, providing a positive connection with the duct bank envelope.

F. Connections to Existing Ducts: Where connections to existing ducts are indicated, excavate around the ducts as necessary. Cut off the ducts and remove loose concrete from inside before installing new ducts. Provide a reinforced-concrete collar, poured monolithically with the new ducts, to take the shear at the joint of the duct banks.

G. Partially-Completed Ducts: During construction, wherever a construction joint is necessary in a duct bank, prevent debris such as mud and dirt from entering ducts by providing suitable plugs. Fit concrete envelope of a partially completed ducts with reinforcing steel extending a minimum of 600 mm (2 feet) back into the envelope and a minimum of 600 mm (2 feet) beyond the end of the envelope. Provide one No. 4 bar in each corner, 75 mm (3 inches) from the edge of the envelope. Secure corner bars with two No. 3 ties, spaced approximately 300 mm (12 inches) apart. Restrain reinforcing assembly from moving during pouring of concrete.

3.4 ACCEPTANCE CHECKS AND TESTS

A. Duct Testing and Cleaning:
   1. Upon completion of the duct installation, a standard flexible mandrel shall be pulled through each duct to loosen particles of earth, sand, or foreign material left in the duct, and to test for out-of-round conditions.
   2. The mandrel shall be not less than 300 mm (12 inches) long, and shall have a diameter not less than 13 mm (0.5 inch) less than the inside diameter of the duct. A brush with stiff bristles shall then be pulled through each duct to remove the loosened particles. The diameter of the brush shall be the same as, or slightly larger than, the diameter of the duct.
   3. If testing reveals obstructions or out-of-round conditions, the Contractor shall replace affected section(s) of duct and retest to the satisfaction of the A / E staff at no cost to the Owner.
   4. Mandrel pulls shall be witnessed by the A/E Staff.

END OF SECTION

SECTION 26 0800 - ELECTRICAL SYSTEM COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for commissioning the electrical, lighting and lighting control systems.

B. General Commissioning Requirements are described in Section 01 9110 (General Commissioning Requirements), and are not repeated in this Section.

C. In addition to the drawings and general provisions of the contract, commissioning requirements are defined in the following sections:

Section 01 9110 – General Commissioning Requirements
Section 01 9115 – Facility Exterior Envelope Commissioning Requirements
Section 22 0800 – Plumbing System Commissioning Requirements
Section 23 0800 – HVAC System Commissioning Requirements
Section 23 0910 – Building Control System Commissioning Requirements
Section 26 0800 – Electrical System Commissioning Requirements

1.2 DEFINITIONS

A. Definitions are listed in Section 01 9110 – General Commissioning Requirements

1.3 SUBMITTALS

A. Refer to Section 01 9010 for submittal requirements.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment being tested. For example, the electrical contractor of Division 26 shall ultimately be responsible for all standard testing equipment for the electrical systems and controls systems in Division 26. A sufficient quantity of two-way radios shall be provided by each contractor.

B. Refer to Section 01 9110 “General Commissioning Requirements” for a detailed description of test equipment requirements.

PART 3 - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

A. With assistance from the installing contractors, the CxA will prepare Construction Checklists for all commissioned components, equipment, and systems

1. Checklists will be developed by the CxA and provided to the contractors.
2. Contractors will complete the construction checklists and provide completed copies to the CxA prior to beginning system functional testing
3. To avoid duplication of effort, contractors may document testing and start-up activities using their own checklists, and provide them as attachments to the checklists issued by the CxA.

B. Red-lined Drawings:

1. The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
4. The contracted party, as defined in the Contract Documents will create the as-built CAD drawings.
5. All red-lined drawings are to be available on-site for review by the Owner and the CxA.

C. Operation and Maintenance Data:

1. The contractor will provide a copy of O&M literature for use during the commissioning process for all commissioned equipment and systems.
2. The CxA will review the O&M literature for conformance to project requirements.
3. The CxA shall have access to a copy of the final approved O&M literature once corrections have been made by the Contractor.

3.2 COMMISSIONING TEAM RESPONSIBILITIES

A. Refer to Section 01 9110 “General Commissioning Requirements” for commissioning team member roles and responsibilities.

3.3 TESTING PREPARATION

A. Certify in writing to the CxA that Electrical systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Inspect and verify the position of each device and interlock identified on the construction documents and equipment vendor’s submittals.

C. Certify in writing that testing procedures have been completed and that testing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

H. If the failure rate of a similar family of equipment or devices is greater than 10%, then the Owner shall be notified. The matter shall be addressed by the Owner, CM, CxA, and other applicable parties. The failure issue shall be resolved to the Owner's satisfaction.

3.4 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to support the CxA in performing systems functional testing.

B. Scope of Electrical testing shall include the entire Electrical installation, from the incoming power equipment throughout the distribution system. Testing shall include measuring, but not limited to resistance, voltage, and amperage of system(s) and devices.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the Electrical contractor and other contracted subcontractors, including the fire alarm Subcontractor shall prepare detailed testing plans, procedures, and checklists for Electrical systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the Electrical system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.5 ELECTRICAL SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 26 sections.

B. Emergency Generator Testing and Acceptance Procedures: Provide technicians, load banks, infrared cameras, instrumentation, tools and equipment to test performance of designated systems and devices as specified in the construction documents.

C. Electrical Distribution System Testing: Provide technicians, load banks, infrared cameras, instrumentation, tools and equipment to test performance of designated systems and devices as specified in the construction documents.

3.6 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

1. Refer to 01 9110 “General Commissioning Requirements” for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

B. APPROVAL

1. Refer to Section 01 9110 “General Commissioning Requirements” for approval procedures.

3.7 DEFERRED TESTING

1. Refer to Division 01 Section 01 9110 “General Commissioning Requirements” for requirements pertaining to deferred testing.

3.8 OPERATION AND MAINTENANCE MANUALS

1. Refer to 01 9110 “General Commissioning Requirements” for requirements pertaining to operation and maintenance manuals.

3.9 TRAINING OF OWNER PERSONNEL

A. Refer to 01 9110 “General Commissioning Requirements” for requirements pertaining to training.

END OF SECTION 054000

SECTION 26 12 19

PAD-MOUNTED, LIQUID-FILLED, MEDIUM-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, connection, and testing of the pad-mounted, liquid-filled, medium-voltage transformers, indicated as transformers in this section.

1.2 RELATED WORK

A. Section 03 30 00, CAST-IN-PLACE CONCRETE: Requirements for concrete equipment pads.
B. Section 09 06 00, SCHEDULE FOR FINISHES: Finishes for electrical equipment.
C. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Requirements for seismic restraint of non-structural components.
D. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.
E. Section 26 05 13, MEDIUM-VOLTAGE CABLES: Medium-voltage cables.
F. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path to ground for possible ground currents.
G. Section 26 05 41, UNDERGROUND ELECTRICAL CONSTRUCTION: Manholes, pull-boxes, and ducts for underground raceway systems.

1.3 QUALITY ASSURANCE

A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 FACTORY TESTS

A. Transformers shall be thoroughly tested at the factory to ensure that there are no electrical or mechanical defects. Tests shall be conducted as per IEEE Standards. Factory tests shall be certified. The following tests shall be performed:
   1. Perform insulation-resistance tests, winding-to-winding and each winding-to-ground.
   2. Perform turns-ratio tests at all tap positions.

B. Furnish four (4) copies of certified manufacturer's factory test reports to the Engineer prior to shipment of the transformers to ensure that the transformers have been successfully tested as specified.

1.5 SUBMITTALS

A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
   1. Shop Drawings:
      a. Submit sufficient information to demonstrate compliance with drawings and specifications.
      b. Include electrical ratings, nameplate data, impedance, outline drawing with dimensions and front, top, and side views, weight, mounting details, decibel rating, termination information, temperature rise, no-load and full-load losses, regulation, overcurrent protection, connection diagrams, and accessories.
      c. Complete nameplate data, including manufacturer’s name and catalog number.
   2. Manuals:
      a. When submitting the shop drawings, submit companion copies of complete maintenance and operating manuals, including technical data sheets, wiring diagrams, and information for ordering replacement parts.
         1) Identify terminals on wiring diagrams to facilitate installation, maintenance, and operation.
         2) Indicate on wiring diagrams the internal wiring for each piece of equipment and interconnections between the pieces of equipment.
         3) Approvals will be based on complete submissions of manuals, together with shop drawings.
      b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
         1) Update the manual to include any information necessitated by shop drawing approval.
         2) Show all terminal identification.
         3) Include information for testing, repair, troubleshooting, assembly, disassembly, and recommended maintenance intervals.

4) Provide a replacement parts list with current prices. Include a list of recommended spare parts, tools, and instruments for testing and maintenance purposes.

B. Certifications:

1. Two weeks prior to the final inspection, submit the following certifications.
   a. Certification by the manufacturer that the transformers conform to the requirements of the drawings and specifications.
   b. Certification by the Contractor that the transformers have been properly installed, connected, and tested.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. American National Standards Institute (ANSI):

C37.47-00 ..... High Voltage Current-Limiting Type Distribution Class Fuses and Fuse Disconnecting Switches

C57.12.00-00 ..... Liquid-Immersed Distribution, Power and Regulating Transformers

C57.12.25-90 ..... Pad-Mounted, Compartmental-Type, Self-Cooled, Single-Phase Distribution-Transformers with Separable Insulated High Voltage Connectors; High Voltage, 34500 Grd Y/19920 Volts and Below; Low-Voltage 240/120 Volts; 167 kVA and Smaller Requirements

C57.12.26-92 ..... Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers for Use with Separable Insulated High-Voltage Connectors (34500 Grd Y/19920 V and Below, 2500 kVA and Smaller)

C57.12.28-05 ..... Pad-Mounted Equipment - Enclosure Integrity

C57.12.29-05 ..... Pad-Mounted Equipment – Enclosure Integrity for Coastal Environments

C57.12.34-10 ..... Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, 5 MVA and Smaller; High Voltage,

34.5 kV Nominal System Voltage and Below; Low Voltage, 15kV Nominal System Voltage and Below

C. American Society for Testing and Materials (ASTM):

D3487-08 .....Standard Specification for Mineral Insulating Oil Used in Electrical Apparatus

D. Institute of Electrical and Electronic Engineers (IEEE):

C2-07 .....National Electrical Safety Code

C57.12.10-11 .....Liquid-Immersed Power Transformers

C57.12.90-10 .....Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers

C62.11-06 .....Metal-Oxide Surge Arresters for AC Power Circuits

48-09 .....Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5kV Through 765kV or Extruded Insulation Rated 2.5kV Through 500kV

386-06 .....Separable Insulated Connector Systems for Power Distribution Systems Above 600 V

592-07 .....Exposed Semiconducting Shields on High-Voltage Cable Joints and Separable Connectors

E. International Code Council (ICC):

IBC-12 .....International Building Code

F. National Electrical Manufacturers Association (NEMA):

LA 1-09.....Surge Arresters

TP 1-02 .....Guide for Determining Energy Efficiency for Distribution Transformers

TR 1-00.....Transformers, Regulators, and Reactors

G. National Fire Protection Association (NFPA):

70-11 .....National Electrical Code (NEC)

H. Underwriters Laboratories Inc. (UL):

467-07 ..... Grounding and Bonding Equipment

1.7 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Transformers shall be in accordance with ANSI, ASTM, IEEE, NEMA, NFPA, UL, as shown on the drawings, and as specified herein. Each transformer shall be assembled as an integral unit by a single manufacturer.
B. Transformers shall be complete, outdoor type, continuous duty, integral assembly, grounded, tamper-resistant, and with liquid-immersed windings.
C. Ratings shall not be less than shown on the drawings.
D. Completely fabricate transformers at the factory so that only the external cable connections are required at the project site.
E. Thoroughly clean, phosphatize, and finish all the metal surfaces at the factory with a rust-resistant primer and dark green enamel finish coat, except where a different color is specified in Section 09 06 00, SCHEDULE FOR FINISHES. All surfaces of the transformer that will be in contact with

the concrete pad shall be treated with corrosion-resistant compounds and epoxy resin or a rubberized sealing compound.

2.2 COMPARTMENTS

A. Construction:
   1. Enclosures shall be weatherproof and in accordance with //ANSI C57.12.28// //ANSI C57.12.29 when installed in coastal environments//.
   2. The medium- and low-voltage compartments shall be separated with a steel barrier that extends the full height and depth of the compartments.
   3. The compartments shall be constructed of sheet steel (gauge to meet ANSI requirements) with bracing and with reinforcing gussets using jig welds to assure rectangular rigidity.
   4. All bolts, nuts, and washers shall be //zinc-plated//cadmium-plated// steel.
   5. Sufficient space shall be provided for equipment, cabling, and terminations within the compartments.
   6. Affix transformer nameplate permanently within the low-voltage compartment. Voltage and kVA rating, connection configuration, impedance, date of manufacture, and serial number shall be shown on the nameplate.
B. Doors:
   1. Provide a separate door for each compartment with provisions for a single padlock to secure all doors. Provide each compartment door with open-position doorstops and corrosion-resistant tamperproof hinges welded in place. The medium-voltage compartment door shall be mechanically prevented from opening unless the low-voltage compartment door is open.
   2. The secondary compartment door shall have a one-piece steel handle and incorporate three-point locking mechanisms.

2.3 BIL RATING

A. 15 kV class equipment shall have a minimum 95 kV BIL rating.

2.4 TRANSFORMER FUSE ASSEMBLY

A. The primary fuse assembly shall be load-break combination fuse and dry-well fuse holder rated for system voltage, rated for 10 load makes and 10 load breaks, with rated 200 amp load current at 75% power factor, 10,000 symmetrical A close-in on fault duty, and 95 kV BIL. The entire fuse assembly shall be removable through the use of hot stick.
   1. The fuses shall be concealed, hot stick removable, 50,000 A symmetrical interrupting, non-expulsion, current-limiting primary distribution type, of the size and voltage class as shown on the drawings. The fuses shall operate within the fuse holder as a unit disconnecting means. Fuses shall be in accordance with ANSI C37.47.
   2. Transformers shall not have internal "weak link" fuses that require transformer tank cover removal for replacement.
   3. For units above 500 kVA using fusing above the 50 A 15 kV and 100 A 5 kV application, a clip-mounted arrangement of the current limiting fuses (i.e., live-front configuration) is required.//

2.5 PRIMARY CONNECTIONS

A. Primary connections shall be200 A dead-front loadbreak wells and inserts for cable sizes shown on the drawings.

2.6 MEDIUM-VOLTAGE SWITCH

A. The transformer primary disconnect switch shall be an oil-immersed, internal, gang-operated, load-interrupter type, rated at ampacity and system voltage as shown on the drawings, with a minimum momentary withstand rating of not less than the calculated available fault current shown on the drawings.

B. For loop feeds, switch shall be a four-position, T-blade manual switch located in the medium-voltage compartment and hot-stick-operated.

2.7 MEDIUM-VOLTAGE TERMINATIONS

A. Terminate the medium-voltage cables in the primary compartment with 200 A loadbreak premolded rubber elbow connectors, suitable for submersible applications. Elbow connectors shall have a semi-conductive shield material covering the housing. The separable connector

system shall include the loadbreak elbow, the bushing insert, and the bushing well. Separable connectors shall comply with the requirements of IEEE 386, and shall be interchangeable between suppliers. Allow sufficient slack in medium-voltage cable, ground, and drain wires to permit elbow connectors to be moved to their respective parking stands.

B. Ground metallic cable shield with a cable shield grounding adapter, consisting of a solderless connector enclosed in watertight rubber housing covering the entire assembly, bleeder wire, and ground braid.

2.8 LOW-VOLTAGE EQUIPMENT

A. Mount the transformer secondary main molded case circuit breaker, low-voltage bushings, and hot stick in the low-voltage compartment.
B. The low-voltage leads shall be brought out of the tank by epoxy pressure tight bushings, and shall be standard arrangement.
C. Tin-plate the low-voltage neutral terminal and isolate from the transformer tank. Provide a removable ground strap sized in accordance with the NEC and connect between the secondary neutral and ground pad.

2.9 TRANSFORMERS

A. Transformer ratings shall be as shown on drawings. kVA ratings shown on the drawings are for continuous duty without the use of cooling fans.
B. Temperature rises shall not exceed the NEMA TR 1 standards of 65˚ C (149˚ F) by resistance.
C. Transformer insulating material shall be mineral oil in accordance with ASTM D 3487.
D. Transformer impedance shall be not less than 4-1/2% for sizes 150 kVA and larger. Impedance shall be as shown on the drawings.
E. Sound levels shall conform to NEMA TR 1 standards.
F. Primary and Secondary Windings for Three-Phase Transformers:
    1. Primary windings shall be delta-connected.
    2. Secondary windings shall be wye-connected, as indicated on the drawings. Provide isolated neutral bushings for secondary wye-connected transformers.
    3. Secondary leads shall be brought out through pressure-tight epoxy bushings.

G. Primary windings shall have four 2-1/2% full-capacity voltage taps; two taps above and two taps below rated voltage.

H. Core and Coil Assemblies:

1. Cores shall be grain-oriented, non-aging, silicon steel to minimize losses.
2. Core and coil assemblies shall be rigidly braced to withstand the stresses caused by rough handling during shipment, and stresses caused by any possible short-circuit currents.
3. Coils shall be continuous-winding type without splices except for taps. Material shall be copper.
4. Coil and core losses shall be optimum for efficient operation.
5. Primary, secondary, and tap connections shall be brazed or pressure type.
6. Provide end fillers or tie downs for coil windings.

I. The transformer tank, cover, and radiator gauge thickness shall not be less than that required by ANSI.

J. Accessories:

1. Provide standard NEMA features, accessories, and the following:
   a. No-load tap changer. Provide warning sign.
   b. Lifting, pulling, and jacking facilities.
   c. Globe-type valve for oil filtering and draining, including sampling device.
   d. Pressure relief valve.
   e. Liquid level gauge and filling plug.
   f. A grounding pad in the medium- and low-voltage compartments.
   g. A diagrammatic nameplate.
   h. Dial-type liquid thermometer with a maximum reading pointer and an external reset.
   i. Hot stick. Securely fasten hot stick within low-voltage compartment.
2. The accessories shall be made accessible within the compartments without disassembling trims and covers.

K. Transformers shall meet the minimum energy efficiency values per NEMA TP 1:

KVA	(%)
75	98.7
112.5	98.8

150	98.9
225	99.0
300	99.0
500	99.1
750	99.2
1000	99.2
1500	99.3
2000	99.4
2500	99.4

2.10 CABLE FAULT INDICATORS (LOOP SYSTEM ONLY):

A. Provide each incoming and outgoing cable within the medium-voltage compartment with a single-phase cable fault indicator with in-rush restraint. Mount the indicator on the cable support member.
   1. The sensor assembly shall have a split-core for easy installation over the incoming and outgoing cable. The core shall be laminated, grain-oriented silicon steel, and encapsulated. Provide a clamp to secure the two coil halves around the cable.
   2. Select the coil to the pick-up at the current setting shown on the drawings.
      a. The coil setting shall be accurate to within 10% of the pick-up.
      b. The coil current-time curve shall coordinate with the primary current-limiting fuse.

B. Upon restoration of the system to normal operating conditions, the cable fault indicator shall automatically reset to normal and be ready to operate. and renumber the paragraphs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install transformers outdoors, as shown on the drawings, in accordance with the NEC, and as recommended by the manufacturer.

B. Anchor transformers with rustproof bolts, nuts, and washers not less than 12 mm (1/2 inch) diameter, in accordance with manufacturer's instructions, and as shown on drawings.

C. Mount transformers on concrete slab. Unless otherwise indicated, the slab shall be at least 200 mm (8 inches) thick, reinforced with a 150 by 150 mm (6 by 6 inches) No. 6 mesh placed uniformly 100 mm (4 inches) from the top of the slab. Slab shall be placed on a 150 mm (6 inches) thick, well-compacted gravel base. The top of the concrete slab shall be approximately 100 mm (4 inches) above the finished grade. Edges above grade shall have 12-1/2 mm (1/2 inch) chamfer. The slab shall be of adequate size to project at least 200 mm (8 inches) beyond the equipment. Provide conduit turnups and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Cut off and bush conduits 75 mm (3 inches) above slab surface. Concrete work shall be as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

D. Grounding:
   1. Ground each transformer in accordance with the requirements of the NEC. Install ground rods per the requirements of Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS, to maintain a maximum resistance of 5 ohms to ground.
   2. Connect the ground rod to the ground pads in the medium- and low-voltage compartments.
   3. Install and connect the cable shield grounding adapter per the manufacturer's instructions. Connect the bleeder wire of the cable shield grounding adapter to the loadbreak or deadbreak elbow grounding point with minimum No. 14 AWG wire, and connect the ground braid to the grounding system with minimum No. 6 AWG bare copper wire. Use soldered or mechanical grounding connectors listed for this purpose.

3.2 ACCEPTANCE CHECKS AND TESTS

A. Perform manufacturer's required field tests in accordance with the manufacturer's recommendations. In addition, include the following:
   1. Visual Inspection and Tests:
      a. Compare equipment nameplate data with specifications and approved shop drawings.
      b. Inspect physical and mechanical condition. Check for damaged or cracked bushings and liquid leaks.
      c. Verify that control and alarm settings on temperature indicators are as specified.

d. Inspect all field-installed bolted electrical connections, using the calibrated torque-wrench method to verify tightness of accessible bolted electrical connections, and perform thermographic survey after energization under load.
e. Vacuum-clean transformer interior. Clean transformer enclosure exterior.
f. Verify correct liquid level in transformer tank.
g. Verify correct equipment grounding per the requirements of Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
h. Verify the presence and connection of transformer surge arresters, if provided.
i. Verify that the tap-changer is set at rated system voltage.

3.3 FOLLOW-UP VERIFICATION

A. Upon completion of acceptance checks, settings, and tests, the Contractor shall demonstrate that the transformers are in good operating condition and properly performing the intended function.

3.4 SPARE PARTS

A. Deliver the following spare parts for the project to the Engineer two weeks prior to final inspection:
   1. Six insulated protective caps.
   2. One spare set of medium-voltage fuses for each size and type of fuse used in the project.
   3. One spare set of three cable fault indicators.

3.5 INSTRUCTION

A. The Contractor shall instruct maintenance personnel, for not less than one 2-hour period, on the maintenance and operation of the equipment on the date requested by the Engineer.

---END OF SECTION---

SECTION 26 24 13

DISTRIBUTION SWITCHBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, connection, and testing of the low-voltage circuit-breaker distribution switchboards, indicated as switchboard(s) in this section.

1.2 RELATED WORK

A. Section 03 30 00, CAST-IN-PLACE CONCRETE: Requirements for concrete equipment pads.//

B. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Requirements for seismic restraint for nonstructural components.//

C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.

D. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.

E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible fault currents.

F. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduit.

1.3 QUALITY ASSURANCE

A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 FACTORY TESTS

A. Switchboards shall be thoroughly tested at the factory to assure that there are no electrical or mechanical defects. Tests shall be conducted as per NEMA PB 2. Factory tests shall be certified.

B. The following additional tests shall be performed:

1. Verify that circuit breaker sizes and types correspond to drawings, and the Overcurrent Protective Device Coordination Study.

2. Verify tightness of bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data.
3. Confirm correct operation and sequencing of key-type mechanical interlock systems for multiple circuit breakers by attempting closure on locked-open devices, and attempting to open locked-closed devices, and making key exchange with devices operated in off-normal positions.
4. Exercise all active components.
5. Perform an insulation-resistance test, phase to ground, on each bus section, with phases not under test grounded, in accordance with manufacturer's published data.
6. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential shall be 500 V DC for 300-volt rated cable and 1000 V DC for 600-volt rated cable, or as required if solid-state components or control devices cannot tolerate the applied voltage.
7. If applicable, verify correct function of control transfer relays located in the switchboard with multiple control power sources.
8. Perform phasing checks on double-ended or dual-source switchboards to insure correct bus phasing from each source.

C. Furnish four (4) copies of certified manufacturer's factory test reports prior to shipment of the switchboards to ensure that the switchboards have been successfully tested as specified.

1.5 SUBMITTALS

A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
   1. Shop Drawings:
      a. Switchboard shop drawings shall be submitted simultaneously with or after the Overcurrent Protective Device Coordination Study.
      b. Submit sufficient information to demonstrate compliance with drawings and specifications.
      c. Prior to fabrication of switchboards, submit the following data for approval:
         1) Complete electrical ratings.
         2) Circuit breaker sizes.
         3) Interrupting ratings.
         4) Safety features.

5) Accessories and nameplate data.
6) Switchboard one line diagram, showing ampere rating, number of bars per phase and neutral in each bus run (horizontal and vertical), bus spacing, equipment ground bus, and bus material.
7) Elementary and interconnection wiring diagrams.
8) Technical data for each component.
9) Dimensioned exterior views of the switchboard.
10) Dimensioned section views of the switchboard.
11) Floor plan of the switchboard.
12) Foundation plan for the switchboard.
13) Provisions and required locations for external conduit and wiring entrances.
14) Approximate design weights.

2. Manuals:
   a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals, including technical data sheets, wiring diagrams, and information for ordering replacement parts.
      1) Schematic signal and control diagrams, with all terminals identified, matching terminal identification in the switchboard.
      2) Include information for testing, repair, trouble shooting, assembly, disassembly, and factory recommended/required periodic maintenance procedures and frequency.
      3) Provide a replacement and spare parts list. Include a list of tools and instruments for testing and maintenance purposes.
   b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certifications: Two weeks prior to final inspection, submit the following.
   a. Certification by the manufacturer that the switchboards conform to the requirements of the drawings and specifications.
   b. Certification by the Contractor that the switchboards have been properly installed, adjusted, and tested.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.

B. Institute of Engineering and Electronic Engineers (IEEE):

C37.13-08 .....Low Voltage AC Power Circuit Breakers Used in Enclosures

C57.13-08 .....Instrument Transformers

C62.41.1-03 .....Surge Environment in Low-voltage (1000V and less) AC Power Circuits

C62.45-92 .....Surge Testing for Equipment connected to Low-Voltage AC Power Circuits

C. International Code Council (ICC):

IBC-12 .....International Building Code

D. National Electrical Manufacturer's Association (NEMA):

PB-2-06.....Deadfront Distribution Switchboards

PB-2.1-07.....Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less

E. National Fire Protection Association (NFPA):

70-11 .....National Electrical Code (NEC)

F. Underwriters Laboratories, Inc. (UL):

67-09 .....Panelboards

489-09 .....Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

891-05 ..... Switchboards

1.7 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 GENERAL

A. Shall be in accordance with ANSI, IEEE, NEMA, NFPA, UL, as shown on the drawings, and have the following features:
   1. Switchboard shall be a complete, grounded, continuous-duty, integral assembly, dead-front, dead-rear, self-supporting, indoor type switchboard assembly, tamperproof, weatherproof, outdoor type switchboard assembly. Incorporate devices shown on the drawings and all related components required to fulfill operational and functional requirements.
   2. Ratings shall not be less than shown on the drawings. Short circuit ratings shall not be less than the available fault current shown in the Overcurrent Protective Device Coordination Study.
   3. Switchboard shall conform to the arrangements and details shown on the drawings.

2.2 BASIC ARRANGEMENT N/A

2.3 HOUSING N/A

2.4 BUSES N/A

2.5 MAIN CIRCUIT BREAKERS

A. Type I or Type II Switchboards: Provide molded case main circuit breakers as shown on the drawings. Circuit breakers shall be the solid state adjustable trip type.
   1. Trip units shall have field adjustable tripping characteristics as follows:
      a. Long time pickup.
      b. Long time delay.
      c. Short time pickup.
      d. Short time delay.
      e. Instantaneous.
   2. Breakers with same frame size shall be interchangeable with each other.
   3. Breakers shall be fully rated.

B. Type II Switchboards: Provide main power circuit breakers as shown on the drawings. Circuit breakers shall be the solid state adjustable trip type.
   1. General: Circuit breakers shall be dead front, drawout, stored energy type with solid state trip devices. Arcing contacts shall be renewable.
   2. Rating: Circuit breakers shall be 3 pole, 600 V AC and below, 60 cycle with frame size, trip rating and functions, and system voltage as shown on drawings. Breakers shall have 30 cycle short time current ratings.
   3. Drawout Mounting: Provide a racking mechanism to position and hold the breaker in the connected, test, or disconnected position. Provide an interlock to prevent movement of the breaker into or out of the connected position unless the breaker is tripped open.
   4. Trip Devices: Breakers shall be electrically and mechanically trip free and shall have trip devices in each pole. Unless otherwise indicated on drawings, each breaker shall have overcurrent and short-circuit, and integral ground fault trip devices. Trip devices shall be of the solid state type with adjustable pick-up settings, with both long time and short time elements, and integral trip unit testing provisions. Devices shall have time-delay band adjustment. Long-time delay element shall have inverse time characteristics. Main circuit breakers shall not have instantaneous trip function.

5. Position Indicator: Provide a mechanical indicator visible from the front of the unit to indicate whether the breaker is open or closed.
6. Trip Button: Equip each breaker with a mechanical trip button accessible from the front of the door.
7. Padlocking: Provisions shall be included for padlocking the breaker in the open position.
8. Operation: Unless otherwise indicated herein or on the drawings, breakers shall be manually operated.

2.6 FEEDER CIRCUIT BREAKERS

A. Provide molded case circuit breakers as shown on the drawings.

B. Non-adjustable Trip Molded Case Circuit Breakers:
   1. Molded case circuit breakers shall have automatic, trip free, non-adjustable, inverse time characteristics, and instantaneous magnetic trip.
   2. Breaker features shall be as follows:
      a. A rugged, integral housing of molded insulating material.
      b. Silver alloy contacts.
      c. Arc quenchers and phase barriers for each pole.
      d. Quick-make, quick-break, operating mechanisms.
      e. A trip element for each pole, thermal magnetic type with long time delay and instantaneous characteristics, a common trip bar for all poles and a single operator.
      f. Electrically and mechanically trip free.
      g. An operating handle which indicates ON, TRIPPED, and OFF positions.
      h. Line and load connections shall be bolted.
      i. An overload on one pole of a multipole breaker shall automatically cause all the poles of the breaker to open.

C. Adjustable Trip Molded Case Circuit Breakers:
   1. Provide molded case, solid state adjustable trip type circuit breakers.
   2. Trip units shall have field adjustable tripping characteristics as follows:
      a. Long time pickup.
      b. Long time delay.
      c. Short time pickup.

d. Short time delay.
e. Instantaneous.
f. Ground fault pickup.
g. Ground fault delay.

3. Breakers with same frame size shall be interchangeable with each other.

2.6 OTHER EQUIPMENT

A. Furnish tools and accessories required for circuit breaker and switchboard test, inspection, maintenance, and proper operation.

B. Panelboards: Requirements for panelboards shown to be installed in the switchboard shall be as shown on the drawings and in Section 26 24 16, PANELBOARDS.

2.7 CONTROL WIRING

A. Switchboard control wires shall not be less than No. 14 AWG copper 600 volt rated. Install wiring complete at the factory, adequately bundled and protected. Provide separate control circuit fuses in each breaker compartment and locate for ease of access and maintenance.

2.8 NAMEPLATES

A. Nameplates: For Normal Power system, provide laminated black phenolic resin with white core with 12 mm (1/2 inch) engraved lettered nameplates next to each circuit breaker. For Essential Electrical System, provide laminated red phenolic resin with white core with 12 mm (1/2 inch) engraved lettered nameplates next to each circuit breaker. Nameplates shall indicate equipment served, spaces, or spares in accordance with one line diagram shown on drawings. Nameplates shall be mounted with plated screws on front of breakers or on equipment enclosure next to breakers. Mounting nameplates only with adhesive is not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install switchboards in accordance with the NEC, as shown on the drawings, and as recommended by the manufacturer.

B. Anchor switchboards with rustproof bolts, nuts, and washers not less than 13 mm (1/2 inch) diameter, in accordance with manufacturer's instructions, and as shown on drawings.

C. In seismic areas, switchboards shall be adequately anchored and braced per details on structural contract drawings to withstand the seismic forces at the location where installed

D. Exterior Location. Mount switchboard on concrete slab. Unless otherwise indicated, the slab shall be at least 200 mm (8 inches) thick, reinforced with a 150 by 150 mm (6 by 6 inches) No. 6 mesh placed uniformly 100 mm (4 inches) from the top of the slab. Slab shall be placed on a 150 mm (6 inches) thick, well-compacted gravel base. The top of the concrete slab shall be approximately 100 mm (4 inches) above the finished grade. Edges above grade shall have 12.5 mm (1/2 inch) chamfer. The slab shall be of adequate size to project at least 200 mm (8 inches) beyond the equipment. Provide conduit turnups and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Cut off and bush conduits 75 mm (3 inches) above slab surface. Concrete work shall be as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

E. Interior Location. Mount switchboard on concrete slab. Unless otherwise indicated, the slab shall be at least 100 mm (4 inches) thick. The top of the concrete slab shall be approximately 100 mm (4 inches) above finished floor. Edges above floor shall have 12.5 mm (1/2 inch) chamfer. The slab shall be of adequate size to project at least 200 mm (8 inches) beyond the equipment. Provide conduit turnups and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Cut off and bush conduits 75 mm (3 inches) above slab surface. Concrete work shall be as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

3.2 ACCEPTANCE CHECKS AND TESTS

A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:

1. Visual Inspection and Tests:
   a. Compare equipment nameplate data with specifications and approved shop drawings.
   b. Inspect physical, electrical, and mechanical condition.
   c. Verify appropriate anchorage, required area clearances, and correct alignment.
   d. Verify that circuit breaker sizes and types correspond to approved shop drawings.
   e. Verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey after energization.
   f. Confirm correct operation and sequencing of key-type mechanical interlock systems.
   g. Vacuum-clean switchboard enclosure interior. Clean switchboard enclosure exterior.
   h. Inspect insulators for evidence of physical damage or contaminated surfaces.

i. Verify correct shutter installation and operation.

j. Exercise all active components.

k. Verify the correct operation of all sensing devices, alarms, and indicating devices.

l. Verify that vents are clear.

2. Electrical tests:

a. Perform insulation-resistance tests on each bus section.

b. Perform insulation-resistance test on control wiring; do not perform this test on wiring connected to solid-state components.

c. Perform phasing check on double-ended switchboards to ensure correct bus phasing from each source.

B. Prior to the final inspection for acceptance, a technical representative from the electric utility company shall witness the testing of the equipment to assure the proper operation of the individual components, and to confirm proper operation/coordination with electric utility company's equipment.

3.3 FOLLOW-UP VERIFICATION

A. Upon completion of acceptance checks, settings, and tests, the Contractor shall show by demonstration in service that the switchboard is in good operating condition and properly performing the intended function.

3.4 INSTRUCTION

A. Furnish the services of a factory-trained technician for one, 4-hour training period for instructing personnel in the maintenance and operation of the switchboards, on the dates requested by the A/E Staff.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, and connection of panelboards.

1.2 RELATED WORK

A. Section 09 91 00, PAINTING: Painting of panelboards.

//B. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Requirements for seismic restraint of non-structural components.//

C. Section 25 10 10, ADVANCED UTILITY METERING: Requirements for electrical metering.

D. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.

E. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.

F. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

G. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits.

1.3 QUALITY ASSURANCE

A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Shop Drawings:

   a. Submit sufficient information to demonstrate compliance with drawings and specifications.

b. Include electrical ratings, dimensions, mounting details, materials, required clearances, terminations, weight, circuit breakers, wiring and connection diagrams, accessories, and nameplate data.

2. Manuals:
   a. Submit, simultaneously with the shop drawings, complete maintenance and operating manuals including technical data sheets, wiring diagrams, and information for ordering circuit breakers and replacement parts.
      1) Include schematic diagrams, with all terminals identified, matching terminal identification in the panelboards.
      2) Include information for testing, repair, troubleshooting, assembly, and disassembly.
   b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certifications: Two weeks prior to final inspection, submit the following.
   a. Certification by the manufacturer that the panelboards conform to the requirements of the drawings and specifications.
   b. Certification by the Contractor that the panelboards have been properly installed, adjusted, and tested.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. International Code Council (ICC):
   IBC-12 .....International Building Code

C. National Electrical Manufacturers Association (NEMA):
   PB 1-11 .....Panelboards
   250-08 .....Enclosures for Electrical Equipment (1,000V Maximum)

D. National Fire Protection Association (NFPA):
   70-11 .....National Electrical Code (NEC)
   70E-12.....Standard for Electrical Safety in the Workplace

E. Underwriters Laboratories, Inc. (UL):

50-95 .....Enclosures for Electrical Equipment

67-09 .....Panelboards

489-09 ..... Molded Case Circuit Breakers and Circuit Breaker Enclosures

1.6 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Panelboards shall be in accordance with NEC, NEMA, UL, as specified, and as shown on the drawings.

B. Panelboards shall have main breaker or main lugs, bus size, voltage, phases, number of circuit breaker mounting spaces, top or bottom feed, flush or surface mounting, branch circuit breakers, and accessories as shown on the drawings.

C. Panelboards shall be completely factory-assembled with molded case circuit breakers and integral accessories as shown on the drawings or specified herein.

D. Non-reduced size copper bus bars, rigidly supported on molded insulators, and fabricated for bolt-on type circuit breakers.

E. Bus bar connections to the branch circuit breakers shall be the “distributed phase” or “phase sequence” type.

F. Mechanical lugs furnished with panelboards shall be cast, stamped, or machined metal alloys listed for use with the conductors to which they will be connected.

G. Neutral bus shall be //100%//200%//rated, mounted on insulated supports.

H. Grounding bus bar shall be equipped with screws or lugs for the connection of equipment grounding conductors.

I. Bus bars shall be braced for the available short-circuit current as shown on the drawings, but not be less than 10,000 A symmetrical for 120/208 V and 120/240 V panelboards, and 14,000 A symmetrical for 277/480 V panelboards.

J. In two-section panelboards, the main bus in each section shall be full size. The first section shall be furnished with subfeed lugs on the line side of main lugs only, or through-feed lugs for main breaker type panelboards, and have field-installed cable connections to the second section as shown on the drawings. Panelboard sections with tapped bus or crossover bus are not acceptable.

K. Series-rated panelboards are not permitted.

2.2 ENCLOSURES AND TRIMS

A. Enclosures:

1. Provide galvanized steel enclosures, with NEMA rating as shown on the drawings or as required for the environmental conditions in which installed.
2. Enclosures shall not have ventilating openings.
3. Enclosures may be of one-piece formed steel or of formed sheet steel with end and side panels welded, riveted, or bolted as required.
4. Provide manufacturer’s standard option for prepunched knockouts on top and bottom endwalls.
5. Include removable inner dead front cover, independent of the panelboard cover.

B. Trims:

1. Hinged “door-in-door” type.

2. Interior hinged door with hand-operated latch or latches, as required to provide access only to circuit breaker operating handles, not to energized parts.
3. Outer hinged door shall be securely mounted to the panelboard enclosure with factory bolts, screws, clips, or other fasteners, requiring a key or tool for entry. Hand-operated latches are not acceptable.
4. Inner and outer doors shall open left to right.
5. Trims shall be flush or surface type as shown on the drawings.

2.3 MOLDED CASE CIRCUIT BREAKERS

A. Circuit breakers shall be per UL, NEC, as shown on the drawings, and as specified.
B. Circuit breakers shall be bolt-on type.
C. Circuit breakers shall have minimum interrupting rating as required to withstand the available fault current, but not less than:
   1. 120/208 V Panelboard: 10,000 A symmetrical.
   2. 120/240 V Panelboard: 10,000 A symmetrical.
   3. 277/480 V Panelboard: 14,000 A symmetrical.

SPEC WRITER NOTE: Edit the paragraph below to conform to project requirements.

D. Circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips for less than 400 A frame. Circuit breakers with 400 A frames and above shall have magnetic trip, adjustable from 5x to 10x. Breaker trip setting shall be set in the field, based on the approved protective device study as specified in Section 26 05 71,
E. Circuit breaker features shall be as follows:
   1. A rugged, integral housing of molded insulating material.
   2. Silver alloy contacts.
   3. Arc quenchers and phase barriers for each pole.
   4. Quick-make, quick-break, operating mechanisms.
   5. A trip element for each pole, thermal magnetic type with long time delay and instantaneous characteristics, a common trip bar for all poles and a single operator.
   6. Electrically and mechanically trip free.
   7. An operating handle which indicates closed, tripped, and open positions.

8. An overload on one pole of a multi-pole breaker shall automatically cause all the poles of the breaker to open.
9. Ground fault current interrupting breakers, shunt trip breakers, lighting control breakers (including accessories to switch line currents), or other accessory devices or functions shall be provided where shown on the drawings.
10. For circuit breakers being added to existing panelboards, coordinate the breaker type with existing panelboards. Modify the panel directory accordingly.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the manufacturer's instructions, the NEC, as shown on the drawings, and as specified.
B. Locate panelboards so that the present and future conduits can be conveniently connected.
C. In seismic areas, panelboards shall be adequately anchored and braced per details on structural contract drawings to withstand the seismic forces at the location where installed.
D. Install a printed schedule of circuits in each panelboard after approval by the A/E Staff. Schedules shall reflect final load descriptions, room numbers, and room names connected to each circuit breaker. Schedules shall be printed on the panelboard directory cards and be installed in the appropriate panelboards
E. Mount panelboards such that the maximum height of the top circuit breaker above the finished floor shall not exceed 1980 mm (78 inches).
F. Provide blank cover for each unused circuit breaker mounting space.
G. For panelboards located in areas accessible to the public, paint the exposed surfaces of the trims with finishes to match surrounding surfaces after the panelboards have been installed. Do not paint nameplates.
H. Rust and scale shall be removed from the inside of existing enclosures where new interior components are to be installed. Paint inside of enclosures with rust-preventive paint before the new interior components are installed. Provide new trim. Trim shall fit tight to the enclosure.
I. Panelboard enclosures shall not be used for conductors feeding through, spliced, or tapping off to other enclosures or devices.

3.2 ACCEPTANCE CHECKS AND TESTS

A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
   1. Visual Inspection and Tests:
      a. Compare equipment nameplate data with specifications and approved shop drawings.
      b. Inspect physical, electrical, and mechanical condition.
      c. Verify appropriate anchorage and required area clearances.
      d. Verify that circuit breaker sizes and types correspond to approved shop drawings.
      e. To verify tightness of accessible bolted electrical connections, use the calibrated torque-wrench method.
      f. Vacuum-clean enclosure interior. Clean enclosure exterior.

3.3 FOLLOW-UP VERIFICATION

A. Upon completion of acceptance checks, settings, and tests, the Contractor shall demonstrate that the panelboards are in good operating condition and properly performing the intended function.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, connection, and testing of wiring devices.

1.2 RELATED WORK

A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section of Division 26.

B. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduit and boxes.

C. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Cables and wiring.

D. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path to ground for possible ground fault currents.

E. Section 26 51 00, INTERIOR LIGHTING: Fluorescent ballasts and LED drivers for use with manual dimming controls.

1.3 QUALITY ASSURANCE

A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Shop Drawings:
   a. Submit sufficient information to demonstrate compliance with drawings and specifications.
   b. Include electrical ratings, dimensions, mounting details, construction materials, grade, and termination information.

2. Manuals:
   a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals, including technical data sheets and information for ordering replacement parts.
   b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certifications: Two weeks prior to final inspection, submit the following.
   a. Certification by the manufacturer that the wiring devices conform to the requirements of the drawings and specifications.
   b. Certification by the Contractor that the wiring devices have been properly installed and adjusted.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.

B. National Fire Protection Association (NFPA):
   70-11 .....National Electrical Code (NEC)
   99-12 .....Health Care Facilities

C. National Electrical Manufacturers Association (NEMA):
   WD 1-10 .....General Color Requirements for Wiring Devices
   WD 6-08 .....Wiring Devices – Dimensional Specifications

D. Underwriter's Laboratories, Inc. (UL):
   5-11 .....Surface Metal Raceways and Fittings
   20-10 .....General-Use Snap Switches
   231-07 .....Power Outlets
   467-07 .....Grounding and Bonding Equipment
   498-07 .....Attachment Plugs and Receptacles
   943-11 .....Ground-Fault Circuit-Interrupters
   1449-07 .....Surge Protective Devices
   1472-96 ..... Solid State Dimming Controls

1.6 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 RECEPTACLES

A. General: All receptacles shall comply with NEMA, NFPA, UL, and as shown on the drawings.
   1. Mounting straps shall be plated steel, with break-off plaster ears and shall include a self-grounding feature. Terminal screws shall be brass, brass plated or a copper alloy metal.
   2. Receptacles shall have provisions for back wiring with separate metal clamp type terminals (four minimum) and side wiring from four captively held binding screws.

B. Duplex Receptacles: Commercial-grade, single phase, 20 ampere, 120 volts, 2-pole, 3-wire, NEMA 5-20R, with break-off feature for two-circuit operation.
   1. Bodies shall be ivory in color.
   2. Switched duplex receptacles shall be wired so that only the top receptacle is switched. The lower receptacle shall be unswitched.
   3. Duplex Receptacles on Emergency Circuit:

a. In rooms without emergency powered general lighting, the emergency receptacles shall be of the self-illuminated type.

4. Ground Fault Interrupter Duplex Receptacles: Shall be an integral unit, hospital-grade, suitable for mounting in a standard outlet box, with end-of-life indication and provisions to isolate the face due to improper wiring.
   a. Ground fault interrupter shall be consist of a differential current transformer, solid state sensing circuitry and a circuit interrupter switch. Device shall have nominal sensitivity to ground leakage current of 4-6 milliamperes and shall function to interrupt the current supply for any value of ground leakage current above five milliamperes (+ or – 1 milliampere) on the load side of the device. Device shall have a minimum nominal tripping time of 0.025 second.
   b. Ground Fault Interrupter Duplex Receptacles (not hospital-grade) shall be the same as ground fault interrupter hospital-grade receptacles except for the hospital-grade listing.
5. Safety Type Duplex Receptacles:
   a. Bodies shall be gray in color.
      1) Shall permit current to flow only while a standard plug is in the proper position in the receptacle.
      2) Screws exposed while the wall plates are in place shall be the tamperproof type.

C. Receptacles; 20, 30, and 50 ampere, 250 Volts: Shall be complete with appropriate cord grip plug.

D. Weatherproof Receptacles: Shall consist of a duplex receptacle, mounted in box with a gasketed, weatherproof, cast metal cover plate and cap over each receptacle opening. The cap shall be permanently attached to the cover plate by a spring-hinged flap. The weatherproof integrity shall not be affected when heavy duty specification grade attachment plug caps are inserted. Cover plates on outlet boxes mounted flush in the wall shall be gasketed to the wall in a watertight manner.

E. Surge Protective (TVSS) Receptacles shall have integral surge suppression in line to ground, line to neutral, and neutral to ground modes.
   1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 Volts and minimum single transient pulse energy dissipation of 210 Joules.
   2. Active TVSS Indication: LED, visible in face of device to indicate device is active or no longer in service.

2.2 TOGGLE SWITCHES

A. Toggle switches shall be totally enclosed tumbler type with nylon bodies. Handles shall be ivory in color unless otherwise specified or shown on the drawings.
   1. Switches installed in hazardous areas shall be explosion-proof type in accordance with the NEC and as shown on the drawings.
   2. Shall be single unit toggle, butt contact, quiet AC type, heavy-duty general-purpose use with an integral self grounding mounting strap with break-off plasters ears and provisions for back wiring with separate metal wiring clamps and side wiring with captively held binding screws.
   3. Switches shall be rated 20 amperes at 120-277 Volts AC.

2.3 MANUAL DIMMING CONTROL

A. Electronic full-wave manual slide dimmer with on/off switch and audible frequency and EMI/RFI suppression filters.
B. Manual dimming controls shall be fully compatible with fluorescent electronic dimming ballasts and approved by the ballast manufacturer,LED dimming driver and be approved by the driver manufacturer, shall operate over full specified dimming range, and shall not degrade the performance or rated life of the electronic dimming ballast and lamp.
C. Provide single-pole or three-way, as shown on the drawings.
D. Manual dimming control and faceplates shall be ivory in color unless otherwise specified.

2.4 WALL PLATES

A. Wall plates for switches and receptacles shall be type smooth nylon . Oversize plates are not acceptable.
B. Color shall be ivory unless otherwise specified.
C. For receptacles or switches mounted adjacent to each other, wall plates shall be common for each group of receptacles or switches.
D. In areas requiring tamperproof wiring devices, wall plates shall be type 302 stainless steel, and shall have tamperproof screws and beveled edges.

2.5 SURFACE MULTIPLE-OUTLET ASSEMBLIES

A. Shall have the following features:
   1. Enclosures:
      a. Thickness of steel shall be not less than 1 mm (0.040 inch) for base and cover. Nominal dimensions shall be 40 mm x 70 mm (1-1/2 inches by 2-3/4 inches) with inside cross

sectional area not less than 2250 square mm (3-1/2 square inches). The enclosures shall be thoroughly cleaned, phosphatized, and painted at the factory with primer and the manufacturer's standard baked enamel finish.

2. Receptacles shall be duplex, commercial grade. See paragraph 'RECEPTACLES' in this Section. Device cover plates shall be the manufacturer's standard corrosion resistant finish and shall not exceed the dimensions of the enclosure.
3. Unless otherwise shown on drawings, receptacle spacing shall be 600 mm (24 inches) on centers.
4. Conductors shall be as specified in Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLE.
5. Installation fittings shall be the manufacturer’s standard bends, offsets, device brackets, inside couplings, wire clips, elbows, and other components as required for a complete system.
6. Bond the assemblies to the branch circuit conduit system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the NEC and as shown as on the drawings.
B. Install wiring devices after wall construction and painting is complete.
C. The ground terminal of each wiring device shall be bonded to the outlet box with an approved green bonding jumper, and also connected to the branch circuit equipment grounding conductor.
D. Outlet boxes for toggle switches and manual dimming controls shall be mounted on the strike side of doors.
E. Provide barriers in multigang outlet boxes to comply with the NEC.
F. Coordinate the electrical work with the work of other trades to ensure that wiring device flush outlets are positioned with box openings aligned with the face of the surrounding finish material. Pay special attention to installations in cabinet work, and in connection with laboratory equipment.
G. Exact field locations of floors, walls, partitions, doors, windows, and equipment may vary from locations shown on the drawings. Prior to locating sleeves, boxes and chases for roughing-in of conduit and equipment, the Contractor shall coordinate exact field location of the above items with other trades.
H. Install wall switches 1.2 M (48 inches) above floor, with the toggle OFF position down.
I. Install wall dimmers 1.2 M (48 inches) above floor.

J. Install receptacles 450 mm (18 inches) above floor, and 152 mm (6 inches) above counter back-splash or workbenches. Install specific-use receptacles at heights shown on the drawings.

K. Install vertically mounted receptacles with the ground pin up. Install horizontally mounted receptacles with the ground pin to the right.

L. When required or recommended by the manufacturer, use a torque screwdriver. Tighten unused terminal screws.

M. Label device plates with a permanent adhesive label listing panel and circuit feeding the wiring device.

3.2 ACCEPTANCE CHECKS AND TESTS

A. Perform manufacturer's required field checks in accordance with the manufacturer's recommendations. In addition, include the following:

1. Visual Inspection and Tests:

a. Inspect physical and electrical condition.

b. Vacuum-clean surface metal raceway interior. Clean metal raceway exterior.

c. Test wiring devices for damaged conductors, high circuit resistance, poor connections, inadequate fault current path, defective devices, or similar problems using a portable receptacle tester. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

d. Test GFCI receptacles.

END OF SECTION

SECTION 26 29 21

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, and connection of fused and unfused disconnect switches (indicated as switches in this section), and separately-enclosed circuit breakers for use in electrical systems rated 600 V and below.

1.2 RELATED WORK

A. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Requirements for seismic restraint of non-structural components.

B. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.

C. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.

D. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground faults.

E. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits.

F. Section 26 24 16, PANELBOARDS: Molded-case circuit breakers.

1.3 QUALITY ASSURANCE

A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Shop Drawings:
   a. Submit sufficient information to demonstrate compliance with drawings and specifications.

b. Submit the following data for approval:
   1) Electrical ratings, dimensions, mounting details, materials, required clearances, terminations, weight, fuses, circuit breakers, wiring and connection diagrams, accessories, and device nameplate data.

c. Certification from the manufacturer that representative enclosed switches and circuit breakers have been seismically tested to International Building Code requirements. Certification shall be based upon simulated seismic forces on a shake table or by analytical methods, but not by experience data or other methods.

2. Manuals:
   a. Submit complete maintenance and operating manuals including technical data sheets, wiring diagrams, and information for ordering fuses, circuit breakers, and replacement parts.
      1) Include schematic diagrams, with all terminals identified, matching terminal identification in the enclosed switches and circuit breakers.
      2) Include information for testing, repair, troubleshooting, assembly, and disassembly.
   b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
3. Certifications: Two weeks prior to final inspection, submit the following.
   a. Certification by the manufacturer that the enclosed switches and circuit breakers conform to the requirements of the drawings and specifications.
   b. Certification by the Contractor that the enclosed switches and circuit breakers have been properly installed, adjusted, and tested.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. International Code Council (ICC):

IBC-12 .....International Building Code

C. National Electrical Manufacturers Association (NEMA):

FU 1-07 ..... Low Voltage Cartridge Fuses

KS 1-06 ..... Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

D. National Fire Protection Association (NFPA):

70-11 ..... National Electrical Code (NEC)

E. Underwriters Laboratories, Inc. (UL):

98-07 ..... Enclosed and Dead-Front Switches

248-00 ..... Low Voltage Fuses

489-09 ..... Molded Case Circuit Breakers and Circuit Breaker Enclosures

1.6 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 FUSED SWITCHES RATED 600 AMPERES AND LESS

A. Switches shall be in accordance with NEMA, NEC, UL, as specified, and as shown on the drawings.

B. Shall be NEMA classified General Duty (GD) for 240 V switches, and NEMA classified Heavy Duty (HD) for 480 V switches.

C. Shall be horsepower (HP) rated.

D. Shall have the following features:

1. Switch mechanism shall be the quick-make, quick-break type.
2. Copper blades, visible in the open position.
3. An arc chute for each pole.
4. External operating handle shall indicate open and closed positions, and have lock-open padlocking provisions.
5. Mechanical interlock shall permit opening of the door only when the switch is in the open position, defeatable to permit inspection.
6. Fuse holders for the sizes and types of fuses specified.
7. Solid neutral for each switch being installed in a circuit which includes a neutral conductor.
8. Ground lugs for each ground conductor.
9. Enclosures:
   a. Shall be the NEMA types shown on the drawings.
   b. Where the types of switch enclosures are not shown, they shall be the NEMA types most suitable for the ambient environmental conditions.
   c. Shall be finished with manufacturer's standard gray baked enamel paint over pretreated steel.

//10. Electrically operated switches shall only be installed where shown on the drawings.//

2.2 UNFUSED SWITCHES RATED 600 AMPERES AND LESS

A. Shall be the same as fused switches, but without provisions for fuses.

2.3 FUSED SWITCHES RATED OVER 600 AMPERES TO 1200 AMPERES

A. Shall be the same as fused switches, and shall be NEMA classified Heavy Duty (HD).

2.4 MOTOR RATED TOGGLE SWITCHES

A. Type 1, general purpose for single-phase motors rated up to 1 horsepower.
B. Quick-make, quick-break toggle switch with external reset button and thermal overload protection matched to nameplate full-load current of actual protected motor.

2.5 N/A

2.6 SEPARATELY-ENCLOSED CIRCUIT BREAKERS

A. Provide circuit breakers in accordance with the applicable requirements in Section 26 24 16, PANELBOARDS.
B. Enclosures shall be the NEMA types shown on the drawings. Where the types are not shown, they shall be the NEMA type most suitable for the ambient environmental conditions.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the manufacturer’s instructions, the NEC, as shown on the drawings, and as specified.
B. In seismic areas, enclosed switches and circuit breakers shall be adequately anchored and braced per details on structural contract drawings to withstand the seismic forces at the location where installed.
C. Fused switches shall be furnished complete with fuses. Arrange fuses such that rating information is readable without removing the fuses.

3.2 ACCEPTANCE CHECKS AND TESTS

A. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
    1. Visual Inspection and Tests:
        a. Compare equipment nameplate data with specifications and approved shop drawings.
        b. Inspect physical, electrical, and mechanical condition.
        c. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.
        d. Vacuum-clean enclosure interior. Clean enclosure exterior.

3.3 SPARE PARTS

A. Two weeks prior to the final inspection, furnish one complete set of spare fuses for each fused disconnect switch installed on the project. Deliver the spare fuses to the Owner.

END OF SECTION

SECTION 26 32 13
ENGINE GENERATORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, connection, and testing of the //low-voltage// //medium-voltage// engine generators.

1.2 RELATED WORK

A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.
B. Section 26 05 13, MEDIUM-VOLTAGE CABLES: Medium-voltage cables.
C. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.
D. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
E. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT: Requirements for pipe and equipment support and noise control.
F. Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION: Requirements for hot piping and equipment insulation.
G. Section 26 23 00, LOW-VOLTAGE SWITCHGEAR: Requirements for secondary distribution switchgear.
H. Section 26 24 13, DISTRIBUTION SWITCHBOARDS: Requirements for secondary distribution switchboards.
I. Section 26 36 23, AUTOMATIC TRANSFER SWITCHES: Requirements for automatic transfer switches for use with engine generators.

1.3 QUALITY ASSURANCE

A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

B. A factory-authorized representative shall be capable of providing emergency maintenance and repairs at the project site within 4 hours maximum of notification.

1.4 FACTORY TESTS

A. Load Test: Shall include two hours while the engine generator is delivering 100% of the specified kW, and four hours while the engine generator is delivering 80% of the specified kW. During this test, record the following data at 20-minute intervals:

Time	Engine RPM	Oil Temperature Out
kW	Water Temperature In	Fuel Pressure
Voltage	Water Temperature Out	Oil Pressure
Amperes	Oil Temperature In	Ambient Temperature

B. Cold Start Test: Record time required for the engine generator to develop specified voltage, frequency, and kW load from a standstill condition with engine at ambient temperature.

C. Furnish four (4) copies of certified manufacturer's factory test reports to the Engineer prior to shipment of the engine generators to ensure that the engine generator has been successfully tested as specified.

D. The manufacturer shall furnish fuel, load banks, testing instruments, and all other equipment necessary to perform these tests.

1.5 SUBMITTALS

A. Submit six copies of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Shop Drawings:
   a. Submit sufficient information to demonstrate compliance with drawings and specifications.
   b. Scaled drawings, showing plan views, side views, elevations, and cross-sections.
   c. Certification from the manufacturer that a representative engine generator has been seismically tested to International Building Code requirements. Certification shall be based upon simulated seismic forces on a shake table or by analytical methods, but not by experience data or other methods.
2. Diagrams:

a. Control system diagrams, control sequence diagrams or tables, wiring diagrams, interconnections diagrams (between engine generators, automatic transfer switches, paralleling switchgear, local control cubicles, remote annunciator panels, and fuel storage tanks, as applicable), and other like items.

3. Technical Data:
   a. Published ratings, catalog cuts, pictures, and manufacturer's specifications for engine generator, governor, voltage regulator, radiator, muffler, dampers, day tank, pumps, fuel tank, batteries and charger, jacket heaters, torsional vibration, and control and supervisory equipment.
   b. Description of operation.
   c. Short-circuit current capacity and subtransient reactance.
   d. Sound power level data.
   e. Vibration isolation system performance data from no-load to full-load. This must include seismic qualification of the engine generator mounting, base, and vibration isolation.
4. Calculations:
   a. Calculated performance derations appropriate to installed environment.
5. Manuals:
   a. When submitting the shop drawings, submit complete maintenance and operating manuals, to include the following:
      1) Technical data sheets.
      2) Wiring diagrams.
      3) Include information for testing, repair, troubleshooting, and factory recommended periodic maintenance procedures and frequency.
      4) Provide a replacement and spare parts list. Include a list of tools and instruments for testing and maintenance purposes.
   b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
6. Test Reports:
   a. Submit certified factory test reports for approval.
   b. Submit field test reports two weeks prior to the final inspection.
7. Certifications:
   a. Prior to fabrication of the engine generator, submit the following for approval:

1) A certification in writing that an engine generator of the same model and configuration, with the same bore, stroke, number of cylinders, and equal or higher kW/kVA ratings as the proposed engine generator, has been operating satisfactorily with connected loads of not less than 75% of the specified kW/kVA rating, for not fewer than 2,000 hours without any failure of a crankshaft, camshaft, piston, valve, injector, or governor system.
2) A certification in writing that devices and circuits will be incorporated to protect the voltage regulator and other components of the engine generator during operation at speeds other than the rated RPM while performing maintenance. Submit thorough descriptions of any precautions necessary to protect the voltage regulator and other components of the system during operation of the engine generator at speeds other than the rated RPM.
3) A certification from the engine manufacturer stating that the engine exhaust emissions meet the applicable federal, state, and local regulations and restrictions. At a minimum, this certification shall include emission factors for criteria pollutants including nitrogen oxides, carbon monoxide, particulate matter, sulfur dioxide, non-methane hydrocarbon, and hazardous air pollutants (HPAs).

b. Prior to installation of the engine generator at the job site, submit certified factory test data.
c. Two weeks prior to the final inspection, submit the following.
   1) Certification by the manufacturer that the engine generators conform to the requirements of the drawings and specifications.
   2) Certification by the Contractor that the engine generators have been properly installed, adjusted, and tested.

1.6 STORAGE AND HANDLING

A. Engine generators shall withstand shipping and handling stresses in addition to the electrical and mechanical stresses which occur during operation of the system. Protect radiator core with wood sheet.
B. Store the engine generators in a location approved by the Engineer.

1.7 JOB CONDITIONS

A. Job conditions shall conform to the arrangements and details shown on the drawings. The dimensions, enclosures, and arrangements of the engine generator system shall permit the

operating personnel to safely and conveniently operate and maintain the system in the space designated for installation.

1.8 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. American National Standards Institute (ANSI):

C37.50-07 .....Low-Voltage AC Power Circuit Breakers Used In Enclosures-Test Procedures

C39.1-81 (R1992) .....Requirements for Electrical Analog Indicating Instruments

C. American Society of Testing Materials (ASTM):

A53/A53M-10.....Standard Specification for Pipe, Steel, Black, and Hot–Dipped, Zinc Coated Welded and Seamless

B88-09 .....Specification for Seamless Copper Water Tube

B88M-11 .....Specification for Seamless Copper water Tube (Metric)

D975-11b .....Diesel Fuel Oils

D. Institute of Electrical and Electronic Engineers (IEEE):

C37.13-08 .....Low Voltage AC Power Circuit Breakers Used In Enclosures

C37.90.1-02 .....Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus

E. International Code Council (ICC):

IBC-12 .....International Building Code

F. National Electrical Manufacturers Association (NEMA):

ICS 6-06.....Enclosures

ICS 4-10.....Application Guideline for Terminal Blocks

MG 1-11.....Motor and Generators

MG 2-07.....Safety Standard and Guide for Selection, Installation and Use of Electric Motors and Generators

PB 2-11 .....Dead-Front Distribution Switchboards

250-08 .....Enclosures for Electrical Equipment (1000 Volts Maximum)

G. National Fire Protection Association (NFPA):

30-12 .....Flammable and Combustible Liquids Code

37-10 .....Installations and Use of Stationary Combustion Engine and Gas Turbines

70-11 .....National Electrical Code (NEC)

99-12 .....Health Care Facilities

110-10 .....Standard for Emergency and Standby Power Systems

H. Underwriters Laboratories, Inc. (UL):

50-07 .....Enclosures for Electrical Equipment

142-06 .....Steel Aboveground Tanks for Flammable and Combustible Liquids

467-07 .....Grounding and Bonding Equipment

489-09 .....Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures

508-99 .....Industrial Control Equipment

891-05 .....Switchboards

1236-06 .....Battery Chargers for Charging Engine-Starter Batteries

2085-97 .....Insulated Aboveground Tanks for Flammable and Combustible Liquids

2200-98 ..... Stationary Engine Generator Assemblies

1.9 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The engine generator system shall be in accordance with NFPA, UL, NEMA and ANSI, and as specified herein.

B. Provide a factory-assembled, wired (except for field connections), complete, fully automatic engine generator system.

C. Engine Generator Parameter Schedule:
   1. Power Rating: Emergency Standby
   2. Voltage: 120/208V
   3. Rated Power: 100 kW 125 kVA continuous)
   4. Power Factor:/0.8 lagging
   5. Engine Generator Application: stand-alone.
   6. Fuel: Natural Gas
   7. Voltage Regulation: +/- 1% standalone applications
   8. Phases: 3 Phase, Wye
   9. Each component of the engine generator system shall be capable of operating at 1500 feet above sea level which will have average ambient air temperature ranging from a minimum of (-10°F) in winter to maximum of (105 °F) in summer.

D. Assemble, connect, and wire the engine generator at the factory so that only the external connections need to be made at the construction site.

E. Engine Generator Unit shall be factory-painted with manufacturer's primer and standard finishes.

F. Connections between components of the system shall conform to the recommendations of the manufacturer.

G. Couplings, shafts, and other moving parts shall be enclosed and guarded. Guards shall be metal, ruggedly constructed, rigidly fastened, and readily removable for convenient servicing of the equipment without disassembling any pipes and fittings.

H. Engine generator shall have the following features:
   1. Factory-mounted on a common, rigid, welded, structural steel base.
   2. Engine generator shall be statically and dynamically balanced so that the maximum vibration in the horizontal, vertical, and axial directions shall be limited to 0.15 mm (0.0059 inch), with an overall velocity limit of 24 mm/sec (0.866 inch per second) RMS, for all speeds.
   3. The isolators shall be constrained with restraints capable of withstanding static forces in any direction equal to twice the weight of the supported equipment.
   4. Shall be capable of operating satisfactorily as specified for not fewer than 10,000 hours between major overhauls.

I. Each engine generator specified for parallel operation shall be configured for automatic parallel operation.

2.2 ENGINE

A. The engine shall be coupled directly to a generator.

B. Minimum four cylinders.

C. The engine shall be able to start in a 4.5 ˚C (40 ˚F) ambient temperature while using natural gas without the use of starting aids.

D. The engine shall be equipped with electric heater for maintaining the coolant temperature between 32-38 °C (90-100 °F), or as recommended by the manufacturer.
   1. Install thermostatic controls, contactors, and circuit breaker-protected circuits for the heaters.
   2. The heaters shall operate continuously except while the engine is operating or the water temperature is at the predetermined level.

2.3 GOVERNOR

A. Isochronous, electronic type.

B. Steady-state speed band at 60 Hz shall not exceed plus or minus 0.33%.

2.4 LUBRICATION OIL SYSTEM

A. Pressurized type.

B. Positive-displacement pump driven by engine crankshaft.

C. Full-flow strainer and full-flow or by-pass filters.

D. Filters shall be cleanable or replaceable type and shall remove particles as small as 3 microns without removing the additives in the oil. For by-pass filters, flow shall be diverted without flow interruption.
E. Extend lube oil sump drain line out through the skid base and terminate it with a drain valve and plug.

F. Provide a 120-volt oil heater for exterior engine generator.

2.5 FUEL SYSTEM

A. Natural gas main.

2.6 COOLING SYSTEM

A. Liquid-cooled, closed loop, with fin-tube radiator mounted on the engine generator, as shown on the drawings.
B. Cooling capacity shall not be less than the cooling requirements of the engine generator and its lubricating oil while operating continuously at 100% of its specified rating.
C. Water circulating pumps shall be the centrifugal type driven by engine. Incorporate pressure relief devices where required to prevent excessive pressure increase after the engine stops.
D. Coolant shall be extended-life antifreeze solution, 50% ethylene glycol and 50% soft water, with corrosion inhibitor additive as recommended by the manufacturer.
E. Fan shall be driven by multiple belts from engine shaft .
F. Coolant hoses shall be flexible, per manufacturer's recommendation.
G. Self-contained thermostatic-control valve shall modulate coolant flow to maintain optimum constant coolant temperature, as recommended by the engine manufacturer.

2.7 AIR INTAKE AND EXHAUST SYSTEMS

A. Air Intake:
   1. Provide an engine-mounted air cleaner with replaceable dry filter and dirty filter indicator.
B. Exhaust System:
   1. Where a turbocharger is required, they shall be engine-mounted, driven by the engine gases, securely braced against vibration and adequately lubricated by the engine's filtered lubrication system.

2. Exhaust Muffler:

   Shall be Hospital grade type and capable of the following noise attenuation or better:

Octave Band Hertz (Mid Frequency)	Minimum db Attenuation (.0002 Microbar Reference)
31	5
63	10
125	27
500	37
1000	31
2000	26
4000	25
8000	26

3. Pressure drop in the complete exhaust system shall be small enough for satisfactory operation of the engine generator while it is delivering 100% of its specified rating.
4. Exhaust pipe size from the engine to the muffler shall be as recommended by the engine manufacturer. Pipe size from muffler to air discharge shall be two pipe sizes larger than engine exhaust pipe.
5. Connections at the engine exhaust outlet shall be made with a flexible exhaust pipe. Provide bolted type pipe flanges welded to each end of the flexible section.

C. Condensate drain at muffler shall be made with schedule 40 black steel pipe through a petcock.

D. Exhaust Piping and Supports: Black steel pipe, ASTM A-53 standard weight with welded fittings. Spring type hangers, as specified in Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT, shall support the pipe.

E. Insulation for Exhaust Pipe and Muffler:
   1. Calcium silicate minimum 75 mm (3 inches) thick.
   2. Insulation shall be as specified in Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.

3. The installed insulation shall be covered with aluminum jacket 0.4 mm (0.016 inch) thick. The jacket is to be held in place by bands of 0.38 mm (0.015 inch) thick by 15 mm (0.5 inch) wide aluminum.

F. Vertical exhaust piping shall be provided with a hinged, gravity-operated, self-closing rain cover.

2.8 ENGINE STARTING SYSTEM

A. The engine starting system shall start the engine at any position of the flywheel.

B. Electric cranking motor:
   1. Shall be engine-mounted.
   2. Shall crank the engine via a gear drive.
   3. Rating shall be adequate for cranking the cold engine at the voltage provided by the battery system, and at the required RPM during five consecutive starting attempts of 10 seconds cranking each at 10-second intervals, for a total of 50 seconds of actual cranking without damage (the fifth starting attempt will be manually initiated upon failure of a complete engine cranking cycle).

C. Batteries shall be lead-acid high discharge rate type.
   1. Each battery cell shall have minimum and maximum electrolyte level indicators and a flip-top flame arrestor vent cap.
   2. Batteries shall have connector covers for protection against external short circuits.
   3. With the charger disconnected, the batteries shall have sufficient capacity so that the total system voltage does not fall below 85% of the nominal system voltage with the following demands:
      Five consecutive starting attempts of 10 seconds cranking at 10 second intervals for a total of 50 seconds of actual cranking (the fifth starting attempt will be manually initiated upon failure of a complete engine cranking cycle).
   4. Battery racks shall be metal with an alkali-resistant finish and thermal insulation, and secured to the floor.

D. Battery Charger:
   1. A current-limiting battery charger, conforming to UL 1236, shall be provided and shall automatically recharge the batteries. The charger shall be capable of an equalize-charging rate for recharging fully depleted batteries within 24 hours and a floating charge rate for maintaining the batteries at fully charged condition.

2. An ammeter shall be provided to indicate charging rate. A voltmeter shall be provided to indicate charging voltage.

2.9 LUBRICATING OIL HEATER

A. Provide a thermostatically-controlled electric heater to automatically maintain the oil temperature within plus or minus 1.7 °C (3 °F) of the control temperature.

2.10 JACKET COOLANT HEATER

A. Provide a thermostatically-controlled electric heater mounted in the engine coolant jacketing to automatically maintain the coolant within plus or minus 1.7 °C (3 °F) of the temperature recommended by the engine manufacturer to meet the starting time specified at the minimum winter outdoor temperature.

2.11 GENERATOR

A. Synchronous, amortisseur windings, bracket-bearing, self-venting, rotating-field type connected directly to the engine.
B. Lifting lugs designed for convenient connection to and removal from the engine.
C. Integral poles and spider, or individual poles dove-tailed to the spider.
D. Designed for sustained short-circuit currents in conformance with NEMA Standards.
E. Designed for sustained operation at 100% of the RPM specified for the engine generator without damage.
F. Telephone influence factor shall conform to NEMA MG 1.
G. Furnished with brushless excitation system or static-exciter-regulator assembly.
H. Nameplates attached to the generator shall show the manufacturer's name, equipment identification, serial number, voltage ratings, field current ratings, kW/kVA output ratings, power factor rating, time rating, temperature rise ratings, RPM ratings, full load current rating, number of phases and frequency, and date of manufacture.
I. The grounded (neutral) conductor shall be electrically isolated from equipment ground and terminated in the same junction box as the phase conductors.

2.12 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator circuit breaker shall be molded case type. Molded case circuit breaker shall have automatic, trip free, non-adjustable, inverse time and instantaneous magnetic trips for 400 A frame size or less. Magnetic trip shall be adjustable from 5x to 10x for breakers with 400 A frame

size and higher. Factory setting shall be LOW unless otherwise noted. Provide shunt trip to trip breaker when engine generator is shut down by other protective devices.

B. Overcurrent protective device cubicle shall contain terminations for neutral and equipment grounding conductors as necessary.

2.13 CONTROLS

A. Shall include Engine Generator Control Cubicle(s) and Remote Annunciator panel to match generator from generator manufacture.

B. General:

1. Control equipment shall be in accordance with UL 508, NEMA ICS-4, ICS-6, and ANSI C37.90.1.
2. Panels shall be in accordance with UL 50.
3. Cubicles shall be in accordance with UL 891.
4. Coordinate controls with the automatic transfer switches shown on the drawings so that the systems will operate as specified.
5. Cubicles:
   a. Code gauge steel: manufacturer's recommended heavy gauge steel with factory primer and light gray finish.
   b. Doors shall be gasketed, attached with concealed or semi-concealed hinges, and shall have a permanent means of latching in closed position.
   c. Panels shall be wall-mounted or incorporated in other equipment as indicated on the drawings or as specified.
   d. Door locks for panels and cubicles shall be keyed identically to operate from a single key.
6. Wiring: Insulated, rated at 600 V.
   a. Install the wiring in vertical and horizontal runs, neatly harnessed.
   b. Terminate all external wiring at heavy duty, pressure-type, terminal blocks.
7. The equipment, wiring terminals, and wires shall be clearly and permanently labeled.
8. The appropriate wiring diagrams shall be laminated or mounted under plexiglass within the frame on the inside of the cubicles and panels.
9. All indicating lamps and switches shall be accessible and mounted on the cubicle doors.
10. Meters shall be per the requirements of Section 25 10 10, ADVANCED UTILITY METERING.

11. The manufacturer shall coordinate the interconnection and programming of the generator controls with all related equipment, including automatic transfer switches and generator paralleling controls as applicable, specified in other sections.

C. Engine generator Control Cubicle:

1. Starting and Stopping Controls:
   a. A three-position, maintained-contact type selector switch with positions marked "AUTOMATIC," "OFF," and "MANUAL." Provide flashing amber light for OFF and MANUAL positions.
   b. A momentary contact push-button switch with positions marked "MANUAL START" and "MANUAL STOP."
   c. Selector switch in AUTOMATIC position shall cause the engine to start automatically when a single pole contact in a remote device closes. When the generator's output voltage increases to not less than 90% of its rated voltage, and its frequency increases to not less than 58 Hz, the remote devices shall transfer the load to the generator. An adjustable time delay relay, in the 0 to 15 minute range, shall cause the engine generator to continue operating without any load after completion of the period of operation with load. Upon completion of the additional 0 to 15 minute (adjustable) period, the engine generator shall stop.
   d. Selector switch in OFF position shall prevent the engine from starting either automatically or manually. Selector switch in MANUAL position shall also cause the engine to start when the manual start push-button is depressed momentarily.
   e. With selector switch is in MANUAL position, depressing the MANUAL STOP push-button momentarily shall stop the engine after a cool-down period.
   f. A maintained-contact, red mushroom-head push-button switch marked "EMERGENCY STOP" will cause the engine to stop without a cool-down period, independent of the position of the selector switch.
2. Engine Cranking Controls:
   a. The cranking cycles shall be controlled by a timer that will be independent of the battery voltage fluctuations.
   b. The controls shall crank the engine through one complete cranking cycle, consisting of four starting attempts of 10 seconds each with 10 seconds between each attempt.
   c. Total actual cranking time for the complete cranking cycle shall be 40 seconds during a 70-second interval.

d. Cranking shall terminate when the engine starts so that the starting system will not be damaged. Termination of the cranking shall be controlled by self-contained, speed-sensitive switch. The switch shall prevent re-cranking of the engine until after the engine stops.

e. After the engine has stopped, the cranking control shall reset.

3. Supervisory Controls:

a. Overcrank:

1) When the cranking control system completes one cranking cycle (four starting attempts), without starting the engine, the OVERCRANK signal light and the audible alarm shall be energized.

2) The cranking control system shall lock-out, and shall require a manual reset.

b. Coolant Temperature:

1) When the temperature rises to the predetermined first stage level, the HIGH COOLANT TEMPERATURE - FIRST STAGE signal light and the audible alarm shall be energized.

2) When the temperature rises to the predetermined second stage level, which shall be low enough to prevent any damage to the engine and high enough to avoid unnecessary engine shutdowns, the HIGH COOLANT TEMPERATURE - SECOND STAGE signal light and the audible alarm shall be energized and the engine shall stop.

3) The difference between the first and second stage temperature settings shall be approximately -12 ˚C (10 ˚F).

4) Permanently indicate the temperature settings near the associated signal light.

5) When the coolant temperature drops to below 21 ˚C (70 ˚F), the "LOW COOLANT TEMPERATURE" signal light and the audible alarm shall be energized.

c. Low Coolant Level: When the coolant level falls below the minimum level recommended by the manufacturer, the LOW COOLANT LEVEL signal light and audible alarm shall be energized.

d. Lubricating Oil Pressure:

1) When the pressure falls to the predetermined first stage level, the OIL PRESSURE - FIRST STAGE signal light and the audible alarm shall be energized.

2) When the pressure falls to the predetermined second stage level, which shall be high enough to prevent damage to the engine and low enough to avoid unnecessary engine

shutdowns, the OIL PRESSURE - SECOND STAGE signal light and the audible alarm shall be energized and the engine shall stop.

3) The difference between the first and second stage pressure settings shall be approximately 15% of the oil pressure.

4) The pressure settings near the associated signal light shall be permanently displayed so that the running oil pressure can be compared to the target (setpoint) value.

e. Overspeed:

1) When the engine RPM exceeds the maximum RPM recommended by the manufacturer of the engine, the engine shall stop.

2) Simultaneously, the OVERSPEED signal light and the audible alarm shall be energized.

f. Low Fuel - Day Tank:

When the fuel oil level in the day tank decreases to less than the level at which the fuel oil transfer pump should start to refill the tank, the LOW FUEL DAY TANK light and the audible alarm shall be energized.

g. Low Fuel - Main Storage Tank:

When the fuel oil level in the storage tank decreases to less than one-third of total tank capacity, the LOW FUEL-MAIN STORAGE TANK signal light and audible alarm shall be energized.

h. Reset Alarms and Signals:

Overcrank, Coolant Temperature, Coolant Level, Oil Pressure, Overspeed, and Low Fuel signal lights and the associated audible alarms shall require manual reset. A momentary-contact silencing switch and push-button shall silence the audible alarm by using relays or solid state devices to seal in the audible alarm in the de-energized condition. Elimination of the alarm condition shall automatically release the sealed-in circuit for the audible alarm so that it will be automatically energized again when the next alarm condition occurs. The signal lights shall require manual reset after elimination of the condition which caused them to be energized. Install the audible alarm just outside the engine generator room in a location as directed by the Engineer. The audible alarm shall be rated for 85 dB at 3 M (10 feet).

i. Generator Breaker Signal Light:

1) A flashing green light shall be energized when the engine generator circuit breaker is in the OPEN or TRIPPED position.

2) Simultaneously, the audible alarm shall be energized.

4. Monitoring Devices:
   a. Electric type gauges for the cooling water temperatures and lubricating oil pressures. These gauges may be engine mounted with proper vibration isolation.
   b. A running time indicator, totalizing not fewer than 9,999 hours, and an electric type tachometer.
   c. A voltmeter, ammeter, frequency meter, kilowatt meter, manual adjusting knob for the output voltage, and the other items shown on the drawings shall be mounted on the front of the generator control panels.
   d. Install potential and current transformers as required.
   e. Visual Indications:
      1) OVERCRANK
      2) HIGH COOLANT TEMPERATURE - FIRST STAGE
      3) HIGH COOLANT TEMPERATURE - SECOND STAGE
      4) LOW COOLANT TEMPERATURE
      5) OIL PRESSURE - FIRST STAGE
      6) OIL PRESSURE - SECOND STAGE
      7) LOW COOLANT LEVEL
      8) GENERATOR BREAKER
      9) OVERSPEED
      10) LOW FUEL - DAY TANK
      11) LOW FUEL – MAIN STORAGE TANK
   f. Lamp Test: The LAMP TEST momentary contact switch shall momentarily actuate the alarm buzzer and all the indicating lamps.
5. Automatic Voltage Regulator:
   a. Shall correct voltage fluctuations rapidly and restore the output voltage to the predetermined level with a minimum amount of hunting.
   b. Shall include voltage level rheostat located inside the control cubicle.
   c. Provide a 3-phase automatic voltage regulator immune to waveform distortion.

2.14 REMOTE ANNUNCIATOR PANEL

A. A remote annunciator panel shall be installed at the Mechanical Electrical room location as shown on the drawings.

B. The annunciator shall indicate alarm conditions as required by NFPA 99 and 110.

C. Include control wiring between the remote annunciator panel and the engine generator. Wiring shall be as required by the manufacturer

2.15 SOUND-ATTENUATED ENCLOSURE

A. The engine generator and related equipment shall be housed in an outdoor weatherproof maximum sound attenuation enclosure.

B. The enclosure shall be provided with a factory-installed and factory-wired panelboard, 20A 120V receptacles, and compact fluorescent light fixtures with guards and switches.

C. Enclosure shall be weatherproof and sound-attenuated (maximum 85 dBA at 1525 mm (5 feet) from any side, top and bottom to no more than 75 dBA when measured at 15 M (50 feet) horizontally from any part of the enclosure). Sound ratings shall be based on full load condition of engine generator in a single unit operation condition.

D. Airflow configuration shall be intake through rear of unit, and discharge air vertically up. Enclosure shall be suitable for winds up to 193 kmh (120 miles per hour) roof load shall be equal to or greater than 200 kg/sq m (40 pounds per square foot) Non-distributed loading as required.

E. The enclosure shall meet the following requirements:
   1. Radiator exhaust outlet shall be ducted through the end of the enclosure.
   2. All exterior surfaces shall be factory-painted with industrial enamel.
   3. Unit shall have sufficient guards to prevent entrance by small animals.
   4. Batteries shall fit inside enclosure and alongside the engine generator. Batteries under the generator are not acceptable.
   5. The muffler shall be mounted and thermally-insulated inside the enclosure.

2.16 SPARE PARTS

A. For each engine generator:
   1. Six lubricating oil filters.
   2. Six primary fuel oil filters.
   3. Six secondary fuel oil filters.
   4. Six intake air filters.

B. For each battery charger:
   1. Three complete sets of fuses.

C. For each control panel:

1. Three complete sets of fuses, if applicable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install concrete bases of dimensions shown on the drawings.

B. Installation of the engine generator shall comply with manufacturer's written instructions and with NFPA 110.

C. Mounting:

1. Support the base of engine generator on vibration isolators, each isolator bolted to the floor (pad), and the generator base bolted to isolator.
2. Install sufficient isolators so that the floor (pad) bearing pressure under each isolator is within the floor (pad) loading specification.
3. Install equal number of isolators on each side of the engine generator's base.
4. Locate isolators for approximately equal load distribution and deflection per isolator. The base of the engine generator shall be drilled at the factory for the isolator bolts.
5. Isolators shall be shipped loose with the engine generator.
6. All connections between the engine generator and exterior systems, such as fuel lines, electrical connections, and engine exhaust system and air exhaust shroud, shall be flexible.

D. In seismic areas, engine generators shall be adequately anchored and braced per details on structural contract drawings to withstand the seismic forces at the location where installed.

E. Balance:

1. The vibration velocity in the horizontal, vertical, and axial directions shall not exceed 16.25 mm (0.65 inch) per second peak at any specific frequency. These limits apply to main structural components such as the engine block and the generator frame at the bearings.

F. Connect all components of the generator system so that they will continue to be energized during failure of the normal electrical power supply system.

G. Install piping between engine generator and remote components of cooling, fuel, and exhaust systems.

H. Flexible connection between radiator and exhaust shroud at the wall damper:

1. Install noncombustible flexible connections made of 20-oz neoprene-coated fiberglass fabric approximately 150 mm (6 inches) wide.

2. Crimp and fasten the fabric to the sheet metal with screws 50 mm (2 inches) on center. The fabric shall not be stressed, except by the air pressure.

I. Exhaust System Insulation:
   1. Adhesive and insulation materials shall be applied on clean, dry surfaces from which loose scale and construction debris has been removed by wire brushing.
   2. Fill all cracks, voids, and joints of applied insulation material with high temperature 1093 °C (2000 °F) insulating cement before applying the outer covering.
   3. The installation shall be clean and free of debris, thermally and structurally tight without sag, neatly finished at all hangers or other penetrations, and shall provide a smooth finished surface.
   4. Insulation and jacket shall terminate hard and tight at all anchor points.
   5. Insulate completely from engine exhaust flexible connection through roof or wall construction, including muffler.

3.2 ACCEPTANCE CHECKS AND TESTS

A. Provide the services of a factory-authorized, factory-trained representative of the engine generator manufacturer to inspect field-assembled components and equipment installation, and to supervise the field tests.

B. When the complete engine generator system has been installed and prior to the final inspection, test all components of the system in the presence of the Engineerfor proper operation of the individual components and the complete system and to eliminate electrical and mechanical defects.

C. Furnish fuel oil, lubricating oil, anti-freeze liquid, water treatment, rust-inhibitor, and load bank for testing of the engine generator.

D. Visual Inspection: Visually verify proper installation of engine generator and all components per manufacturer's pre-functional installation checklist.

E. Set engine generator circuit breaker protective functions per Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY.

F. Field Tests:
   1. Perform manufacturer's after-starting checks and inspections.
   2. Test the engine generator for six hours of continuous operation as follows:
      a. Two hours while delivering 100% of the specified kW.
      b. Four hours while the engine generator is delivering 80% of its specified kW rating.

c. If during the 6-hour continuous test, an engine generator failure occurs or the engine generator cannot maintain specified power output, the test(s) are null and void. After repair and/or adjustments, the test(s) shall be repeated at no additional cost to the Government until satisfactory results are attained.

3. Record the following test data at 30-minute intervals:
   a. Time of day, as well as reading of running time indicator.
   b. kW.
   c. Voltage on each phase.
   d. Amperes on each phase.
   e. Engine RPM.
   f. Frequency.
   g. Coolant water temperature.
   h. Fuel pressure.
   i. Oil pressure.
   j. Outdoor temperature.
   k. Average ambient temperature in the vicinity of the engine generator.
4. Demonstrate that the engine generator will attain proper voltage and frequency within the specified time limit from a cold start after the closing of a single contact.
5. Furnish a resistance-type load for the testing of the engine generator. Test loads shall always include adequate resistance to assure stability of the loads and equipment during all of the testing operations. The test load kW rating shall not be less than 100% of the specified kW rating of the engine generator.

G. Starting System Test:
   1. Demonstrate that the batteries and cranking motor are capable of five starting attempts of 10 seconds cranking each at 10-second intervals with the battery charger turned off.

H. Remote Annunciator Panel Tests:
   Simulate conditions to verify proper operation of each visual or audible indication, interconnecting hardware and software, and reset button.

I. Fuel systems shall be flushed and tested per Section 23 10 00, FACILITY FUEL SYSTEMS: Fuel supply and storage requirements.

J. Automatic Operation Tests:
   Test the engine generator and associated automatic transfer switches to demonstrate automatic starting, loading and unloading. The load for this test shall be the actual connected loads. Initiate

loss of normal source and verify the specified sequence of operation. Restore the normal power source and verify the specified sequence of operation. Verify resetting of controls to normal.

K. At the completion of the field tests, fill the main storage tank and day tank with fuel of grade and quality as recommended by the manufacturer of the engine. Fill all engine fluids to levels as recommended by manufacturer.

L. When any defects are detected during the tests, correct all the deficiencies and repeat all or part of the 6-hour continuous test as requested by the Engineer, at no additional cost to the Government.

M. Provide test and inspection results in writing to the Engineer.

3.3 FOLLOW-UP VERIFICATION

A. After completion of acceptance checks, settings, and tests, the Contractor shall demonstrate that the engine generator(s) and control and annunciation components are in good operating condition and properly performing the intended function.

3.4 INSTRUCTIONS AND FINAL INSPECTIONS

A. Laminate or mount under acrylic resin a set of operating instructions for the system and install instructions within a frame mounted on the wall near the engine generator at a location per the Engineer.

B. Furnish the services of a competent, factory-trained technician for one 4-hour period for instructions to VA personnel in operation and maintenance of the equipment, on the date requested by the Engineer.

---END OF SECTION---

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 260926 "Lighting Control Panelboards" for panelboards used for lighting control.
3. Section 260933 "Central Dimming Controls" or Section 260936 "Modular Dimming Controls" for architectural dimming systems and for fluorescent dimming controls with dimming ballasts specified in interior lighting Sections.
4. Section 260943.16 "Addressable-Luminaire Lighting Controls" and Section 260943.23 "Relay-Based Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, arranged by designation.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Sustainable Design Submittals:

D. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved:

B. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

C. Product Certificates: For each type of luminaire.

D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: 5 year(s) from date of Substantial Completion.

1.7 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green

Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. Recessed Fixtures: Comply with NEMA LE 4.

E. CRI of 70. CCT of 3000-3500 K.

F. Rated lamp life 50,000 hours.

G. Lamps dimmable from 100 percent to 0 percent of maximum light output.

H. Internal driver.

I. Nominal Operating Voltage: 120 V ac.

1. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

J. Housings:

1. Extruded-aluminum housing and heat sink.
2. White powder-coat or painted finish.

2.3 CYLINDER

A. Use same designations indicated on Drawings.

B. With integral mounting provisions.

2.4 DOWNLIGHT

A. Use same designations indicated on Drawings.

B. Universal mounting bracket.

C. Integral junction box with conduit fittings.

2.5 LOWBAY

A. Use same designations indicated on Drawings.

B. Universal mounting bracket.

2.6 RECESSED LINEAR

A. Use same designations indicated on Drawings.

B. Integral junction box with conduit fittings.

2.7 STRIP LIGHT

A. Use same designations indicated on Drawings.

B. Integral junction box with conduit fittings.

2.8 SURFACE MOUNT, LINEAR

A. Use same designations indicated on Drawings.

B. Integral junction box with conduit fittings.

2.9 SURFACE MOUNT, NONLINEAR

A. Use same designations indicated on Drawings.

B. Integral junction box with conduit fittings.

2.10 SUSPENDED, LINEAR

A. Use same designations indicated on Drawings.

2.11 SUSPENDED, NONLINEAR

A. Use same designations indicated on Drawings.

B. Integral junction box with conduit fittings.

2.12 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers, and Globes:

1. Diffused glass and prismatic acrylic

2. Retain "Acrylic" Subparagraph below if acrylic options in "Diffusers and Globes" Paragraph above are retained.
3. Acrylic: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
4. Glass: Annealed crystal glass unless otherwise indicated.
5. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. White powder-coat and painted finish.

2.13 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.14 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm)

D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports: Sized and rated for luminaire weight.

E. Flush-Mounted Luminaire Support: Secured to outlet box.

F. Wall-Mounted Luminaire Support:

1. Attached using through bolts and backing plates on either side of wall.
2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two 5/32-inch- (4-mm-) diameter aircraft cable supports adjustable to120 inches (6 m) in length

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.

J. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

K. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 265619 - LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.
4. Photoelectric programmable timers.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 260926 "Lighting Control Panelboards" for panelboard-based lighting control.
3. Section 260943.16 "Addressable-Luminaire Lighting Controls" and Section 260943.23 "Relay-Based Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.
4. Section 265613 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire Schedule on drawings."

D. IP: International Protection or Ingress Protection Rating

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Sustainable Design Submittals:

D. Delegated-Design Submittal: For luminaire supports.

1. Include design calculations for luminaire supports.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale and coordinated.

B. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

C. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.
3. Photoelectric programmable timer

D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 FIELD CONDITIONS

A. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.7 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 year(s) from date of Substantial Completion.

1.8 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces.

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. Lamp base complying with ANSI C81.61orIEC 60061-1.

F. CRI of minimum 70. CCT of [3000 K - 4100 K.

G. L70 lamp life of 50,000 hours.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Nominal Operating Voltage: 120 V ac.

J. In-line Fusing: On the primary for each luminaire.

K. Lamp Rating: Lamp marked for outdoor use.

L. Source Limitations: Obtain luminaires from single source from a single manufacturer.

M. Source Limitations: For luminaires, obtain each color, grade, finish, type, and variety of luminaire from single source with resources to provide products of consistent quality in appearance and physical properties.

2.3 LUMINAIRE TYPES

A. Area and Site:
1. Use same designations indicated on Drawings
2. Luminaire Shape: Square and Rectangle.
3. Mounting: Pole and building.
4. Luminaire-Mounting Height: Use same designations indicated on Drawings
5. Distribution: Use same designations indicated on Drawings

B. Canopy:
1. Use same designations indicated on Drawings
2. Shape: Rectangle.
3. Dimensions: Use same designations indicated on Drawings

2.4 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: **Corrosion-resistant aluminum**. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

2.5 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.

3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.
   a. Color: Use same designations indicated on Drawings

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
   a. Color: Use same designations indicated on Drawings.

2.6 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached using through bolts and backing plates on either side of wall.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires level, plumb, and square with finished grade unless otherwise indicated. Install luminaires at height and aiming angle as indicated on Drawings.

I. Coordinate layout and installation of luminaires with other construction.

J. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.2 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

B. Install above finished grade or surface at luminaire location as designations indicated on Drawings . Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- (0.254-mm-) thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls and programmable timer.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

   a. IES LM-5.
   b. IES LM-50.
   c. IES LM-52.
   d. IES LM-64.
   e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires programmable timers and photocell relays.

END OF SECTION

SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

1.1 SUSTAINABILITY REQUIREMENTS

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

1.2 MATERIALS

A. Metal Conduits and Fittings:

1. GRC.
2. ARC.
3. IMC.
4. PVC-coated rigid steel conduit IMC.
5. EMT.
6. PVC
7. Fittings:

    a. Conduit fittings for hazardous (classified) locations.
    b. EMT: Steel or die-cast, compression type.
    c. Expansion fittings.
    d. PVC coated.

B. Nonmetallic Conduits and Fittings:

1. Optical fiber pathways
2. RNC.
3. Rigid HDPE.
4. Continuous HDPE.

5. Coilable HDPE.
6. RTRC.
7. Fittings: Match conduit.

C. Optical-Fiber-Cable Pathways and Fittings: Flexible type, approved for plenum riser or general-use installation

D. Metal Wireways and Auxiliary Gutters: Sheet metal with hinged, screw, flanged-and-gasketed covers.

E. Nonmetallic Wireways and Auxiliary Gutters: Fiberglass polyester or PVC plastic.

F. Surface Metal Pathways: Metal, galvanized steel, with snap-on covers.

G. Surface Nonmetallic Pathways: Two- or three-piece, rigid PVC.

H. Tele-Power Poles:[Galvanized steel with ivory baked-enamel finish or Aluminum with clear anodized finish.

I. Boxes, Enclosures, and Cabinets:

1. Cast-Metal Outlet and Device Boxes: Ferrous alloy or Aluminum.
2. Metal Floor Boxes: Cast metal, fully adjustable.
3. Nonmetallic Floor Boxes: Non-adjustable,rectangular.
4. Small sheet metal pull and junction boxes.
5. Cast-metal access, pull, and junction boxes.
6. Gangable boxes are prohibited.
7. Hinged-Cover Enclosures: Metal or Nonmetallic.
8. Cabinets: Galvanized steel.

J. Handholes and Boxes for Exterior Underground Wiring: Polymer concrete with polymer-concrete or Fiberglass with fiberglass frame and cover; prototype tested for compliance with SCTE 77.

1. Configuration: Open bottom.
2. Weatherproof cover.
3. Cover Legend: "COMMUNICATIONS.".

1.3 PATHWAY APPLICATION

A. Outdoors:

1. Exposed: GRC
2. Concealed, Aboveground: Type EPC-40-PVC.
3. Underground: RNC, Type EPC-80-PVC, direct buried or concrete encased as indicated on drawings.
4. Boxes and Enclosures, Aboveground: Type 4.

B. Indoors:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage:[RNC identified for such use.
3. Exposed and Subject to Severe Physical Damage: GRC.
4. Concealed: EMT or]Type EPC-40-PVC.
5. Damp or Wet Locations: GRC.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway; Plenum-type, communications-cable pathway; EMT
7. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: Riser-type, optical-fiber-cable pathway; Riser-type, communications-cable pathway; EMT.
8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical-fiber-cable pathway; Riser-type, optical-fiber-cable pathway; Plenum-type, optical-fiber-cable pathway; General-use, communications-cable pathway; Riser-type, communications-cable pathway; [Plenum-type, communications-cable pathway;[EMT.
9. Boxes and Enclosures: Stainless steel or[Nonmetallic in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size: 3/4-inch (21-mm) trade size. Minimum size for optical-fiber cables is 1 inch (27 mm).

D. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Threaded rigid steel conduit fittings.
2. PVC Externally Coated, Rigid Steel Conduits: Fittings listed for use with this type of conduit.
3. EMT: compression], steel or cast-metal fittings.

E. Wiring Method: In pathways and pathways in accessible indoor ceiling spaces and attics.

1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.

END OF SECTION

SECTION 271300 - TELECOMMUNICATION CABLING

PART 1 - GENERAL

1.1 PURPOSE

The proper design and construction of a Telecommunication's Structured Cabling System at the University of Connecticut.
A properly designed and constructed Structured Cabling System, based on industry standards, will provide a flexible, efficient, long-lasting, and cost-effective transportation solution for our present and future communication needs. The University of Connecticut recognizes and adopts for itself the Telecommunication Industry's standards and practices as defined and/or interpreted by those agencies listed in section 1.5 and the intent of this document is to identify and define those requirements specific to the needs and practices of the University. The implementation of this design guide and standards will ensure a flexible, uniform telecommunications environment that will allow for the growth of high speed, high bandwidth required by specialized applications used in a higher education environment.

1.2 DEFINITIONS

To establish a common understanding, this document and the University of Connecticut shall use the following definitions of terms:

UCONN - The University of Connecticut; the owner of all property and completed projects, unless otherwise specified in the project documents. As the owner, UCONN has the right to enforce or modify all applicable codes, standards, and UCONN specific requirements.

UITS - University Information Technology Services; the University's department that is responsible for maintaining all of UCONN's telecommunications systems. As such, UITS shall have final approval of the design, parts, and equipment proposed or installed for UCONN's telecommunications infrastructure and systems.

TELECOMMUNICATIONS- Term used to describe voice, data, and TV services and the infrastructure to deliver them.

SHALL - The term used to denote requirement(s)set forth by UCONN that are not negotiable or arbitrary.

SHOULD - The term used where UCONN strongly recommends certain products or practices. FURNISH - To supply and deliver the item(s) described to the project site; ready for installation.

- To construct, erect, assemble, or place into position the item(s) described; ready for the intended use.

PROVIDE- To furnish and install the item(s) described; complete and ready for the intended use.

REMOVE - To make safe, disconnect, disassemble, deconstruct and/or remove from UCONN property; to properly and legally dispose.

MAC - An acronym for "Moves, Adds, and Changes" or the post-construction cabling that occurs after the building is occupied.

WAO - An acronym for "Work Area Outlet"; the Telecommunication outlet located at the end user's work area.

VOICE - Equipment and services associated with the delivery of analog, digital, or IP telephony.

DATA - Equipment and services associated with connectivity to the local and wide area networks and the internet.

TV - Equipment and services associated with the delivery of HUSKY vision broadband cable television solutions.

1.3 SCOPE AND DELIVERABLES

All telecommunication designs and installations for UCONN administrative, academic, residence halls and apartment buildings shall be such that at the completion of the project, UCONN is provided with a complete Structured Cabling System for the error free delivery of voice, data, and TV services to the end user; consistent with the guidelines and standards set forth in this document. Designs and installations shall incorporate existing systems to ensure a seamless co-existence of newly installed and existing systems. Certified personnel as specified in section 1.6 shall perform all designs and installations UITS is the service provider for all voice, data, and TV at the University of Connecticut. As Such, UITS will provide the following:

- All design and installation of the transportation media (i.e. copper, fiber, wireless) necessary to deliver these services to a demarcation point established at the building's Entrance Facility (EF). However, the pathways for the media (ie. underground conduits, manholes, pole lines, masts) shall be included in the project's scope and budget and their designs part of the Designer's scope of work.
- All telephone sets, equipment (i.e. NT1 cards, power supplies), and cross-connects to deliver voice services to the end user.
- All network equipment (i.e. routers, switches, wireless access points) and cross-connects to deliver network services to the end user.
- All fiber receivers, amplifiers, taps, splitters, and cross-connects to deliver TV services to the end user.

The non-reoccurring installation and equipment costs associated with delivering these UITS services shall be borne by the project or requesting department. Coordinate information with UITS to estimate their values.
The Contractor shall provide a design for a complete and functional Structured Cabling System; include equipment, materials, labor, tools, and services. System components include, but are not limited to:

- Raceways, boxes, cable tray, and cable supports
- Wall and floor penetrations and sleeves
- Fire-stopping
- Inside and outside plant cabling
- Line protection
- Splice enclosures
- Balanced twisted-pair cabling, terminations, and splicing
- Optical fiber cabling, terminations, and splicing

- Coaxial cabling, terminations, and splicing
- Work area communication outlets
- Consolidation points
- Cross-connect systems (wiring blocks, patch panels)
- Equipment racks, frames, and cabinets
- Wireless Access Point Enclosures
- Grounding and bonding
- Cable management
- Testing and labeling
- Pre-construction samples and submissions
- As-built documentation
- Removing abandoned cable

Close and careful coordination between UITS and the Designer is required to assure the proper design of the Telecommunication pathways and spaces to include UITS provided cable and equipment.

1.4 SPECIFIC MATERIALS

As an effort to reduce maintenance inventory and to provide consistency across the campus, UITS has standardized on specific brands and warranties for Telecommunications Structured Cabling Systems. All designs and specifications shall be based on the following approved manufacturers without substitution:

•Unshielded Twisted Pair (UTP) copper, horizontal and backbone cabling: Hubbell Premise Wiring - (800) 626-0005 www.hubbell-premise.com
•Optical fiber horizontal and backbone cabling: Corning Cable Systems - (800) 743-2671 www.coming.com/cablesystems
•Open frame racks, cable management, and ladder racks: Chatsworth Products, Inc. - (818) 735-6100 www.chatsworth.com
•Enclosed equipment racks: Wright-Line - (800) 225-7348 www.wrightline.com (Paramount Series)
•Surface Metal Raceways: Wiremold - (877) 295-3472 www.legrand.uslWiremold.aspx

All materials, equipment, hardware, and components shall be new and free from defects in materials, composition, and installed workmanship. Materials and equipment shall be installed, placed, terminated, tested, handled, and processed in a manner consistent with manufacturer's instructions.

1.5 REGULATORY REQUIREMENTS, CODES AND STANDARDS

All designs shall be in compliance with the following codes, industry standards, and practices, as well as, UCONN specific requirements described in this document. It is the responsibility of the contractor to know and comply with the most current revisions of each document referenced below:

Connecticut Department of Public Safety State Building Code - 2005 Connecticut Supplement, 2009 Amendment

ANSI/IEEE 802 series of standards for Local Area Networks and Wide Area Networks

ANSI/NFPA-70 - National Electrical Code (NEC)

ANSI/IEEE C2 - National Electrical Safety Code (NESC)

ANSI/IEEE 1100 2005 - Recommended Practice for Powering and Grounding Electronic Equipment (IEEE Emerald Book)

ANSI/NECA/BICSI-568 - Standard for Installing Commercial Building Telecommunications Cabling

ANSI/TIA-568-C.0 - Generic Telecommunications Cabling for Customer Premises

ANSI/TIA-568-C.1 – Commercial Building Telecommunications Cabling Standard

ANSI/TlA-568-C.2 - Balanced Twisted Pair Telecommunications Cabling and Components Standard

ANSI/TIA-568-C.3 -Optical Fiber Cabling Components Standard

ANSI/TIA-569-B - Commercial Building Standard for Telecommunications Pathways and Spaces

ANSI/TIA-606-A - The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

ANSI-J-STD-607-A - Commercial Building Grounding and Bonding Requirements for Telecommunications

ANSI/TlA-7S8-A - Customer-Owned Outside Plant Telecommunications Cabling Standard

ANSI/TIA-862 – Building Automation Systems Cabling Standard for Commercial Buildings

ANSI/TIA-942 – Telecommunications Infrastructure Standard for Data Centers Telcordia SR-1421 - Blue Book, Manual of Construction Procedures

Hubbell Premise Wiring - MISSION CRITICAL™ Extended Warranty Program

Corning Cable Systems - LANscape™ Extended Warranty Program

All codes, industry standards and practices, and UCONN specific requirements shall be enforced, however, where they conflict, the more stringent or UCONN specific requirements shall apply.

1.6 CERTIFICATIONREQUIREMENTSAND DOCUMENTATION

The Designer shall be competent in the field of Telecommunications design. (S)He shall demonstrate at least three years of experience in Telecommunications design and specialized education in this field as well. Acceptable evidence is that the Designer be a BICSI certified Registered Communications Distribution Designer (RCDD) or equal. The Designer shall also be a professional,licensed by the State of Connecticut to perform this function (l.e. PE or TLT).

. .

The Contractor shall be competent in the field of installing Structured Cabling Systems as well. (S)He shall show at least three years' experience in this field and provide customer references for work recently completed. The Contractor shall show proof they are certified by the cabling connectivity manufacturer to support the manufacturer's extended warranty program and of training to all their installers by the manufacturer offering the extended warranty program. As a plus, the Contractor should provide installers and supervisors that have received specialized training in installing Structured Cabling Systems by a vendor neutral organization such as BICSI. The Contractor and his(er) installers shall be properly licensed by the State of Connecticut to install Structured Cabling Systems.

1.7 WARRANTY

The Contractor shall provide UCONN a warranty for performance of the Structured Cabling System and against defects in materials and workmanship for a period of no less than one year after close of the project. All material, labor, and expenses to correct the problem(s) are to be included in the warranty.

The Contractor shall enroll the installed Structured Cabling System into the cabling component manufacturer's extended warranty program. They shall provide UCONN with a certificate of warranty from the manufacturer valid for a period of no less than twenty-five years. All materials, labor, and expenses to correct the problem(s) shall be included in the warranty.

1.8 PERFORMANCEREQUIREMENTS

The Structured Cabling System to meet the following minimum requirements:

- UTP Horizontal Permanent Links: Category 6
- UTP Backbone Cabling: Category 3
- Optical Fiber Backbone Cabling and Permanent Links: ITU-T G.652.D compliant Full Spectrum Singlemode(OS2)
- Coaxial Horizontal Permanent Links: Series 6 (RG6) Quad-shield;tested to 3GHz
- Coaxial Backbone Cabling: .500" Parameter III

1.9 GROUNDING

Provide a low-impedance Telecommunications Grounding System in accordance with ANSI-J- STD-607-A - Commercial Building Grounding and Bonding Requirements for Telecommunications. The Telecommunications Main Grounding Busbar (TMGB) shall be located in the Equipment Room; in close proximity to the Entrance Facility; bonded in accordance to NEC Art. 800.100. Size the TMGB to provide enough points of attachment for each bonding connection plus 10% growth. The minimum size for the TMGB is 1/4"W X 4"H X12"L. Provide a Telecommunications Grounding Busbar (TGB) in each Telecommunication Room. The TGB shall be located high on the wall just below the overhead ladder racking. Size the TGB to provide enough points of attachment for each bonding connection plus 10% growth. The minimumsize for the TGB is 1/4"W X 2"H X 12"L. Provide a grounding busbar 1/4" W X 5/8"H X 72"L mounted vertically along the backside of each ER equipment rack and each TR equipment rack provisioned with power for active electronic equipment.

1.10 ADMINISTRATION

Identify and label each Equipment Room and Telecommunication Room with a unique identifier derived from the UCONN's FAMIS facility management database. The labels shall be permanent and consistent

with the labeling style established for the building. Along with the room number the label shall include "TEL/DATA" as the use describer.

110 TEL/DATA

Identify and label each Equipment Rack with a unique identifier that includes the Telecommunication Space FAMIS room number followed by a hyphen then a single numeric character. The labels shall be engraved plastic; the font shall be at least 1 inch high and contrasting the background in color. Securely attach the label to the front of the ladder rack; directly above the equipment rack.

110-1

Identify and label each Wall with a Plywood Backboard with a unique identifier that includes the Telecommunication Space FAMIS room number followed by a hyphen then a single alpha character. The labels shall be engraved plastic; the font shall be at least 1 inch high and contrasting the background in color. Securely attach the label to the front of the ladder rack directly; above the plywood backboard.

110-A

Identify and label each Patch Panel and Wiring Block with a unique identifier that includes the Equipment Rack or Plywood Backboard identifier followed by a single alpha character. The labels shall be durable, machine generated, self-adhering, at least 3/8" wide; the font shall be a minimum of 3/16" high and contrasting the background in color. Affix the labels to the front of the patch panel or wiring block so that they will remain clearly visible once cross-connects or patching is completed.
110-1A (rack-mount patch panel)
110-AA(wall-mount wiring block)

Uniquely identify and label each Backbone Cable as to reference its source and destination termination patch panel or wiring block, the cable's type and size. The labels shall be durable, machine generated, self-adhering, at least 3/8" wide; the font shall be a minimum of 3/16" high and contrasting the back ground in color. Affix labels at the end of the cable within 12 inches of termination and on each patch panel or wiring block.

001-AA/110-AA100-3-UTP (UTP copper backbone)
001-1A1110-OA12-SMF (fiber backbone)

001-AB/110-ABP3-500 (coaxial backbone)

Uniquely identify and label each Permanent Link as to reference its source termination patch panel port or wiring block position. The identifier shall include the patch panel or wiring block identifier followed by a two digit port or position number. The labels shall be durable, machine generated, self-adhering, at least 3/8" wide; the font shall be a minimum of 3/16" high and contrasting the background in color. Affix labels at the end of each cable within 12 inches of terminationand to the front of the faceplate near the connector module.

110-1A01

All identifiers shall be clearly recorded on the as-built drawings.

As part of the close-out documentation, provide UITS with a table that shows the relationship of each permanent link, by its identifier, to the FAMIS room number of the TR and the FAMIS room number where the WAO is installed. .

1.11 SUSTAINABILITY REQUIREMENTS

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.
Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.
It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.
Low-lead requirements.
Low-emitting adhesives.

2 PART 2 - INSIDE PLANT

2.1 TELECOMMUNICATIONS PATHWAYSAND SPACES

Pathways and spaces identified for Telecommunication use shall be dedicated solely for that purpose. Concerns for network security, complexity of the systems, sensitivity to alien interferences (i.e. static electricity, RF, or EMI), power quality, and special environmental requirements make it necessary that telecommunications equipment and cabling to be the sole occupant of these pathways and spaces.

Telecommunication Spaces (ER, TR) shall be directly accessible from main corridors; technicians shall not have to pass through other spaces, such as offices or mechanical rooms, to access Telecommunication Spaces. The doors shall be locked and keyed to UITS specified keys for Telecommunication Spaces. The rooms shall be clearly labeled as a Telecommunications Space.

Provide enough space for all equipment located within the Equipment and Telecommunications Rooms and offer a safe working environment for technicians. Codes and standards establish minimum working clearances, but considerations shall be given to the layout and for space that allows a technician with a tool belt to work safely around active equipment without having to step around or over cords, cables, and equipment or accidentally disconnecting equipment.

As buildings become "Smarter", more and more services are becoming dependent on the local area network for their communication needs. As a result, it has become a critical function of the university to keep the network up and running. Power availability and quality are significant components to that equation. UCONN has deemed that Telecommunications is an "EMERGENCY SERVICE" and that it must be made highly available. The Designer shall include a back-up power source with a UPS solution in the design for powering the Equipment and Telecommunications Rooms. UITS strongly recommends that a centralized UPS and power distribution system be provided for all telecommunication spaces. Provide branch circuits for telecommunications equipment as noted below. In addition, provide at least one 120VAC 20A outlet in each room from normal building power for maintenance operations.

The designer shall include a solution for the room's environmental needs, utilizing practices and standards set forth by ASHRE. Equipment and Telecommunications Rooms shall maintain temperatures and humidity levels within the recommended limits of the telecommunication equipment manufacturers, as well as the ventilation of any accumulated fumes and gasses.

Where Equipment and Telecommunication Rooms contain a significant volume of data equipment (Le. Data Center, Server Farm, Network Distribution Layer Node) or service a large portion of the buildings needs the designer should include a pre-action solution for the fire suppression system.

Provide equipment racks in quantities and types as described below. Racks shall be of a high strength extruded aluminum construction with a black powder-coat finish; standard TIA 19" design with #12-24 threaded holes space according to the EIA-310-D Universal Hole pattern on both the front and rear of the rails. The rails shall be labeled along the front to identify the Rack Mount Unit (RMU, 1.75") spaces. Racks shall be 7 foot tall providing 45-RMU of mountings pace. Provide cable management troughs with rounded "waterfall" edges at the top of each rack. The racks shall be securely fastened to the floor and to the ladder racking above. Mount racks side-by-side in continuous row with 10" wide vertical cable management in between each pairing of racks and 6" wide vertical cable management at the outside of the row. Vertical cable managers shall be 7 foot tall with deep "T' shaped rigid cable guides spaced at 1-RMU increments; they shall have hinged covers that open to the left or right by a single control action; Chatsworth Products, Inc. EVOLUTION™ series or equal. Provide double sided vertical cable managers with two-post racks and Single-sided with four-post racks.

2.1.1 ENTRANCE FACILITY

For the purposes of this document, the Entrance Facility (EF) is the service lateral conduits that provide a pathway from the nearest UCONN telecommunications manhole to the building Equipment Room and the location within the Equipment Room where UITS will terminate their outside plant service providing cables.

Provide a minimum of two trade size 4 conduits from the nearest UCONN telecommunications manhole to the building's Equipment Room. Where the purpose of the building, either whole or in part, is to serve the telecommunications needs of other buildings (i.e. SLC site, Network Distribution Layer Node, Wiring Center) provide six trade size 4 conduits. Refer to section 3 for installation requirements.
For line-protection and splicing of the UITS copper cable(s), provide two 4' X 8' X *" fire-retardant plywood next to the entrance facility conduits.

For terminations and splicing of the UITS optical fiber cable{s) provide one four-post Equipment Rack; Chatsworth Products, Inc. QUADRARACK™ or equal.

2.1.2 EQUIPMENT ROOM

The purpose of Equipment Room (ER) to serve as the building distributor for Telecommunication services; it shall be located as close as practicable to the main electrical service. Located within the ER shall be the EF; the TMGB; terminations for .all Telecommunication Backbones; Telecommunications Equipment that serve the building (i.e. ISDN NT1's, telephone power supplies, routers, switches, servers, broadband amplifiers). Where the size of the building is such that it only requires one Telecommunications space, the ER may also serve as the TR.

Provide overhead ladder racking around the perimeter of the ER and over each Equipment Rack. This ladder rack shall be sized to accommodate the orderly distribution of cable within the room, but shall not be less than 12" wide. Install the ladder rack approximately 7'-6" AFF. Provide "waterfall" cable guides over each vertical cable manager and vertical cable route to protect the cables' bend radius.

Locate the UTP copper and P-III coaxial backbone terminations on the plywood back board near the OSP line-protection.

For terminations and splicing of the building backbone optical fiber cable(s) provide (1) four-post Equipment Rack; Chatsworth Products, Inc. QUADRARACK™ or equal. Locate this rack next to the EF rack.

Provide two 120VAC 20A branch circuits with two NEMA 5-20R duplex receptacles each from the Telecommunications power supply; one circuit at the plywood backboard and the other at the equipment rack.

2.1.3 TELECOMMUNICATIONS ROOMS

The purpose of the Telecommunication Room (TR) to serve as an area or floor distributor for Telecommunication services; it shall be located near the center of the area/floor served. In a multi-story building the TR's should be located as to stack one directly above the other. The area served by the TR and the location of the TR shall be such that no permanent link exceeds 90 m (328 ft.) in total length. Located within the TR are the
termination fields for the permanent links and backbone cables, the TGB, active and passive equipment racks ,the Telecommunications equipment to serve the area.

At least two walls of the TR shall be covered with ~" fire-retardant plywood from the floor to a height of 8'-0" AFF.

Provide overhead ladder racking around the perimeter of the TR and over each Equipment Rack. This ladder rack shall be sized to accommodate the orderly distribution of cable within the room, but shall not be less than 12" wide. Install the ladder rack approximately 7'-6" AFF. Provide "waterfall" cable radius bend protection over each vertical cable manager and vertical cable route to protect the cables' bend radius.

Provide a minimum of two two-post equipment racks in each TR to house all cable terminations and Telecommunications equipment. The rack loading shall be designed so as not to exceed 80% (32-RMU) usage of the available space.

Provide an intra-TR backbone in each TR. An intra-TR backbone is a category 3 UTP backbone from the plywood backboard, near the UTP backbone, to the equipment rack. This backbone terminates to a 110-type wiring block on the plywood backboard and to
48-port T568B patch panel(s) on the equipment rack. Equip the 110-type wiring block with 110-C4 connector blocks. This backbone shall be sized in 48 port increments so as
to provide 1.1 patch panel ports (4-pairs per port) for each standard and wallphone WAO
served from the TR.

Provide one 120VAC 20A branch circuit with two NEMA 5-20R duplex receptacles from Telecommunications power supply at the plywood backboard near the intra-TR backbone termination field. Provide

two 208VAC 30A 3-phase branch circuits with NEMA L15-30R receptacles from Telecommunications power supply for each equipment rack with active electronic equipment.

2.1.4 TELECOMMUNICATION PATHWAYS

Information technology is forever changing. As such, the media infrastructure for this technology must develop and change to keep pace; as it provides the "highways" to transport these services to our customers. The question that keeps reoccurring is "How do we future-proof our building against the costs associated. with these changes?" The answer comes with well designed and built Telecommunication Pathways such as cable trays, conduits, ring-runs, and sleeves. A Telecommunication Pathway should provide ease of access for the installer to minimize damage to the building and ease installation to reduce labor costs. The pathway should also be of sufficient size to accommodate future cabling needs such as MAC cabling for personal changes or wholesale media upgrades. With this in mind, include the following points in designing the Telecommunications Pathways.

Cable supports shall be wide-based and close enough together to prevent distortion to the cables' geometry from the weight of other cables on piled top and excessive cable drooping.

Provide oversized or additional sleeves through common pathway walls and floors such as the ones for the TR or along the major cable paths.

Provide conduits through non-accessible spaces like fixed or gypsum ceilings. In areas where horizontal cables aggregate into the TR provide cable tray.
Design the telecommunications pathways to run parallel with or perpendicular to the lines of the building. Cables shall not be run through ceiling spaces in an "as the crow flies" manor.

All through-wall and through-floor penetrations for the Telecommunications Pathway shall be sleeved and properly fire-stopped.

Provide pull-strings in conduits and cable tray for future cable installations.

2.1.4.1 BACKBONE PATHWAYS

Backbone cabling pathways shall be clearly identified as such designed to provide adequate space and protection for the backbone cables, and allow room for future growth; recommended is a cable tray or conduits. Where backbone cables pass vertically through stacked TR's, provide a ladder rack vertically mounted from floor to ceiling for cable support Where possible, the pathway should extend to the roof to accommodate future cabling needs.

2.1.4.2 HORIZONTAL PATHWAYS

Cable pathways shall be accessible and should follow the corridors of the building. Where cable tray or conduit is not specified, a continuous pathway of independent cable supports shall be provided.

2.1.4.3 WORK AREA OUTLET BOXES

WAO boxes concealed within wall spaces shall be a minimum of 4-11/16"H x 4-

11/16'W x 2-1/8"D with a single gang plaster ring. Each outlet box shall have a minimum trade size 1 conduit stubbed to an accessible ceiling space or cable tray. Conduit openings shall be bushed to protect cables from damage.

2.1.4.4 SURFACE MOUNTED RACEWAY

Raceways shall be metallic and sized to accommodate the number of cables specified for installation. They shall maintain proper cable bend radii and provide room for additional fill. Provide split or dual channel raceway for installations that require both power and telecommunication services to share the raceway.

2.1.4.5 MODULAR SYSTEM FURNITURE AND PANELING

Modular system furniture and paneling shall accommodate UCONN specific materials and not require the use of proprietary cabling components. They shall have integral raceways that conceal telecommunication cables without distorting or damaging them or compromising cable bend radius requirements. System furniture raceways shall have metal barriers to separate telecommunication cables from power cables.

2.2 BACKBONE CABLING

2.2.1 UTP COPPER BACKBONE

Provide a UTP copper backbone cable from each TR back to the ER. The cable shall be, at a minimum, category 3 and UL listed to be installed in an environmental return-air plenum space (CMP).

Size the UTP copper backbone in 100 pair increments so as to provide at least 2.3 pairs for each standard and wallphone WAO served.

Terminate the cable(s) to wall-mount 300-pair 110-type wiring block(s) in the ER and TR. The 110-type wiring blocks shall be equipped with 110-C5 connector blocks. Provide cross-connect wire management above and below each 110 wiring block.

Each cable pair shall be tested for point-to-point continuity. This includes testing to certify correct wire mapping and to insure there are no opens, shorts, crosses, or grounds. As part of the close-out documentation provide UITS the testing equipment's make, model, serial number, and most recent certification of calibration by the manufacturer. List the setting(s) used, as well as, cable identification, from/to locations of each cable, test date and the names of the testing technicians.

2.2.2 OPTICAL FIBER BACKBONE

Provide a single mode optical fiber backbone from each TR back to the ER. The cable shall be of a tight-buffer construction with an aluminum interlocking armor jacket and UL listed to be installed in an environmental return-air plenum space (OFCP). The fiber shall be ITU-T G.652.0 compliant Full Spectrum Single mode (OS2).

Size the optical fiber backbone in 12-fiber increments so as to provide at least 8 fibers per application (UITS typically has one application per TR).

Terminate fiber cables by fusion-splicing pigtail cable assemblies to the cable ends. The pigtail cable assemblies shall be factory terminated with SC/APC connectors. Protect the fusion-splices with reinforced heat-shrink sleeves and place them in splice trays. Provide rack-mount patch panels with SC-APC couplers and storage for splice trays. Where fiber backbone cables terminate on four-post racks; fiber patch panels shall be mounted on the front side of the rack and splicing cabinets on the rear.

Optical fiber testing shall be performed in accordance with ANSI-TIAIEIA-568 C.O and C.1. Perform a Tier 1 (LS/PM) test on each optical fiber. Fibers that are spliced, with other than pigtail splicing, shall also undergo a Tier 2 (OTDR) test. As part of the close- out documentation provide UITS the test results of each fiber along with the testing equipment's make, model, serial number, and most recent certification of calibration by the manufacturer. List the setting(s) used, as well as, cable identification, from/to locations of each cable, test date and the names of the testing technicians.

2.2.3 COAXIAL BACKBONE

Provide a Coaxial Backbone from the plywood backboard in each TR back to the plywood backboard in the ER. The cable shall be a .500" Parameter III coax distribution cable and UL listed to be installed in an environmental return-air plenum
space (CATVP).

Terminate each cable end with F81 bulkhead connector. All connectors shall be terminated with OEM specified tools. Provide and neatly store 10 feet of additional cable at each location.

Test the following parameters of each cable: Continuity, length, and insertion loss. Testing shall be done in accordance to OEM requirements for warranty. As part of the close-out documentation provide UITS the test results of each coaxial cable along with the testing equipment's make, model, serial number, and most recent certification of calibration by the manufacturer. List the setting(s) used, as well as, cable identification, from/to locations of each cable, test date and the names of the testing technicians.

2.3 HORIZONTALCABLING (PERMANENT LINKS)

All horizontal cabling, including video cabling, shall be distributed in a star configuration; running from the WAD back to the serving TR. See below for specific requirements.

2.3.1 UTP PERMANENT LINKS

Cables shall be solid copper conductors, 22 AWG to 24 AWG, 1000 balanced unshielded twisted-pair (UTP) Enhanced Category 6 cables with four individually twisted- pairs, which meet or exceed the mechanical and transmission performance specifications in ANSI/TIA-568-C.2;tested to at least 550 MHz, minimally compliant category 6 cables shall not be accepted. The color of the cable's outer jacket shall be WHITE. Cables shall be UL listed for the application and environment for which they are installed with the following modification: cables installed in residence buildings and places of public assembly shall be, at a minimum, UL listed to be installed in an environmental return-air plenum space (CMP).

Modular Connectors (Jacks) shall be category 6; "Keystone" in design; wired T568B; and meet or exceed the mechanical and transmission performance specifications in ANSI/TIA-568-C.2. The color of the jacks shall match the color of the mounting frame and the nearby electrical outlets.

Patch Panels shall be category 6; wired T568B; 48 port; 2-RMU; designed to mount on a standard TIA 19" frame; and shall meet or exceed the mechanical and transmission performance specifications in ANSI/TIA-568-C.2; color BLACK. Each port shall be uniquely and permanently numbered from the manufacturer.

Test each permanent link as a complete horizontal cabling system, with jacks and faceplates completely assembled and properly mounted in their final position. Perform permanent link field tests with a Level III field tester; in accordance to test unit manufacturer instructions. Field-test each category 6 permanent link in accordance with ANSI/TIA-568-C.O, ANSI/TIA-568-C.1 and ANSI/TIA -568-C.2. including their addenda. UCONN will' accept only those permanent links whose field-test results with a PASS. Permanent links with a field-test result of FAIL or *PASS will be rejected. Store and identify test results by the permanent link identification as shown on the contract drawings. As part of the close-out documentation provide UITS the test results and the testing equipment's make, model, serial number and most recent certification of calibration by the manufacturer. List the setting(s) used, as well as, cable identification, from/to locations of each cable, test date and the names of the testing technicians.

2.3.2 OPTICAL FIBER PERMANENT LINKS

Cables shall be of a fan-out type construction with a minimum 2.0mm outer jack and high-strength reinforcing fibers protecting each fiber. The cables shall contain four Single mode (OS2) fibers which meet or exceed the mechanical and transmission performance specifications in ANSI/TIA-568-C.3. The color of the cable's outer jacket shall be YELLOW. Cables shall be UL listed for the application and environment for which they are installed with the following modification: cables installed in residence buildings and places of public assembly shall be, at a minimum, UL listed to be installed in an environmental retum-air plenum space (OFNP).

The fibers shall be field terminated high performance, no epoxy/no polish small form factor LC connectors which meets or exceeds the mechanical and transmission performance specifications in ANSI/TIA-568-C.3. Adaptor modules shall be flush mount duplex LC and produced by the same manufacturer of the UTP modular connectors. The color of the modules shall match the color of the mounting frame.

Test each permanent link as a complete horizontal cabling system, with connectors, adaptors, and faceplates completely assembled and properly mounted. Perform permanent link field tests with a Level III field tester; in accordance to test unit manufacturer instructions. Field-test each fiber permanent link in accordance with ANSI/TIA-568-C.O, ANSI/TIA -568-C.1 and ANSI/TIA -568-C.3, including their addenda. UCONN will accept only those permanent links whose field-test results with a PASS. Permanent links with a field-test result of FAIL or *PASS will be rejected. Store and identify test results by the permanent link identification as shown on the' contract drawings. As part of the close-out documentation provide UITS the test results and the testing equipment's make, model, serial number and most recent certification of calibration by the manufacturer. List the setting(s) used. as well as, cable identification, from/to locations of each cable, test date and the names of the testing technicians.

2.3.3 COAXIAL PERMANENT LINKS

Cables shall be Series 6 (RG6) Quad-shield coaxial construction; 750 unbalanced video cable; 18 AWG copper-clad steel center conductor; Foam dielectric; Aluminum foil- 60% braid - foil - 40% braid shield; factory tested to 3GHz. Cables shall be UL listed for the application and environment for which they are installed with the following modification: cables installed in residence buildings and places of pub-

lic assembly shall be, at a minimum, UL listed to be installed in an environmental return-air plenum space (CATVP, CMP).

Terminate each end of the coaxial cable with an F-type compression connector. Positive compression type connectors with minimal signal leakage characteristics shall be installed with OEM installation tool. Hex crimp connectors are not acceptable.

At the TR the cable shall be connected to an F-81 ground block orderly and securely mounted to the plywood backboard. At the WAO the cable shall be connected to an F-81 adapter module. The color of the modules shall match the color of the mounting frame.

Test each permanent link as a complete horizontal cabling system, with connectors, adaptors, and faceplates completely assembled and properly mounted. Test the following parameters of each cable: Continuity, length, and insertion loss. Testing shall be done in accordance to OEM requirements for warranty. As part of the close-out documentation provide UITS the test results of each coaxial cable along with the testing
equipment's make, model, serial number, and most recent certification of calibration by the manufacturer. List the setting(s) used, as well as, cable identification, from/to locations of each cable, test date and the names of the testing technicians.

2.4 WAO DESIGN CONSIDERATIONS

2.4.1 MOUNTING FRAMES AND FACEPLATES

Connector modules and adapters shall be installed in a NEMA standard rectangular (Style Line®, GFCI) shaped plastic mounting frame. The frame shall be the rear-loading type and of the same manufacturer as the connector and adaptor modules. The color of the frames should match the color of the nearby electrical outlets.

Faceplates shall accommodate the rectangular mounting frames and shall match the nearby electrical outlet faceplates in appearance. The faceplates shall have provisions to affix and display labeling for the connector or adaptor modules.

2.4.2 DEFINITIONS FOR COMMONLY USED WAO'S:

Standard WAO - shall have a three port rectangular frame and faceplate with three UTP permanent links. The topmost port is typically reserved for voice applications and the remaining two ports for data.

Wallphone WAO - shall have one UTP permanent link. The wallphone faceplate shall be made of stainless steel with a brushed finish and shall have two mounting posts that accommodate a standard wallphone. The faceplate shall be rear loading with a recessed port opening.

2-Port WAO - shall have a two port rectangular frame and faceplate with two UTP
Permanent links.

TV WAO - consists of a one port rectangular frame and faceplate with one Coaxial permanent link.

2.4.3 Program Space WAO Requirements:

The following are minimal WAO requirements based on typical program spaces. Additional WAO may be required for ancillary devices .(printers, fax machines, etc.), specific needs of the occupant(s), and size or intended use of the room. Each WAO should be located near an electrical power outlet.

Faculty/Staff Office: Two Standard WAO on opposing walls

Dean/Director Office: Three StandardWAO on opposing walls and one TV WAO.

Clerical Staff and Graduate Student Work Area: One Standard WAO for each desk or workspace.

Conference Room: Two Standard WAO on opposing walls and one TV WAO.

Lounge or Break Room: One Standard WAO and one TV WAO. Considerations should be given to mount the TV WAO high on the wall or in the ceiling for wall-mount televisions.
Computer Lab: One 2-Port WAO for every two computers, one TV WAO, one Wallphone WAO located near the door.

Research / Laboratory: One 2-Port WAO for each work station, one Wallphone WAO located near the door.

Classrooms: Two Standard WAO; one near the teaching station and one on an opposing wall; one TV WAO at the front of the room; one Wallphone WAO located near the door. UCONN's Institute for Teaching & Learning (ITL), AV Technology Services Division (AVT) supports all Hi-tech Classrooms and shall be consulted for additional WAO and AV requirements. Contact information can be found at http://itl.uconn.edu/avtechnology/.

Student Housing: One 2-Port WAO per bed and one TV WAO per room. Provide one Standard WAO and one TV WAO in suite scenario common area.

2.4.4 ELECTRONIC SURVEILLANCE AND SECURITY (ESS)

Provide one UTP permanent link for each door access controller and CCTV camera. ESS permanent links shall terminate to a separate patch panel field in the TR.

2.4.5 BUILDING AUTOMATION SYSTEMS (BAS)

The following are BAS services that typically require dial-up or network connectivity. Provide permanent links as noted:

- Elevator: Two UTP permanent links
- Fire Alarm Control Panel: Four UTP permanent links, and one Optical Fiber Permanent Link
- HVAC (Andover Controls): One UTP permanent link
- Power Metering (S.quare D PowerLogic): One UTP permanent link

- Sewage Pumping Station (WPCF SCADA): One UTP permanent link

BAS permanent links shall terminate to a separate patch panel field in the TR. The BAS patch panel shall be of the modular, multimedia type, 24 or 48 port; the connector and adaptor modules in the TR shall be black.

2.4.6 WIRELESS NETWORK ACCESS (WLAN)

UITS provides wireless network access (IEEE 802.11a1b/g1n) via a Cisco Unified Wireless Network consisting of WLAN controllers and. CAPWAP access points .. The Designer shall conduct an engineering study to establish the best location for each access point in order to provide optimum wireless coverage. Provide one UTP permanent link and a ceiling mounting enclosure for each wireless access point. UITS will provide the wireless access points (Cisco AIR-CAP35021-K910) and Power-over- Ethernet (PoE) power sources. The engineering study shall meet the following RF specifications as a minimum requirement for delivery of voice and video quality IEEE
802.11 services as defined by Cisco Systems:

- Optimal Cell Boundary of the wireless access point shall be -60db measured by the client adapter; or equivalent client association rate
- 20% cell overlap based on the optimal cell boundary to ensure smooth client roaming
- Latency shall be no less that 150 seconds
- Packet loss shall be no more than .05%
- Packet jitter shall have a value no more than 10

3 PART 3 - OUTSIDE PLANT

As stated in section 1.3, UITS is UCONN's service provider for voice, data, and TV to the Storrs Campus and as SUch, UITS provides the outside plant media to deliver these services. However, the Designer must include within the project's scope and budget the pathways necessary to deliver these services to the building. Typically, all pathways are underground duct banks; UITS requires a minimum of six trade size 4 conduits for feeder and distribution ducts, ducts that run from manhole to manhole, and two trade size 4 conduits for the service laterals, ducts that run from manhole to building. Feeder and distribution ducts are organized in a three-over three fashion. All underground duct banks shall be encased in concrete. Manholes shall be spaced so that the duct banks between them do not exceed 600 feet in length and the sum of all bends shall not exceed 1800• Service laterals shall not exceed 300 feet in length. However, conditions may vary and these requirements may need to be modified. Coordinate with UITS to insure these pathways are of adequate size and configuration or if other pathway solutions or cabling requirements are needed.

3.1 GENERAL - UNDERGROUND DUCT BANKS:

Visit the project location prior to the start of the project; examine and evaluate all existing conditions. Included in this project's Scope of Work are the processes, equipment, services, materials, and labor necessary for the safe, timely, orderly, and proper completion of the project.

All measurements are approximate. Verify all dimensions with field conditions.

The locations of all underground structures shown here in are according to the best available information. They are not guaranteed to be correct or complete.
Do not deviate from these plans without first gaining approval of the University Information Technology Services (UITS) project manager.

Arrange to have all utilities identify their positions in the field before starting excavation; "Call- Before-You-Dig".

Protect all monuments and bench marks.

Protect all plants and trees and their root systems from mechanica land environmental damage during excavation. Excavation is not allowed within the drip-line of any tree without prior written approval from UCONN.

Unless otherwise noted, maintain the following minimum clearances:

Utility	Crossing	Parallel
Gas Main	12"	30"
Gas Service	12"	12"
Water	12"	18"
Steam 1S" 4S"		
Electric	12"	12"
Storm & Sanitary	12"	12"

Unless otherwise noted, maintain the following minimum buried depths. Measure from the top of the structure to the nearest portion of finished grade:

Structure	Depth
Duct Bank	30"
Manhole	12"

3.2 MATERIALS

Manholes: 38Y (Splay), "J"-type, made of precast concrete with the minimum interior dimensions of 6'W X 12'L X 7' H (see the attached drawing for details). Provide cast iron rings and covers; load rated H-20 with a minimum diameter of 32 inches. Covers shall be labeled “TELEPHONE"'or "COMMUNICATIONS".

Non-Metallic Conduit: Rigid Polyvinyl Chloride Conduit (PVC), Telephone Duct Type-C, designed for direct burial or concrete encasement applications; RUS listed, meets or exceeds the requirements of NEMA TC-10 and Bellcore CAO 8546. Fittings shall match requirements for conduit.

Metallic Conduit: Rigid Metal Conduit, Steel, ANSI C8O.1,Hot Dipped Galvanized interior and exterior, NPT threads, ANSI B1.20.1. Fittings shall match requirements for conduit.

Conduit Spacers: Carlon "SNAP-N-STACK" SP4W20-2 or equal. Spacers shall maintain a minimum 2" wall-to-wall separation of conduits in all directions and elevate bottom conduits a minimum 3" above trench floor. Maximum spacing between spacers: 7'-0"

Concrete: Encase conduits in concrete having nominal compression strength of 2500Ibs/sq.in, with 3/8" maximum aggregate crush stone or washed gravel. (Concrete slump size: 6ft min., 8" max.).

Tracer Wire: Minimum - #12AWG solid copper conductor insulation type UL listed THWN (Gas & Oil Resistant).

Tracer Wire Access Box: Provide grade level access to each end of the tracer wire. ABS tubular valve box with Cast iron cover, color: Orange, accessible via standard pentagonal key. Tracer wire lug attached to underside of cover; rated for road surface applications. Install per manufacturer's instructions in close proximity to manhole cover with a maximum separation shall not exceed 500' between boxes (i.e. Copperhead Industries, LLC "Snake Pit Magnetized Tracer Box" series or equal)
utility Marker Ball: 3MIM EMS 4" Extended Range 5' Ball Marker - Telephone 1401-XR Mule tape: Flat, woven, polyester tape with a pulling strength of 12501bs. Pre-lubricated for easy pulling and durably printed with sequential footage markings (Neptco or equal).

Duct Plugs: Blank duct plugs made of corrosion resistant high-impact plastic. Center washer expands when tightened to prevent water and sediment infiltration; provided with eyelet to secure pull rope (Tyco Electronics "Jack Moon" or equal).

3.3 DUCT BANKS

All Duct Banks shall be constructed of concrete encased non-metallic conduit. All bends shall have a minimum radius of 36 inches. Utilize manufactured bends where ever possible. Where bends are performed in the field, protect conduits against kinks or distortion of shape.

Feeder and Distribution ducts shall enter on the narrow walls of the manholes. Ducts providing Service Laterals to buildings may enter on the long walls.

Ducts shall not enter the manhole in the cover chimney. Conduits shall enter manholes perpendicular to the wall.

Utilize installed TERMADUCTS for all conduits entering the manhole wherever possible. Populate the lowest knock-outs available to allow for future expansion. Conduits shall be installed flush with the interior wall of the manhole and shall not protrude into the interior space.

Splay all conduits entering the narrow wall of Telecommunication Manholes. Equally separate duct banks so that half the conduits will enter near the left comer of the narrow wall and the other half will enter near the right corner of the same narrow wall. The splaying of the conduits should start at least 20' from the manhole. Service lateral ducts are not required to be splayed.

Where possible, organize conduits in such a manner as to provide "in-line" or "pull-through" cable installations.

Provide #6 X 12" steel reinforcing bars inserted into manhole walls prior to concrete encasement of duct bank.

At all road and driveway crossings the duct bank concrete shall be reinforced with engineer designed steel reinforcement.

Provide Rigid Metal Conduit at the entrance to each building starting at 10' (min.) outside the foundation wall to termination in the Equipment Room. Bond the conduits to the TMGB with a #6 AWG copper ground wire and bonding bushings.

Patch walls around conduit entrances with hydraulic cement or watertight grout to prevent water infiltration. Seal all conduit entrances into a below grade building space with a mechanical modular sealing system (Link Seal® or equal).

Cement all non-metallic conduit joints using a PVC primer and solvent cement.

All underground conduits shall be encased in concrete. Work concrete to remove all trapped air and insure each conduit is completely surrounded by a minimum 2" of concrete. Allow concrete to cure for at least one hour before backfilling.

Seal all conduit ends with blank duct plugs. Secure Mule tape to duct plug.

3.4 TRAFFIC & SAFETY

Provide signs, barricades, drums, traffic cones, fencing, delineators, and traffic control officers to maintain a safe "WORKZONE", insure safe traffic patterns, and restrict public access to the work site.

Coordinate work schedule with UITS project manager to maintain building access and minimize traffic disruptions.

Provide shoring and exercise safe trenching practices as required by OSHA.

3.5 BACKFILL

Provide a tracer wire on top and along the centerline of duct bank.

The first 12" of fill shall be sand or other granular material tamped using lightweight equipment such as pneumatic or vibrating tampers.

Install Utility Marker Balls above duct bank at intervals not exceed 50' when duct bank is in a straight line. Shorten intervals as appropriate to accurately identify changes in direction.

Backfill shall be free from large stones, frozen materials, wood, and other extraneous materials.

Place backfill in layers not exceed 6". Thoroughly compact each layer:

Place a plastic marking tape above the duct bank and 12" below finished grade. The plastic tape shall be durable and orange in color clearly indicating that there is a buried Telecommunications Utility Structure below.

3.6 RESTORATION& EROSION PROTECTION

Cut back all concrete and bituminous concrete surfaces 1'-6"

Restore all disturbed footpaths, walkways, sidewalks, driveways and roadways to match existing materials and depths (“Like-for-Like").

Refer to University Design Guide and Standards, Div. 2, Sect 500.A for type and thickness of roadway base surface courses.

When laterally crossing under a concrete sidewalk with a duct bank, replace/restore no less than "Full Square" increments of walkway (i.e. Dummy Joint to Dummy Joint or Dummy Joint to Expansion Joint). Provide a felt expansion joint at each abutting joint.

Refer to University Design Guide and Standards, Div. 2, Sect 500.B for details on concrete paving for permanent sidewalks.

Provide erosion and sediment controls along the entire length of the excavation.

3.7 TESTING & AS-BUILT DOCUMENTATION

Rod and mandrel each conduit and provide a 1200lbs test fabric "Muletape" with distance markings.

Utilizing a 3M "Dynatel" locating tool, identify the duct bank's path by both tracer wire and marker ball methods. The UITS project manager must be present for this test.

Provide as-built Autodesk AutoCAD drawings that accurately provide the following information:

- The installed duct bank's location
- Callouts showing a cross-section detail of each duct bank segment
- Wall-to-wall conduit distances
- Triangulation reference distances from permanent landmarks to points along the duct bank to identify location, changes in direction, changes in configuration, and termination.
- GIS coordinates of each Manhole Cover and Utility Marker Ball location along the duct bank's path
- Manhole wall elevation drawings showing conduit identifiers and locations.

END OF SECTION

SECTION 275123 - INTERCOMMUNICATIONS AND PROGRAM SYSTEMS

1.1 QUALITY ASSURANCE

A. Installer Qualifications: NICET-certified technician.

1.2 PRODUCTS

A. Manually Switched System Functions: Contractor to provide matching devices, additional user licenses, wiring and interconnection to existing campus intercom control systems, as located on drawings.

1. Master Station: Use as designated on drawings.

   a. Station selection.
   b. All call.
   c. Master station privacy.
   d. Conference call.
   e. Paging.
   f. Conversation override.

2. Speaker-Microphone Station: Use as designated on drawings

   a. Privacy.
   b. Hands-free operation.
   c. Call initiation.
   d. Busy signal.
   e. Noise and distortion free.

B. User-Programmable, Microprocessor-Switched System Functions: Contractor to provide matching devices, additional user licenses, wiring and interconnection to existing campus intercom control systems, as located on drawings.

1. Master Station:

   a. Station selection.
   b. Master station privacy.
   c. Conference call.
   d. Paging.
   e. Conversation override.
   f. Station display.

2. Speaker-Microphone Station:

   a. Privacy.
   b. Hands-free operation.

c. Call initiation.
d. Busy signal.
e. Noise and distortion free.

C. Equipment and Materials:

1. Expansion Capability: 25 percent.
2. Equipment: Modular with solid-state components.

D. Master Station for Manually Switched Systems:

1. Station-selector and talk-listen switches.
2. Volume control.
3. Light annunciation.
4. Tone annunciation.
5. Speaker microphone.
6. Handset with hook switch.
7. Central-control cabinet.

E. Master Station for Microprocessor-Switched Systems:

1. 12-digit keypad selector.
2. Volume control.
3. Light annunciation.
4. Tone annunciation.
5. Handset with hook switch.
6. Reset control.
7. Central-control cabinet.

F. Speaker-Microphone Stations:

1. Flush mounting.
2. Stainless-steel or aluminum faceplate.
3. Speaker.
4. Reoccurring tone for incoming calls.
5. Call switch.
6. Privacy switch.
7. Handset with hook switch.

G. Call-Switch Unit: Call switch, privacy switch, volume control, and handset with hook switch.

H. Amplifiers: All call, intercommunication, and paging.

I. Loudspeakers/Speaker Microphones: Horn type.

J. Horn-type explosion-proof loudspeakers.

K. Conductors and Cables: Jacketed, twisted pair and twisted multipair, solid-copper conductors.

1.3 INSTALLATION

A. Wiring Method: In raceways except within consoles, cabinets, desks, and counters.

B. Testing: By Owner-engaged agency and Contractor.

1.4 SUSTAINABILITY REQUIREMENTS

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

END OF SECTION

SECTION 281300 - ACCESS CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Security access central-control station.
2. One or more security access networked workstations.
3. Security access operating system and application software.
4. Security access controllers connected to high-speed electronic-data transmission network.

1.2 DEFINITIONS

A. Credential: Data assigned to an entity and used to identify that entity.

B. DTS: Digital Termination Service. A microwave-based, line-of-sight communication provided directly to the end user.

C. Identifier: A credential card, keypad personal identification number or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

D. Location: A Location on the network having a PC-to-controller communications link, with additional Controllers at the Location connected to the PC-to-controller link with TIA 485-A communications loop. Where this term is presented with an initial capital letter, this definition applies.

E. PCI Bus: Peripheral Component Interconnect. A peripheral bus providing a high-speed data path between the CPU and peripheral devices such as monitor, disk drive, or network.

F. RAS: Remote access services.

G. TWAIN: Technology without an Interesting Name. A programming interface that lets a graphics application, such as an image editing program or desktop publishing program, activate a scanner, frame grabber, or other image-capturing device.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Comply with SIA BIO-01.

B. Shop Drawings:

1. Diagrams for cable management system.
2. System labeling schedules.
3. Wiring diagrams.
4. Cable administration drawings.
5. Battery and charger calculations for central station, workstations, and controllers.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data include the following:

1. Software documentation.
2. PC installation and operating documentation, manuals, and software for the PC and all installed peripherals. Software shall include system restore, emergency boot diskettes, and drivers for all installed hardware. Provide separately for each PC.
3. Hard copies of manufacturer's specification sheets, operating specifications, design guides, user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy submittal.
4. System installation and setup guides with data forms to plan and record options and setup decisions.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70, "National Electrical Code."

C. Comply with SIA DC-01 and SIA DC-03 and SIA DC-07.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding normal environmental conditions without mechanical or electrical damage or degradation of operating capability:

1.8 SUSTAINABILITY REQUIREMENTS

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Existing campus access control system, card readers and automatic door strikes from DSX Access Controls. Contractor to provide matching devices, additional user licenses, wiring and interconnection to existing campus access control system.

2.2 DESCRIPTION

A. Security Access System: Is an existing campus access control system by DSX Access Systems.

2.3 OPERATION

A. Security access system shall be interfaced to the existing campus access control system

2.4 APPLICATION SOFTWARE

A. System Software: shall be from existing campus access control system.

2.5 SYSTEM DATABASE

A. Database and database management software shall be interfaced from existing campus access control system.

2.6 SURGE AND TAMPER PROTECTION

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor-entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits" as recommended by manufacturer for type of line being protected.

B. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station control-unit alarm display shall identify tamper alarms and indicate locations.

2.7 CENTRAL-STATION HARDWARE

A. Central-Station Computer: existing campus access system

2.8 CONTROLLERS

A. Entry-Control Controller:

1. Function: As existing campus access system
   a. Accept information generated by the entry-control devices; automatically process this information to determine valid identification of the individual present at the portal:

      1) On authentication of the credentials or information presented, check privileges of the identified individual, allowing only those actions granted as privileges.
      2) Privileges shall include, but are not limited to, time of day control, day of week control, group control, and visitor escort control.

2.9 CARD READERS

A. Card-Reader Power: Powered from its associated controller, including its standby power source, and shall not dissipate more than 5 W.

B. Response Time: Card reader shall respond to passage requests by generating a signal that is sent to the controller. Response time shall be 800 ms or less, from the time the card reader finishes reading the credential card until a response signal is generated.

C. Enclosure: Suitable for surface, semi-flush, pedestal, or weatherproof mounting. Mounting types shall additionally be suitable for installation in the following locations:

1. Indoors, controlled environment.
2. Indoors, uncontrolled environment.
3. Outdoors, with built-in heaters or other cold-weather equipment to extend the operating temperature range as needed for operation at the site.

D. Display: Digital visual indicator shall provide visual status indications and user prompts. Indicate power on or off, whether user passage requests have been accepted or rejected, and whether the door is locked or unlocked.

E. Touch-Plate and Proximity Readers:

1. Active-detection proximity card readers shall provide power to compatible credential cards through magnetic induction, and shall receive and decode a unique identification code number transmitted from the credential card.
2. Passive-detection proximity card readers shall use a swept-frequency, RF field generator to read the resonant frequencies of tuned circuits laminated into compatible credential cards. The resonant frequencies read shall constitute a unique identification code number.
3. The card reader shall read proximity cards in a range from contact to at least 6 inches (150 mm) from the reader.

2.10 PUSH-BUTTON SWITCHES

A. Push-Button Switches: Momentary-contact back-lighted push buttons with stainless-steel switch enclosures.

B. Electrical Ratings:

1. Minimum continuous current rating of **10** A at 120-V ac

C. Enclosures: Flush or surface mounting. Push buttons shall be suitable for flush mounting in the switch enclosures.

D. Enclosures shall additionally be suitable for installation in the following locations:

1. Indoors, controlled environment.
2. Indoors, uncontrolled environment.

3. Outdoors.

E. Power: Push-button switches shall be powered from their associated controller, using dc control.

2.11 DOOR AND GATE HARDWARE INTERFACE

A. Exit Device with Alarm: Operation of the exit device shall generate an alarm and annunciate a local alarm. Exit device and alarm contacts are specified in Section 087100 "Door Hardware."

B. Exit Alarm: Operation of a monitored door shall generate an alarm. Exit devices and alarm contacts are specified in Section 087100 "Door Hardware."

C. Electric Door Strikes: Use end-of-line resistors to provide power-line supervision. Signal switches shall transmit data to controller to indicate when the bolt is not engaged and the strike mechanism is unlocked, and they shall report a forced entry. Power and signal shall be from the controller. Electric strikes are specified in Section 087100 "Door Hardware."

2.12 CABLES

A. General Cable Requirements: Comply with requirements in Section 280513 "Conductors and Cables for Electronic Safety and Security" and as recommended by system manufacturer for integration requirement.

B. PVC-Jacketed, TIA 485-A Cables: Two pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, PVC insulation, unshielded, PVC jacket, and NFPA 70, Type CMG.

C. Plenum-Type, TIA 485-A Cables:

1. Two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

D. Multiconductor, PVC, Reader Cables:

1. No. 22 AWG, paired and twisted multiple conductors, stranded (7x30) tinned copper conductors, semi rigid PVC insulation, overall aluminum-foil/polyester-tape shield with 100 percent shield coverage, plus tinned copper braid shield with 65 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.
4. For TIA 232-F applications.

E. Paired, PVC, Reader Cables:

1. Three pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, individual aluminum-foil/polyester-tape shielded pairs each

with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CM.
3. Flame Resistance: UL 1581 vertical tray.

F. Paired, PVC, Reader Cables:

1. Three pairs, twisted, No. 20 AWG, stranded (7x28) tinned copper conductors, polyethylene (polyolefin) insulation, individual aluminum-foil/polyester-tape shielded pairs each with No. 22 AWG, stranded (19x34) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CM.
3. Flame Resistance: UL 1581 vertical tray.

G. Paired, Plenum-Type, Reader Cables:

1. Three pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum-foil/polypropylene-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

H. Paired, Lock Cables:

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.

I. Paired, Plenum-Type, Lock Cables:

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

J. Paired, Lock Cables:

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.

K. Paired, Plenum-Type, Lock Cables:

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, unshielded, and plastic jacket.
2. NFPA 70, Type CMP.

3. Flame Resistance: NFPA 262 flame test.

L. Paired, Input Cables:

1. One pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, overall aluminum-foil/polyester-tape shield with No. 22 AWG, stranded (7x30) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CMR.
3. Flame Resistance: UL 1666 riser flame test.

M. Paired, Plenum-Type, Input Cables:

1. One pair, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, fluorinated-ethylene-propylene insulation, aluminum-foil/polyester-tape shield (foil side out), with No. 22 AWG drain wire, 100 percent shield coverage, and plastic jacket.
2. NFPA 70, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

N. Paired, AC Transformer Cables:

1. One pair, twisted, No. 18 AWG, stranded (7x26) tinned copper conductors, PVC insulation, unshielded, and PVC jacket.
2. NFPA 70, Type CMG.

2.13 TRANSFORMERS

A. NFPA 70, Class II control transformers, NRTL listed. Transformers for security access-control system shall not be shared with any other system.

2.14 CABLE AND ASSET MANAGEMENT SOFTWARE

A. Computer-based cable and asset management system, with fully integrated database and graphic capabilities, complying with requirements in TIA/EIA 606-A.

1. Document physical characteristics by recording the network, asset, user, TIA/EAI details, device configurations, and exact connections between equipment and cabling.

   a. Manage the physical layer of security system.
   b. List device configurations.
   c. List and display circuit connections.
   d. Record fire stopping data.
   e. Record grounding and bonding connections and test data.

2. Information shall be presented in database view, schematic plans, or technical drawings.

2.15 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA/EIA 606-A, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval.

1. Record setup data for control station and workstations.
2. For each Location, record setup of controller features and access requirements.
3. Propose start and stop times for time zones and holidays, and match up access levels for doors.
4. Set up groups, facility codes, linking, and list inputs and outputs for each controller.
5. Assign action message names and compose messages.
6. Set up alarms. Establish interlocks between alarms, intruder detection, and video surveillance features.
7. Prepare and install alarm graphic maps.
8. Develop user-defined fields.
9. Develop screen layout formats.
10. Propose setups for guard tours and key control.
11. Discuss badge layout options; design badges.
12. Complete system diagnostics and operation verification.
13. Prepare a specific plan for system testing, startup, and demonstration.
14. Develop acceptance test concept and, on approval, develop specifics of the test.
15. Develop cable and asset-management system details; input data from construction documents.

D. In meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

2.16 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. Install cables and wiring according to requirements in Section 280513 "Conductors and Cables for Electronic Safety and Security."

C. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.

D. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental airspaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

2.17 CABLE APPLICATION

A. Comply with TIA 569-B, "Commercial Building Standard for Telecommunications Pathways and Spaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

C. TIA 485-A Cabling: Install at a maximum distance of 4000 ft. (1220 m).

D. Card Readers:

1. Install number of conductor pairs recommended by manufacturer for the functions specified.
2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from controller to the reader is 250 ft. (75 m), and install No. 20 AWG wire if maximum distance is 500 ft. (150 m).
3. For greater distances, install "extender" or "repeater" modules recommended by manufacturer of the controller.
4. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.

E. Install minimum No. 16 AWG cable from controller to electrically powered locks. Do not exceed 500 ft. (150 m).

F. Install minimum No. 18 AWG ac power wire from transformer to controller, with a maximum distance of 25 ft. (8 m).

2.18 GROUNDING

A. Comply with Section 280526 "Grounding and Bonding for Electronic Safety and Security."

B. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
2. Bus: Mount on wall of main equipment room with standoff insulators.
3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

2.19 INSTALLATION

A. Install card readers, keypads and push buttons.

2.20 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in Section 260553 "Identification for Electrical Systems" and with TIA/EIA 606-A.

B. Using software specified in "Cable and Asset Management Software" Article, develop cable administration drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with the same designation. Use logical and systematic designations for facility's architectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

D. At completion, cable and asset management software shall reflect as-built conditions.

2.21 SYSTEM SOFTWARE AND HARDWARE

A. Install to interface with existing campus access control system.

2.22 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bidirectional, Category 5 tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA 568-B.1, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for UTP cables must comply with minimum criteria in TIA/EIA 568-B.1.

2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

C. Devices and circuits will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

2.23 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.
2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

2.24 PROTECTION

A. Maintain strict security during the installation of equipment and software. Rooms housing the control station, and workstations that have been powered up shall be locked and secured with an activated burglar alarm and access-control system reporting to a central station complying with UL 1610, "Central-Station Burglar-Alarm Units," during periods when a qualified operator in the employ of Contractor is not present.

2.25 DEMONSTRATION

A. Contractor to e**ngage a factory-authorized service representative to train** Owner's maintenance personnel to adjust, operate, and maintain security access system. See Section 017900 "Demonstration and Training."

B. Develop separate training modules for the following:

1. Computer system administration personnel to manage and repair the LAN and databases and to update and maintain software.
2. Operators who prepare and input credentials to man the control station and workstations and to enroll personnel.
3. Security personnel.
4. Hardware maintenance personnel.

5. Corporate management.

END OF SECTION

SECTION 282300 - VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes a video surveillance system consisting of cameras, digital video recorder, data transmission wiring, and a control station with its associated equipment.

B. Video surveillance system shall be integrated with monitoring and control system specified in Section 281300 "Access Control," which specifies systems integration.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Video surveillance system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic event.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For video surveillance. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.
3. Dimensioned plan and elevations of equipment racks, control panels, and consoles. Show access and workspace requirements.
4. UPS: Sizing calculations.
5. Wiring Diagrams: For power, signal, and control wiring.

C. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For video surveillance, cameras, camera-supporting equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NECA 1.

C. Comply with NFPA 70.

D. Electronic data exchange between video surveillance system with an access-control system shall comply with SIA TVAC.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
1. Interior, Controlled Environment: System components, except central-station control unit, installed in interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
2. Interior, Uncontrolled Environment: System components installed in non- interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 4 enclosures.
3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up

to 85 mph (137 km/h) and snow cover up to 24 inches (610 mm) thick. Use NEMA 250, Type 4X enclosures.

4. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

1.9 SUSTAINABILITY REQUIREMENTS

Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

2. Low-lead requirements.
3. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Video-signal format shall comply with NTSC standard, composite interlaced video. Composite video-signal termination shall be 75 ohms.

B. Surge Protection: Protect components from voltage surges entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.

1. Minimum Protection for Power Connections 120 V and More: Auxiliary panel suppressors complying with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits."
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Connections: Comply with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits" as recommended by manufacturer for type of line being protected.

C. Tamper Protection: Tamper switches on enclosures, control units, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled. Control-station, control-unit alarm display shall identify tamper alarms and indicate locations.

2.2 STANDARD CAMERAS

A. Genetec Omnicast to match existing campus video system. Contractor to provide matching devices, additional user licenses, wiring and interconnection to existing campus video control system, as located on drawings.

B. Color Camera:

1. Comply with UL 639.

C. Genetec Omnicast to match existing campus video system.

D. Description: Optical-quality coated lens, designed specifically for video-surveillance applications and matched to specified camera. Provide color-corrected lenses.

2.3 POWER SUPPLIES

A. Low-voltage power supplies matched for voltage and current requirements of cameras and accessories, and of type as recommended by manufacturer of camera and lens.

1. Enclosure: NEMA 250, Type 1

2.4 CAMERA-SUPPORTING EQUIPMENT

A. Genetec Omnicast to match existing campus video system. Contractor to provide matching devices, additional user licenses, wiring and interconnection to existing campus video control system, as located on drawings.

B. Minimum Load Rating: Rated for load in excess of the total weight supported times a minimum safety factor of two.

C. Mounting Brackets for Fixed Cameras: Type matched to items supported and mounting conditions. Include manual pan-and-tilt adjustment.

2.5 COLOR MONITORS

A. Genetec Omnicast to match existing campus video system. Contractor to provide matching devices, additional user licenses, wiring and interconnection to existing campus video control system, as located on drawings.

B. Screen Size (Diagonal Dimension): 19”

C. Horizontal Resolution: **300** lines.

D. Minimum Front Panel Devices and Controls: Power switch; power-on indicator; and brightness, contrast, color, and tint controls.

E. Degaussing: Automatic.

F. Mounting: Single, 14-inch (356-mm), EIA 19-inch (483-mm) electronic equipment rack or cabinet complying with CEA 310-E.

G. Electrical: 120-V ac, 60 Hz.

2.6 NETWORK VIDEO RECORDERS

A. Genetec Omnicast to match existing campus video system. Contractor to provide matching devices, additional user licenses, wiring and interconnection to existing campus video control system, as located on drawings.

2.7 IP VIDEO SYSTEMS

A. Genetec Omnicast to match existing campus video system. Contractor to provide matching devices, additional user licenses, wiring and interconnection to existing campus video control system, as located on drawings.

B. Description:

1. System shall provide high-quality delivery and processing of IP-based video, audio, and control data using standard Ethernet-based networks.
2. System shall have seamless integration of all video surveillance and control functions.
3. Graphical user interface software shall manage all IP-based video matrix switching and camera control functions, two-way audio communication, alarm monitoring and control, and recording and archive/retrieval management. IP system shall also be capable of integrating into larger system environments.
4. System design shall include all necessary compression software for high-performance, dual-stream, MPEG-2/MPEG-4 video. Unit shall provide connections for all video cameras, camera PTZ control data, bidirectional audio, discreet sensor inputs, and control system outputs.
5. All camera signals shall be compressed, encoded, and delivered onto the network for processing and control by the IP video-management software.

6. Camera system units shall be ruggedly built and designed for extreme adverse environments, complying with NEMA Type environmental standards.
7. Encoder/decoder combinations shall place video, audio, and data network stream that can be managed from multiple workstations on the user's LAN or WAN.
8. All system interconnect cables, workstation PCs, PTZ joysticks, and network intermediate devices shall be provided for full performance of specified system.

2.8 VIDEO MOTION SENSORS (INTERIOR)

A. Genetec Omnicast to match existing campus video system. Contractor to provide matching devices, additional user licenses, wiring and interconnection to existing campus video control system, as located on drawings.

B. Device Performance: Detect changes in video signal within a user-defined protected zone. Video inputs shall be composite video as defined in SMPTE 170M. Provide an alarm output for each video input.

1. Detect movement within protected zone of intruders wearing clothing with a reflectivity that differs from that of background scene by a factor of two. Reject all other changes in video signal.
2. Modular design that allows for expansion or modification of number of inputs.
3. Controls:

   a. Size of detection zones.
   b. Sensitivity of detection of each protected zone.

4. Mounting: Standard 19-inch (483-mm) rack complying with CEA 310-E.

2.9 CONTROL STATIONS

A. Genetec Omnicast to match existing campus video system. Contractor to provide matching devices, additional user licenses, wiring and interconnection to existing campus video control system, as located on drawings.

B. Description: Heavy-duty, freestanding, modular, metal furniture units arranged to house electronic equipment. Coordinate component arrangement and wiring with components and wiring of other systems.

C. Equipment Mounting: Standard 19-inch (483-mm) rack complying with CEA 310-E.

D. Normal System Power Supply: 120 V, 60 Hz, through a locked disconnect device and an isolation transformer in central-station control unit. Central-station control unit shall supply power to all components connected to it unless otherwise indicated.

E. Power Continuity for Control Station: Batteries in power supplies of central-station control units and individual system components shall maintain continuous system operation during outages of both normal and backup ac system supply.

1. Batteries: Rechargeable, valve-regulated, recombinant, sealed, lead-acid type with nominal 10-year life expectancy. Capacity adequate to operate portions of system served including audible trouble signal devices for up to four hours and audible and visual alarm devices under alarm conditions for an additional 10 minutes.
2. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Charger shall recharge fully discharged battery within 24 hours.

F. Annunciation: Indicate change in system condition and switching of system or component to backup power.

2.10 SIGNAL TRANSMISSION COMPONENTS

A. Cable: Coaxial cable elements have 75-ohm nominal impedance. Comply with requirements in Section 280513 "Conductors and Cables for Electronic Safety and Security."

B. Video Surveillance Coaxial Cable Connectors: BNC type, 75 ohms. Comply with requirements in Section 280513 "Conductors and Cables for Electronic Safety and Security."

PART 3 - EXECUTION

3.1 WIRING

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

B. Wiring Method: Install cables in raceways unless otherwise indicated.

1. Except raceways are not required in accessible indoor ceiling spaces and attics.
2. Except raceways are not required in hollow gypsum board partitions.
3. Conceal raceways and wiring except in unfinished spaces.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

E. For LAN connection and fiber-optic and copper communication wiring, comply with Section 271300 "Communications Backbone Cabling" and Section 271500 "Communications Horizontal Cabling."

F. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.2 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install cameras with 84-inch- (2134-mm-) minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

B. Set pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms, and adjust.

C. Avoid ground loops by making ground connections only at the control station.

1. For 12- and 24-V dc cameras, connect the coaxial cable shields only at the monitor end.

D. Identify system components, wiring, cabling, and terminals according to Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:

   a. Verify operation of auto-iris lenses.
   b. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
   c. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet (17 to 23 m) away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
   d. Set and name all preset positions; consult Owner's personnel.
   e. Set sensitivity of motion detection.
   f. Connect and verify responses to alarms.
   g. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation.

C. Video surveillance system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION

SECTION 283111

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-alarm control unit. Existing to be reused with new parts as required to accomplish design.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Magnetic door holders.
7. Remote annunciator.
8. Addressable interface device.
9. Digital alarm communicator transmitter.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

A. Noncoded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

1. Interface with existing fire alarm system.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Locate detectors according to manufacturer's written recommendations.
6. System riser diagram with all device types and cable and wire types and sizes.
7. Wiring Diagrams: Power, signal and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
8. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
9. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

C. General Submittal Requirements:
1. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.
b. NICET-certified fire-alarm technician, Level III minimum.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software

4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

   a. Frequency of testing of installed components.
   b. Frequency of inspection of installed components.
   c. Requirements and recommendations related to results of maintenance.
   d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.
7. Copy of NFPA 25.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
3. Smoke Detectors, Fire Detectors, and Addressable Interface Devices: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no fewer than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamperproofed components.
6. Audible and Visual Notification Appliances: Three of each type installed.
7. Fuses: Two of each type installed in the system.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Personnel licenses by the City and/or State.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Manufacturer Qualifications: Source must be an authorized distributor of the specified manufacturer and authorized to sell in project area.

1.10 PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify Architect, Construction Manager and Owner no fewer than seven days in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Architect's, Construction Manager's and Owner's written permission.

1.11 SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT

IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

1.12 ALLOWANCE

A. Furnish, install, wire (with 50 ft. of approved wiring and conduit), terminate and program the following:

1. Smoke Detector with Base: Quantity equal to 5 percent of units installed, but not less than two units.
2. Combination Audio/Visual Notification Appliance: Quantity equal to 5 percent of units installed, but not less than five units.
3. Visual Notification Appliance: Quantity equal to 5 percent of units installed, but not less than ten units.
4. Manual Fire Alarm Box: Quantity equal to 5 percent of units installed, but not less than two units.
5. Addressable Interface Devices: Quantity equal to 5 percent of units installed, but not less than ten units.
6. Speaker: Quantity equal to 5 percent of units installed, but not less than ten units.

B. If units are not utilized before substantial completion of Project, then at the Owner's option, either turn units over to Owner or provide credit to Owner for deletion of material and labor.

1.13 SUSTAINABILITY REQUIREMENTS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 - SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

It will be the contractor's responsibility to procure materials that will meet the goals of the LEED Scorecard. Attempt to specify products in each spec. section that meet as many of the credits as possible (recycled content, regional, etc.) to ensure the credits are achievable.

1. Low-lead requirements.
2. Low-emitting adhesives.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide SimplexGrinnell LP

1. SimplexGrinnell LP; a Tyco International company; 4100 U, Voice System.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Verified automatic alarm operation of smoke detectors.
6. Automatic sprinkler system water flow.
7. Heat detectors in elevator shaft and pit.
8. Fire-extinguishing system operation.
9. Fire standpipe system.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm at fire-alarm control unit.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Activate voice/alarm communication system.
7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
8. Activate smoke-control system (smoke management) at firefighter smoke-control system panel.

9. Close smoke dampers in air ducts/HVAC units of designated air-conditioning duct systems serving zone where alarm was initiated.
10. Recall elevators to primary or alternate recall floors.
11. Activate emergency lighting control in assembly spaces.
12. Activate emergency shutoffs for gas, fuel and power supplies for equipment under kitchen hoods. Provide additional contactors and relays and pushbuttons to control and monitor hoods, valves, makeup fans and equipment.
13. Record events in the system memory.
14. Open smoke dampers in elevator shafts under smoke detector alarm condition in elevator lobbies.
15. Deactivate sound systems located in assembly spaces. Provide relays to interrupt power supply to each head-end system.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Low-air-pressure switch of a dry-pipe sprinkler system.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.
9. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit.

2.3 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer.

2. Addressable initiation devices that communicate device identity and status.

a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.

3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 2 lines of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.

a. Notification Appliance Circuits: Style Z.
b. Signaling Line Circuits: Style 6.
c. Install no more than 50 addressable devices on each signaling line circuit.
d. System Layout: Load each signaling line circuit to no more than 80 percent of its capability.

1. Serial Interfaces: One RS-232 port per annunciator.

D. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Sound general alarm if the alarm is verified.
4. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

E. Notification Appliance Circuit: Operation shall sound in a temporal pattern, comply with ANSI S3.41.

F. HVAC Controls: Auto/off switch located in FACP allows for manual control of each air distribution unit 2,000 cfm and over in size.

G. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.

H. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

I. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

J. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones provided in a separate cabinet located in other remote location designated by the fire marshal.

1. Indicated number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711 and be listed by an NRTL.

   a. Allow the application of and evacuation signal to indicated number of zones and, at same time, allow voice paging to the other zones selectively or in any combination.
   b. Programmable tone and message sequence selection.
   c. Standard digitally recorded messages for "Evacuation" and "All Clear."
   d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification appliance circuits of fire-alarm control unit.

2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

K. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
2. Power supply shall be from a circuit breaker with locking clip located in an emergency panelboard located as close to main service as possible.

L. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed, valve-regulated lead acid. Sized based upon all strobes set at 75 cd.
2. Battery and Charger Capacity: Comply with NFPA 72. Minimum 60 hours of standby, followed by 10 minutes of alarm.
3. Loads Not Served by Battery: Magnetic door handlers and smoke dampers.

M. Surge Protection:

1. Install surge protection normal AC power for the FACP and its accessories. Comply with Section 264313 "Transient-Voltage Suppression for Low-Voltage Electrical Power Circuits" for auxiliary panel suppressors.
2. Install surge protectors recommended by FACP manufacturer. Install on all system wiring external to the building housing the FACP.

N. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

O. Smoke Damper Supervision: Visible signal indication at fire alarm control unit to reflect open and closed position of dampers associated with smoke control system only. Provide multiple local addressable interface devices for each damper for control open and close and monitoring open and close independently. Provide appropriate UL relays and contactors for interface.

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Single-action mechanism, breaking-glass or plastic-rod type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key-operated switch.
3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery- powered audible horn intended to discourage false-alarm operation.
4. Weatherproof Protective Shield: Provide where appropriate. Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
3. Provide combination of smoke detector with carbon monoxide detector wherever indicated on electrical plans. Carbon monoxide detectors shall be connected to the building fire alarm system control panel.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status. Provide remote status and alarm indictor and test station where noted or indicated.
6. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

    a. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.

d. Present sensitivity selected.
e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Low Velocity Detectors: Design as recommended by manufacturer for the specific air velocity and installation conditions where applied.
7. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit or smoke damper control.

2.6 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521

B. Provide combination of heat detector with carbon monoxide detector whenever indicated on electrical plans. Carbon monoxide detectors shall be connected to the building fire alarm control panel.

C. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg per minute unless otherwise indicated.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

D. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.

1. Mounting: Adapter plate for outlet box mounting or twist-lock base interchangeable with smoke-detector bases depending on location.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.7 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections. Color to be selected by Architect; on renovation projects, match color of existing devices.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

B. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.

1. Rated Light Output:

a. 15/30/75 field adjustable cd (batteries based upon 75 cd). b. 110/135/177 cd, field adjustable.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units whenever more than two units are visible in any space.
5. Strobe Leads: Factory connected to screw terminals.

C. Voice/Tone Notification Appliances:

1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
2. High-Range Units: Rated 2 to 15 W.
3. Low-Range Units: Rated 1/8 to 2 W.
4. Mounting: Flush, semirecessed or surface mounted and bidirectional.

5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

2.8 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate. 1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or 120-V ac. See plans.

B. Material and Finish: Match door hardware.

2.9 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush or surface cabinet, NEMA 250, Type 1 (flush where possible).

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.10 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to elevator controller, motor controllers, dampers, circuit-breaker shunt trip, or other devices.

2.11 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire- alarm control unit and automatically capture one or two telephone line(s) and dial a

preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.12 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by manufacturer of device.
2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Install wall-mounted equipment, with tops of cabinets not more than 72 inches above the finished floor.

1. Comply with requirements for seismic-restraint devices specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

C. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A or Appendix B in NFPA 72.
5. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
6. Luminaires: Locate detectors not closer than 12 inches from any part of a luminaire. D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Install remote test switch and indicating light in location as directed in field. Coordinate installation with Division 23. Provide a permanent placard to clearly identify location of detector per NFPA 72. Provide one low velocity detector per each 36-inch width of transfer ducts. Locate test switch in same space as smoke detector.

E. Transfer Duct and Plenum In-Duct Smoke Detectors: Comply with NFPA 72. Provide low velocity in-duct smoke detectors within transfer ducts and duct plenums. For transfer ducts up to 36 inches in width, provide one detector. For ducts up to 72 inches in width, provide two detectors at quarter points of the duct. For ducts greater than 72 inches in width, provide detectors 24 inches on center. Provide a permanent placard to clearly identify location of detector per NFPA 72. Provide one low velocity detector per each 36 inches in width of transfer ducts. Locate test switch in same space as smoke damper.

F. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

G. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

H. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling or 80 inches above finished floor, whichever is lower. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install bottom of strobe not less than 6 inches below the ceiling or 80 inches above finished floor, whichever is lower. Install devices not less than 24 inches below the ceiling in sleeping rooms.

J. Provide adjustable 4 watt speakers and 177 candela strobes for all mechanical, electrical, and equipment rooms with noise producing machines.

K. Device Location-Indicating Lights: Locate in public space near the device they monitor. L. Manual Fire-Alarm Boxes: Install top of box at 48 inches above finished floor.

M. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.

N. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

O. Program central graphic annunciation station to reflect all building backgrounds in this project including all devices and addresses, and connect to and provide fiber network connections for campus fire alarm network.

P. The detectors shall be connected as a separate zone or zones to the fire alarm signaling system, but shall only activate a supervisory signal at the main control unit and any remote annunciators. The CO detection shall not activate the building evacuation alarm.

Q. Any room containing fuel-burning heating equipment and CO detection shall be provided with a sign at all entrances to the space indicating that CO detectors are located inside the space.

3.2 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Smoke dampers in air ducts of designated air-conditioning duct systems.
2. Smoke dampers in elevator shafts.
3. Heating, ventilating and air conditioning designated equipment controls.
4. Alarm-initiating connection to elevator recall system and components.
5. Alarm-initiating connection to activate fire extinguishing system operation.
6. Provide appropriate UL relays and auxiliary contacts to interface with mechanical equipment locally.
7. Provide control and monitoring of hood systems, makeup air systems, equipment under hoods, gas valves and emergency shutoffs.
8. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
9. Supervisory connections at valve supervisory switches.
10. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
11. Supervisory connections at elevator shunt trip breaker.

C. Coordinate all features of fire alarm devices with HVAC systems, including interface with HVAC control systems, power and control wiring requirements. See Section 233300 "Air Duct Accessories" and HVAC control sections for requirements and sequence of operations.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

C. Paint power-supply disconnect switch red and label "FIRE ALARM."

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100.

3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by Architect/Engineer and authorities having jurisdiction. Proper planning and scheduling (five days) is required.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Provide additional factory-authorized technician site visits and field programming during field testing and twice for post occupancy programming adjustments and testing for Owner-initiated changes and tailoring to actual conditions during the first six months.

D. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections. G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

J. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

K. Provide two site visits for post occupancy follow-up programming to fine tune sensitive, audio, visual, and any follow-up programming required within first year.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system. As a minimum and in addition to the requirements of other sections, provide two (2) 8-hour days of owner training sessions in addition to multiple start-up visits to properly support the contractor.

3.7 FIREMEN'S WATCH

A. Provide a Firemen's Watch 24-hours per day for the time period when the existing building is unsupervised by the existing and/or new fire alarm systems. As the new fire alarm system is installed and activated, the size of the Firemen's Watch can be decreased.

1. Fire watch shall be acceptable to the City Fire Marshal.
2. Coordinate with the Owner other time periods requiring a Firemen's Watch.
3. Submit with the Bid the proposed new fire alarm system phasing procedure.

END OF SECTION

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all sections within DIVISION 01- GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

2. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping, or sealing site utilities.

1.2 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion and sedimentation-control measures are in place.

E. Tree- and Plant-Protection Zones: Protect according to requirements specified herein

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements specified herein.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE AND PLANT PROTECTION

A. A pre-construction meeting shall be held on-site to explain protection measures to operators, construction supervisors, or contractor's representatives with the Owner and/or Owner’s representatives.

B. The clearing limits line as demarcated hereon shall be delineated in the field using a survey instrument by the contractor. All trees to remain, as noted on this plan, shall be located outside of the clearing limits line. The contractor shall clearly define trees to be removed for inspection by the Owner and/or Owner’s representatives before clearing is initiated. Contractor may choose to install his temporary tree protection measures, as described below, before clearing is initiated. Alternatively, the Contractor shall note trees to be cleared using alternative methods such as flagging. No clearing or grading shall begin in areas where tree preservation measures have not been completed.

C. Contractor shall erect robust tree protection measures which will include the installation and maintenance of orange warning barrier fencing (4-foot high staked with steel or hard wood stakes at 10-foot on center maximum) around the perimeter of the clearing limits line as defined hereon. Alternatively, the contract may integrate silt fence in lieu of the orange warning barrier fencing where appropriate and necessary.

D. The Contractor shall be responsible for maintenance of the tree protection measures throughout the duration of the project. Trees designated to remain, as indicated hereon, that are damaged during construction shall be restored or replaced at the contractor's expense to the satisfaction of the Owner.

E. Upon completion of the construction activities and stabilization of all disturbed area, the Contractor shall remove all silt and orange warning barrier fencing and stakes from the site.

3.3 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
2. Use only hand methods or air spade for grubbing within protection zones.

B. Fill depressions caused by clearing and grubbing operations with appropriate material for the intended purpose unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth 4 inches in a manner to prevent intermingling with underlying subsoil or other waste materials. The depth is to be considered an average as there are thinner and thicker areas of topsoil as indicated on the boring logs in the geotechnical report.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all sections within DIVISION 01- GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

2. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing areas for slabs-on-grade, walks, pavements, turf and grasses, and plants.
3. Excavating and backfilling for buildings and structures.
4. Earthwork for concrete slabs-on-grade, concrete walks and pavements and asphalt paving.
5. Excavating and backfilling trenches for utilities, buried structures and miscellaneous items as indicated.

C. Related Requirements:

1. Division 0, Section 003132 Geotechnical Data.

2. Division 1, Section 017419 – Construction Waste Management And Disposal

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving and cement concrete and as indicated.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Crushed Stone: Aggregate layer placed over the excavated subgrade in a trench before laying pipe and installing structures. Material also used for drainage and infiltration trenches and as indicated.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

F. Sand: Aggregate layer placed over utilities and as indicated.

G. Select Fill: Aggregate layer supporting the slab-on-grade and as indicated.

H. Structural Fill: Aggregate layer used as fill for overexcavated soft areas and as indicated.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk or aggregate layer for backfill as indicated.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 INFORMATIONAL SUBMITTALS

A. Material test reports.

1.4 FIELD CONDITIONS

A. Contractor shall assume full responsibility for damage to any existing utility lines during the course of work and be liable for damages as a result thereof. The Contractor shall notify the owner of all existing utilities in the vicinity of the construction.

B. The location of the existing utilities indicated is approximate based on the best available information. The Contractor shall physically verify the location of the existing utilities

indicated prior to starting construction. The Contractor shall contact "Call Before You Dig" at 1-800-922-4455 prior to starting construction and retain the services of an independent utility locating company to identify underground utilities.

1.5 SAFETY PRECAUTIONS

A. Work shall be done in conformance with all applicable local, state and federal regulations, including temporary barricades, railings, lighting, etc., and marking and protecting excavations and trenches with shoring and bracing.

1.6 ENGINEERING AND LAYOUT

A. The Contractor shall utilize the services of a competent surveyor to determine all lines and elevations necessary for the location and construction of the work under this contract. The surveyor shall carefully compare all levels given on the drawings with those recorded in the field and shall call to the attention of the Owner any discrepancies before proceeding with the work.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Backfill: Conform to CT DOT Form 816, Division III, Section M.02.06, Grading A.

C. Base Course: Conform to CT DOT Form 816, Division III, Section M.05, Article M.05.01.

D. Crushed Stone: Conform to CT DOT Form 816, Division III, Section M.01.01, No. 6.

E. Filter Fabric: 8 oz/sy non-woven geotextile, US Fabrics, US 205NW, or approved equal.

F. Sand Course: Conform to CT DOT Form 816, Division III, Section M.05.02 (Sand Cover).

G. Select Fill: shall conform to the following gradation requirements:

Sieve Size	Percent Passing by Weight
3”	100
No. 10	30-95
No. 40	10-70
No. 200	0-6

H. Subbase Course: Conform to CT DOT Form 816, Division III, Section M.02.06, Grading A.

I. Structural fill: shall conform to the following gradation requirements:

Sieve Size	Percent Passing by Weight
3”	100
No. 4	40-85
No. 40	10-50
No. 200	0-12

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation unless otherwise indicated. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces unless otherwise indicated.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 311000 "Site Clearing".

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit unless otherwise indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit as indicated. Shape bottom to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements Section 311000 "Site Clearing".

3.6 SUBGRADE INSPECTION

A. Proof-roll subgrade below the building slabs and pavements consisting of a minimum of six passes using a large vibratory roller having a minimum dynamic force of 5,000 pounds per foot drum width. Any weak or unstable areas identified should be overexcavated and replaced with compacted Structural or Select Fill. Vibrations should be discontinued if disturbance or weaving of the subgrade is observed. Do not proof-roll wet or saturated subgrades.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact crushed stone on trench bottoms and where indicated. Shape to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Initial Backfill: Place and compact initial backfill of sand to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

D. Final Backfill: Place and compact final backfill of subbase and subsequent layers to elevation indicated.

E. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as indicated.

3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Shape subbase course and base course to required crown elevations and cross-slope grades.
2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.15 SELECT FILL COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place select fill course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact select fill course under cast-in-place concrete slabs-on-grade as follows:

1. Place select fill course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
2. Compact each layer of select fill course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.16 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 312005 – SEDIMENTATION AND EROSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all sections within DIVISION 01- GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

2. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:
1. Temporary sedimentation and erosion control.

PART 2 - PRODUCTS

2.1 SILT FENCE AND HAY BALES

A. Provide contractor grade materials, 36-inch wide fabric, 1½ x 1 ½ inch hardwood stakes spaced every 10 feet maximum.

B. Hay bales as indicated.

PART 3 - EXECUTION

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, as indicated and as per the requirements of authorities having jurisdiction.

B. Prior to any clearing, all erosion control barriers shall be placed to confine sediment as indicated and where required by the owner's representative. Erosion control shall be left in place and maintained until the construction work has been completed and surfaces stabilized, at which time all erosion control measures shall be removed from the site. This plan recognizes the difficulties associated with clearing and grubbing after installation of erosion controls. The

contractor shall coordinate these activities to mitigate disturbance and immediately restore temporarily removed or damaged erosion control structures.

C. It shall be the responsibility of the contractor to monitor the condition of the erosion control structures. If the effectiveness or integrity of the structures is found to be insufficient or if the structures are damaged in any way, the contractor shall make whatever repairs are necessary to ensure that proper erosion control is maintained. Monitoring of the erosion control is particularly important in the areas where excavation or construction is taking place or following periods of rainfall. All repairs of erosion control structures shall be made by the contractor as soon as the damage is discovered.

D. If additional erosion and sedimentation control structures are necessary to minimize erosion and sedimentation as determined in the field, the contractor shall install structures as required.

E. It is noteworthy that the proposed construction on this site includes structures on steep slopes. Care will be required to ensure that erosion controls and construction limits are effectively honored during the performance of the construction activities. Further, specific care shall be exercised in the vicinity of the watercourse located along the southeast portion of the parcel.

F. The contractor shall be responsible for mitigating dust throughout his/her site operations. Dust control shall be accomplished by chemical (salt) or water applications.

G. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

H. The contractor is responsible for correcting any unforeseen field conditions. The contractor shall maintain an emergency spill kit, six hay bales and 100 linear feet of silt fencing on the job at all times until final stabilization is achieved.

I. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

END OF SECTION 311000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all sections within DIVISION 01- GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

2. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:
1. Hot-mix asphalt paving.

C. Related Requirements:

1. Section 312000 "Earthwork" for subgrade preparation, fill material, unbound-aggregate subbase and base courses.

2. Section 017419 – Construction Waste Management And Disposal

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each paving material. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

1.4 LEED SUBMITTALS

A. Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.

B. Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of

material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of reach regional materials and the fraction by weight that is considered regional.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the Connecticut Department of Transportation.

B. Installer Qualifications: Comply with materials, workmanship, and other applicable requirements of the State of Connecticut Department of Transportation (CT DOT), Form 816 (2004) Standard Specifications for Roads, Bridges and Incidental Construction (Form 816).

PART 2 - PRODUCTS

2.1 ASPHALT MATERIALS

A. Provide bituminous concrete in accordance with applicable requirements of Form 816. Binder and wearing courses shall conform to Form 816, Section M.04, Article M.04.01. Binder course shall be Class 1 and wearing course shall be Class 2.

B. Tack Coat: Form 816, ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

C. Pavement-Marking Paint: Form 816, Color: White, Yellow, Blue or as indicated. Glass Beads: Form 816 and AASHTO M 247, Type 1.

2.2 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires, asphalt shingles, or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

PART 3 - EXECUTION

A. Tack Coat: Apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.2 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.3 PLACING HOT-MIX ASPHALT

A. Provide construction in accordance with applicable requirements of Form 816.

B. Construct binder and wearing courses in accordance with Form 816, Section 4.06, Article 4.06.01, 4.06.02 and 4.06.03. Provide tack coat on binder course before construction of wearing course. Provide bituminous seal material where new pavement meets existing pavement.

C. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Spread mix at a minimum temperature of 250 deg F.
2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

D. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

E. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.4 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.

4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.5 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified. Allow paving to age for 30 days before starting pavement marking. Sweep and clean surface to eliminate loose material and dust. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils. Broadcast glass beads uniformly into wet pavement markings at a rate of 6 lb/gal.

B. Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F. Pavement Marking Paint shall meet the requirements of the Form 816.

3.7 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch.
2. Surface Course: 1/8 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Replace and compact hot-mix asphalt where core tests were taken.

C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.9 WASTE HANDLING

A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all sections within DIVISION 01- GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

2. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes Concrete Paving Including the Following:

1. Truck Pad.
2. Walks and ramps

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of product, ingredient, or admixture requiring color selection.

C. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.3 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

1.4 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

D. Joint Dowel Bars: zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

2.3 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150/C 150M, portland cement Type I.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 4S, uniformly graded. Provide aggregates from a single source.

C. Air-Entraining Admixture: ASTM C 260/C 260M.

D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

E. Water: Potable and complying with ASTM C 94/C 94M.

2.4 FIBER REINFORCEMENT

A. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.6 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

B. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 5 percent plus or minus 1-1/2 percent.

C. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

D. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.

E. Concrete Mixtures: Normal-weight concrete.

1. Compressive Strength (28 Days): 4000 psi.
2. Maximum W/C Ratio at Point of Placement: 0.45.
3. Slump Limit: 5 inches plus or minus 1 inch.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Proof-roll prepared surface below concrete to identify soft pockets and areas of excess yielding.

3.2 PREPARATION

A. Remove loose material from compacted surface below concrete immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT INSTALLATION

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness to match jointing of existing adjacent concrete paving.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed paving surface with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions.

1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
2. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture-retaining-cover curing and curing compound.

3.9 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-feet long; unleveled straightedge not to exceed 1/2 inch.
4. Joint Spacing: 3 inches.
5. Contraction Joint Depth: Plus 1/4 inch, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

3.10 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

C. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321401 – STONE CURBING

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all sections within DIVISION 01- GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

2. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:
1. Granite Stone Curbing.

C. Related Requirements:

1. Section 312000 "Earthwork" for subgrade preparation, fill material, unbound-aggregate subbase and base courses.
2. Section 321313 "Concrete Paving" for setting curbing.

1.2 INFORMATIONAL SUBMITTALS

A. Manufacture’s literature for granite curbing showing standard lengths and cross section detail with all pertinent dimensions.

1.3 STORAGE AND PROTECTION

A. All materials shall be stored to prevent damage from the elements and other causes.

B. Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter. Any materials which have deteriorated, or which have been damaged, shall not be used for concrete.

C. Curbing shall be packaged to manufacturer’s standard and delivered on pallets. Curbing damaged in any manner will be rejected and shall be replaced with new material.

1.4 QUALITY ASSURANCE

A. Comply with materials, workmanship, and other applicable requirements of the State of Connecticut Department of Transportation (CT DOT), Form 816 (2004) Standard Specifications for Roads, Bridges and Incidental Construction (Form 816).

PART 2 - PRODUCTS

2.1 GRANITE CURBING

A. Provide new granite curbing; curbing shall be hard, durable stone conforming to conform to Form 816, Section 8.13, Article M.12.06. Provide straight and curved curb sections as indicated. Curb sections to be set in transition or flush with pavements shall be cut to full depth with parallel sides. Curbing shall conform to the following:
   1. Curbing shall have smooth sawn tops, split sides and bottom.
   2. All curbing shall have sawn ends.
   3. Any exposed edges shall be eased one sixteenth inch (1 /16").
   4. No curbstone sawn surfaces shall exhibit markings from the cutting process, including but not limited to band marks from the saw. All sawn faces shall be smooth and uniform.
   5. No curbstone shall contain veins or intrusions or obviously dissimilar characteristics including color, texture, and physical make-up. Stones that show obvious veins or intrusions of dissimilar materials will be rejected.
   6. All exposed sawn surfaces shall have an additional non-slip finish.
      Split face surfaces shall not be flame finished.

B. Cement mortar shall conform to Form 816, Article M.11.04.

C. Concrete for setting curbing shall comply with Section 321313 Concrete Paving.

PART 3 - EXECUTION

3.1 GRANITE CURBING

A. Install curbing in accordance with Form 816 and as indicated.

B. Excavate to the lines and grades required to establish the subgrade limits.

C. Provide grade stakes to check alignment for curb setting. Install the granite curb true to line and grade.

D. Each unit shall meet the next with a common tangent. Curb sections that are not plumb or are discontinuous or broken after installation will not be approved and shall be reset as required by the Engineer.

E. Joints between curb stones shall be filled full-depth with cement mortar and neatly pointed in the top and exposed faces. After pointing, clean off all excess Mortar and tool joints slightly below adjacent stone surfaces as approved by the Engineer.

F. Set granite curb as follows:
   1. All spaces under the curb shall be filled with dry-placed, zero slump concrete so that the curb will be completely supported throughout its length.
   2. After proper alignment of curbing and concrete base has been established, place additional concrete, of slightly wetter consistency, to extend the concrete up the face of the curbing as indicated.

END OF SECTION 321216

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all sections within DIVISION 01- GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

2. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Chain-link fences.
2. Swing gates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of fence and gate assembly.

1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each exposed product and for each color and texture specified.

D. Delegated-Design Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Chain-link fence and gate frameworks shall withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated according to ASCE/SEI 7.

2.2 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:

1. Fabric Height: as indicated.
2. Steel Wire for Fabric: Wire diameter of 0.192 inch.

a. Mesh Size: 2-1/8 inches.
b. Zinc-Coated Fabric: ASTM A 392, Type II, Class 1, 1.2 oz./sq. ft. with zinc coating applied before weaving.

c. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.

3. Selvage: Twisted top and knuckled bottom.

2.3 FENCE FRAMEWORK

A. Posts and Rails as indicated: ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 based on the following:

1. Fence Height: as indicated.
2. Light-Industrial-Strength Material: Group IC-L, round steel pipe, electric-resistance-welded pipe.

a. Line Post: as indicated.
b. End, Corner, and Pull Posts: as indicated.

3. Horizontal Framework Members: Intermediate and top rails according to ASTM F 1043.
4. Brace Rails: ASTM F 1043.
5. Metallic Coating for Steel Framework:

a. Type A zinc coating.

2.4 TENSION WIRE

A. Metallic-Coated Steel Wire: 0.177-inch diameter, marcelled tension wire according to ASTM A 817 or ASTM A 824, with the following metallic coating:

1. Type I: Aluminum coated (aluminized).

2.5 SWING GATES

A. General: ASTM F 900 for gate posts and double swing gate types.

1. Gate Leaf Width: as indicated.
2. Framework Member Sizes and Strength: Based on gate fabric height as indicated.

B. Pipe and Tubing:

1. Zinc-Coated Steel: ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framework

C. Frame Corner Construction: assembled with corner fittings.

D. Hardware:

1. Hinges: swing as indicated.
2. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
3. Lock: Manufacturer's standard internal device.
4. Padlock and Chain: as per Owner.
5. Closer: Manufacturer's standard.

2.6 FITTINGS

A. Provide fittings according to ASTM F 626.

B. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. of zinc.

2.7 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure

without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 CHAIN-LINK FENCE INSTALLATION

A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

    a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.
    b. Concealed Concrete: Place top of concrete 2 inches below grade to allow covering with surface material.
    c. Posts Set into Sleeves in Concrete: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed according to anchoring material manufacturer's written instructions. Finish anchorage joint to slope away from post to drain water.
    d. Posts Set into Holes in Concrete: Form or core drill holes not less than 5 inches deep and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed according to anchoring material manufacturer's written instructions. Finish anchorage joint to slope away from post to drain water.

D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment as indicated. For runs exceeding 500 feet, space pull posts an equal distance between corner or end posts.

E. Line Posts: Space line posts uniformly at 10 feet maximum o.c.

F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:

1. Extended along top and bottom of fence fabric.

G. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

3.4 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION 323113

SECTION 329115 SOIL PREPARATION (PERFORMANCE SPECIFICATION)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hearby made a part of this Section of Specifications.

1.2 SUMMARY

A. Section includes planting soils specified according to performance requirements of the mixes.

B. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

C. Related Requirements:

1. Section 017419 “Construction Waste Management and Disposal”.
2. Section 018113.13 “Sustainable Design Requirements”.
3. Section 311000 "Site Preparation and Demolition" for topsoil stripping and stockpiling.
4. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
5. Section 329300 "Plants" for placing planting soil for plantings.

1.3 DEFINITIONS

A. AAPFCO: Association of American Plant Food Control Officials.

B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.

C. CEC: Cation exchange capacity.

D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.

E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

F. Imported Soil: Soil that is transported to Project site for use.

G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.

H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

I. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.

J. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

L. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.

M. SSSA: Soil Science Society of America.

N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

O. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

P. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

Q. USCC: U.S. Composting Council.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for application and use.
2. Include test data substantiating that products comply with requirements.
3. Include sieve analyses for aggregate materials.

4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:

    a. Manufacturer's qualified testing agency's certified analysis of standard products.
    b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
    c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.

B. Samples: For each bulk-supplied material, 1-gal. (4-L) volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.6 INFORMATIONAL SUBMITTALS

A. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.

B. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil and imported soil.

    1. Notify Architect seven days in advance of the dates and times when laboratory samples will be taken.

B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.

    1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.9 SOIL-SAMPLING REQUIREMENTS

A. General: Extract soil samples according to requirements in this article.

B. Sample Collection and Labeling: Have samples taken and labeled by Contractor in presence of Architect under the direction of the testing agency.

1. Number and Location of Samples: Minimum of three representative soil samples for each soil to be used or amended for landscaping purposes.
2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Sampling Soils."
3. Division of Samples: Split each sample into two, equal parts. Send half to the testing agency and half to Owner for its records.
4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.10 TESTING REQUIREMENTS

A. General: Perform tests on soil samples according to requirements in this article.

B. Physical Testing:

1. Soil Texture: Soil-particle, size-distribution analysis by the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":

a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
b. Hydrometer Method: Report percentages of sand, silt, and clay.

C. Chemical Testing:

1. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.

D. Fertility Testing: Soil fertility analysis according to standard laboratory protocol of SSSA NAPT NEC-67, including the following:

1. Percentage of organic matter.
2. Soil reaction (acidity/alkalinity pH value).
3. Nitrogen ppm.
4. Phosphorous ppm.
5. Potassium ppm.
6. Manganese ppm.
7. Soluble-salts ppm.
8. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
9. Other deleterious materials, including their characteristics and content of each.

E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3-Chemical Methods."

F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable

plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.

1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm)depth of soil.
2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.1 PLANTING SOILS SPECIFIED ACCORDING TO PERFORMANCE REQUIREMENTS

A. Planting-Soil Type I: Existing, on-site surface soil, with the duff layer, if any, retained; and stockpiled on-site; modified to produce viable planting soil. Using preconstruction soil analyses and materials specified in other articles of this Section, amend existing, on-site surface soil to become planting soil complying with the following requirements:

1. Particle Size Distribution by Separates:

   a. Total Sand: 15 to 75 percent by dry weight.
   b. Silt: 10 to 60 percent by dry weight.
   c. Clay: 5 to 30 percent by dry weight.

2. Percentage of Organic Matter: Minimum 4 to 8 percent by volume.
3. Soil Reaction: pH of 6 to 7 except for acid-loving plants the pH shall be 4.5 to 5.5.
4. Soluble-Salt Content: less than 2.0 mmhos/cm saturation media extract.
5. Fertility: N, P, K, Mg, and Ca in amounts recommended by the testing laboratory for the turf types and plant groups to be installed.
6. RCRA Metals: Below maximum limits established by the EPA.
7. Phytotoxicity: Below phytotoxicity limits established by SSSA.

B. Planting-Soil Type II: Imported, naturally formed soil from off-site sources and consisting of sandy loam loam or silt loam soil according to USDA textures; and modified to produce viable planting soil. Amend imported soil with materials specified in other articles of this Section to become planting soil complying with the following requirements:

1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep, not from bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass.
2. Additional Properties of Imported Soil before Amending: Minimum of 2 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration. Clean soil to be of the following:

    a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
    b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 5 percent by dry weight of the imported soil.
    c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 1 ¼ inches in any dimension.

3. Particle Size Distribution by Separates:

    a. Total Sand: 15 to 75 percent by dry weight.
    b. Silt: 10 to 60 percent by dry weight.
    c. Clay: 5 to 30 percent by dry weight.

4. Percentage of Organic Matter: Minimum 4 to 8 percent by volume.
5. Soil Reaction: pH of 6 to 7.
6. Soluble-Salt Content: less than 2.0 mmhos/cm saturation media extract.
7. Fertility: N, P, K, Mg, and Ca in amounts recommended by the testing laboratory for turf types and plant groups to be installed..
8. RCRA Metals: Below maximum limits established by the EPA.
9. Phytotoxicity: Below phytotoxicity limits established by SSSA.

C. Planting Mixture: Planting Soil Type I or II mixed with the following soil amendments in the following quantities to produce plant bed mixes and tree pit backfill mixes.

1. Ratio of loose Compost to Planting Soil by volume: 1:3.
2. Uniformly blend materials to produce a homogenous dry mixture so that when placed, no layering within the soil profile will occur. Keep mixtures dry until installation.

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Percent by weight passing through square mesh sieves:

   a. 100 percent passing No. 10 sieve.
   b. Minimum 90 percent passing No. 20 sieve.
   c. Minimum 40 percent passing No. 100 sieve.

2. Form: Provide lime in form of ground dolomitic limestone.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through a No. 40 (0.425-mm) sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

2.3 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:

1. Feedstock: May include biosolids.
2. Reaction: pH of 5.5 to 8.
3. Soluble-Salt Concentration: Less than 4 dS/m.
4. Moisture Content: 35 to 55 percent by weight.
5. Organic-Matter Content: 40 to 60 percent of dry weight.
6. Particle Size: Minimum of 98 percent passing through a 3/4-inch sieve.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch (13-mm) sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.

2.4 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

PART 3 - EXECUTION

3.1 GENERAL

A. Place planting soil and fertilizers according to requirements in other Specification Sections.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

A. Excavation: Excavate soil from designated area(s) to a depth of 6 inches (150 mm) and stockpile until amended.

B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.

C. Unsuitable Materials: Clean soil to contain a combined maximum of 5 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.

D. Screening: Pass unamended soil through a 2-inch (50-mm) sieve to remove large materials.

3.3 PLACING PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply planting soil with amendments on-site in its final blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 6 inches (150 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply approximately half the thickness of planting soil over prepared, loosened subgrade. Mix thoroughly into top 2 inches (50 mm) of subgrade. Spread remainder of planting soil.

C. Application: Spread planting soil to a total depth of 6 inches (150 mm) minimum or as indicated on Drawings, but not less than required to meet finish grades after natural settlement. Do not spread if soil or subgrade is frozen, muddy or excessively wet.

D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 except where a different compaction value is indicated on Drawings.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests:

1. Performance Testing: For each amended planting-soil type, demonstrating compliance with specified performance requirements. Perform testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.

C. Soil will be considered defective if it does not pass tests.

D. Prepare test reports.

E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.5 PROTECTION

A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.

C. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

3.6 CLEANING

A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION 329115

SECTION 329200 TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hearby made a part of this Section of Specifications.

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Hydroseeding.
3. Erosion-control material(s).

B. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

C. Related Requirements:

1. Section 018113.13 “Sustainable Design Requirements”.
2. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329115 "Soil Preparation (Performance Specification)" and drawing designations for planting soils.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.6 LEED SUBMITTALS

A. MRc4: Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.

B. MCc5: Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of reach regional materials and the fraction by weight that is considered regional.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

3. Pesticide Applicator: State licensed, commercial.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.9 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting acceptance.

1. Spring Planting: March 15 to June 15.
2. Fall Planting: August 15 to October 1.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

C. Watering: Monitor, adjust, and use existing irrigation systems, if available, and provide additional material, equipment, and water to ensure adequate irrigation. Provide and transport water from other sources at no additional expense to the Owner when irrigation systems are not available.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:

1. Quality: Seed of grass species as listed below, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
2. Lawn Seed: Proportioned by weight as follows:

    a. 40 percent: equal proportions of 2 or more improved Kentucky bluegrass (Poa pratensis) varieties.
    b. 40 percent: equal proportions of 2 or more improved creeping red fescue (Festuca rubra) varieties.
    c. 20 percent: 1 or more improved variety of perennial ryegrass (Lolium perenne).

2.2 GRASS AND WILDFLOWER SEED MIXES

A. Conservation Seed Mix: Fresh, clean, and dry new seed, of mixed species as follows:
1. New England Semi-Shade Grass and Forbs Mix as produces by New England Wetland Plants Inc., Amherst, MA (413-548-8000), or approved equal containing the following:
    a. Elymus virginicus (Virginia Wildrye)
    b. Elymus canadensis (Canada Wile Rye)
    c. Desmodium canadense (Showy Ticktrefoil)
    d. Chamaecrista fasciculata (Partridge Pea)
    e. Festuca rubra (Creeping Red Fescue)
    f. Asclepias syriaca (Common Milkweed)
    g. Zizia aurea (Golden Alexanders)
    h. Panicum clandestinum (Deer Tongue)
    i. Penstemon digitalis (Beard Tongue)
    j. Geum canadense (White Avens)
    k. Heliopsis helianthoides (Ox Eye Sunflower)
    l. Eupatorium maculatum (Spotted Joe Pye Weed)
    m. Aster cordifolius (Blue Wood Aster)
    n. Euthamia graminifolia (Grassleaf Goldenrod)
    o. Aquilegia canadensis (Eastern Columbine)
    p. Agrostis perennans (Upland Bentgrass)
    q. Solidago caesia (Blue Stem Goldenrod)

2.3 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.4 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

2.5 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.6 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329115 "Soil Preparation (Performance Specification)."

B. Placing Planting Soil: Place manufactured planting soil over exposed subgrade.

C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

C. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h).

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 5 to 8 lb/1000 sq. ft. (2.3 to 3.6 kg/92.9 sq. m).

C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.

F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

3.6 HYDROSEEDING

A. Hydroseeding: Mix specified seed, commercial fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with nonasphaltic tackifier.
2. Spray-apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre (5.2-kg/92.9 sq. m) dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre (10.4 kg/92.9 sq. m).

3.7 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow to a height of 1-1/2 to 2 inches (38 to 50 mm).

D. Turf Postfertilization: Apply slow-release fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to turf area.

3.8 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.9 GRASS AND WILDFLOWERS

A. Sow seed by either dry application method or hydroseeding method as specified below. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
1. Before sowing, mix seed with seed carrier at a ratio of not less than two parts seed carrier to one part seed.
2. Do not use wet seed or seed that is moldy ot otherwise damaged.
3. Sow seed at a rate as recommended by the seed producer.
4. Dry Application Method:
   a. Broadcast seed mix over the prepared soil surface. Seed shall be uniformly mixed and spread with a fertilizer spreader or similar equipment equipped with an agitator to ensure continuous mixing. Install seed evenly by sowing equal quantities in two directions, at right angles to each other.
   b. After seeding, the seed shall be raked or dragged into the soil surface to an average depth of 0.25 inch. When the soil is in a loose or fluffy condition, the seed bed shall be rolled with a weighted roller, so that the seed is firmly pressed into the soil.
5. Hydroseeding Method:
   a. Use hydroseeding methods to apply seed mixes. Seeding shall be done when wind does not interfere with uniform distribution of hydroseeding mixture. Apply

mixture uniformly; and avoid spraying mixture on adjacent surfaces, walks, building walls and curbs. Keep mixture in an agitated state so that the materials are uniformly suspended in the water.

b. Hydroseeding shall be a two-step process. Do not add fiber mulch to the seed mixture to ensure good seed to soil contact. Hydraulic applications of mulch with the seed will not be permitted.

c. Strictly comply with manufacturer's installation instructions and recommendations. Use as approved mechanically agitated hydraulic application machines.

B. Mulching Procedure:

1. Uniformly cover seeded areas with either Erosion Control Blanket or Straw Mulch immediately after seeding. Do not allow any hydroseeded areas to dry out prior to blanketing or mulching. Do not use tackifiers with mulch to allow proper seedling development.

C. Water newly planted areas and keep moist until grass and wildflower area are established.

3.10 GRASS AND WILDFLOWER MAINTENANCE

A. Maintain and establish grass and wildflower mixes by watering, weeding, mowing, trimming, replanting, and performing other operations as required to establish a healthy, viable grass and wildflower establishment. Roll, regrade, and replant bare or eroded areas and remulch. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and grass and wildflower areas damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep grass and wildflower areas and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Monitor, adjust and use installed irrigation systems, if available, to keep meadow uniformly moist. If unavailable, furnish, install and maintain temporary piping, hoses, and meadow-watering equipment to convey water from sources and to keep meadow uniformly moist. Provide and transport water from other sources at no additional expense to the Owner when irrigation systems are unavailable.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water meadows with fine spray according to seed vendor's written recommendations.

3.11 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.12 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

3.13 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

1. Seeded Turf: 60 days from date of planting acceptance or Substantial Completion, whichever occurs later.

    a. Maintenance Service for turf shall include a minimum of 5 mowings.
    b. Provide Maintenance Service until acceptable turf is established throughout all turf areas. Turf areas will not be accepted individually.
    c. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

B. Grass and Wildflower Maintenance: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in “Grass and Wildflower Maintenance” Article. Begin maintenance immediately after each area is planted and continue until acceptable grass and wildflower areas are established, but not less than maintenance period below.

1. Maintenance Period: 365 days from the date of planting acceptance, or upon Substantial Completion of the contract, whichever occurs later.

END OF SECTION 329200

SECTION 329300 PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 – GENERAL REQUIREMENTS, which are hearby made a part of this Section of Specifications.

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Tree stabilization.
3. Landscape edgings.
4. Maintenance Strip.

B. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

C. Related Requirements:

1. Section 015639 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.

2. Section 018113.13 “Sustainable Design Requirements”.
3. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.

E. Central Leader: A continuation of the main trunk located more or less in the center of the crown, beginning at the lowest main branch (scaffold) and extending to the top of the tree. Also referred to as the Dominant Leader.

F. Codominant: Two or more vigorous, upright branches or stems of relatively equal size that orginate from a common point, usually where the leader was lost or removed.

G. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

H. Crown: The portion of a tree beginning at the lowest main (scaffold) branch extending to the top of the tree.

I. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

J. Finish Grade: Elevation of finished surface of planting soil.

K. Included Bark: Bark embedded in the union between a branch and the trunk or between two or more stems that prevents the formation of a normal branch bark ridge.

L. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

M. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

N. Planting Area: Areas to be planted.

O. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329115 "Soil Preparation (Performance Specification)" for drawing designations for planting soils.

P. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

Q. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

R. Scaffold Branches: Large main branches that form the main structure of the crown.

S. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

T. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

U. Trunk: The main stem of a tree, beginning at the root collar and ending at the lowest main scaffold branch.

1.4 COORDINATION

A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

B. Samples for Verification: For each of the following:

1. Organic Mulch: 1-pint (0.5-L) volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.

Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.

C. Nursery Source Tagging Submittals

1. Nursery Sources: Submit a list of all proposed nursery sources for approval, confirming the availability of plant varieties, sizes, forms, and quantities indicated in the Contract Documents. Include photographs of the available plant blocks to confirm that the nurseries have a sufficient selection of satisfactory plants available for tagging. Provide the names and telephone numbers for the nurseries' representatives.

   a. Substitutions: Substitutions of plant materials will not be permitted unless approved in writing by the Landscape Architect. If any of the specified plants are not available at the time when needed to meet the project schedule, submit a statement documenting the nursery sources investigated and providing proposals for equivalent plants of the nearest available size or similar variety.
   b. Container-grown plants shall not be substituted for plants designated "B&B" on the Plant List, unless approved in writing by Landscape Architect.
   c. Quantities: Quantities shone on the Plant List are for information only. Provide every plant shown on the Drawings. In the event a discrepancy between the Planting Plans and the written quantities on the Plant List, the Planting Plan shall govern.

2. Planting Schedule: Submit the projected planting schedule, including nursery visits, digging, delivery, storage and installation dates to the Landscape Architect for review and approval. Schedule the dates for each type of work during normal seasons for such work in each area of the site. Correlate with specified maintenance periods to provide maintenance until conclusion of the planting establishment and maintenance period. Revise schedule to keep current, subject to the Landscape Architect's approval.
3. Nursery Visit Schedule: Coordinate with the Landscape Architect and the proposed nurseries to arrange nursery visits. The final schedule for nursery visits shall be submitted no later than 45 days before the plants are scheduled to be dug.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

D. Sample Warranty: For special warranty.

1.8 LEED SUBMITTALS

A. MRc4: Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost.

B. MCc5: Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of reach regional materials and the fraction by weight that is considered regional.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
3. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject

unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Plants are subject to inspection and selection for overall form, vigor and condition by the Landscape Architect at the nursery source or place of growth. Plants designated as "balled and burlapped" shall be field-grown, and shall not be dug until inspected, approved, and sealed by the Landscape Architect.
2. The installer must provide all transportation and shall accompany the Landscape Architect on all source inspections.
3. Coordinate with approved nurseries and with the Landscape Architect to schedule the Landscape Architect's nursery visits. To secure approved plants, and to confirm digging and shipping dates in conformance with the approved planting schedule. Arrange nursery visits as far in advance of the scheduled installation as possible, which will typically occur during the September or October preceding the installation. In all cases, tagging shall be scheduled for completion prior to the onset of winter conditions that will make the grower's fields inaccessible. All tagging shall be completed by December 15. Summer and fall digging of deciduous plants will not be permitted without the Landscape Architect's approval.
4. All plants shall arrive at the site with the Landscape Architect's permanent seals intact.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.

F. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

G. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

H. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.12 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion. Planting shall progress only under favorable weather conditions and will not be permitted when the ground is frozen or excessively moist.

1. Plant Deciduous Plants: March 1 to May 30, and October 15 until the ground freezes.
2. Evergreen Plants: April 1 to June 15, and September 1 to October 15.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

D. The installer shall be solely responsible for irrigating plants to maintain vigorous and healthy growth without overwatering or flooding. Monitor, adjust, and use existing irrigation facilities, if available. And provide materials, equipment, and water to ensure adequate irrigation. Provide and transport water from other sources at no additional expense to the Owner when irrigation systems are not available.

1.13 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
    b. Structural failures including plantings falling or blowing over.
    c. Faulty performance of tree stabilization.

2. Warranty Periods: From date of Substantial Completion or Planting Acceptance, whichever occurs later.

    a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months, except that deciduous plants in a dormant condition on the date the warranty commences will be warranted for an additional period extended through June 1 of the next following spring..
    b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.

3. Include the following remedial actions as a minimum:

    a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
    b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
    c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
    d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.14 ACCEPTANCE

A. The Landscape Architect will inspect all plant material for acceptance upon written request of the Installer. The request shall be received at least 10 calendar days before the anticipated date of inspection.

B. Acceptance of plant material will be granted for general conformance of the specified size, character, and quality, but will not relieve the Installer of responsibility for full conformance to the Contract Documents, including correct species.

C. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Landscape Architect, the Landscape Architect will certify in writing that the plant material has been accepted.

1.15 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the Maintenance Period and upon written request of the Installer, the Landscape Architect will inspect all plant material for final acceptance. The request shall be received at least 10 calendar days before the anticipated date of inspection. Upon completion and re-inspection of all repairs and renewals necessary in the judgment of the Landscape Architect at

that time, the Landscape Architect will certify in writing that the plant material has received final acceptance.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots are unacceptable.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Form and Structure: Unless otherwise indicated in Plant List shown on Drawings, deciduous and evergreen trees shall comply with the following:

1. Tree shall have a single, relatively straight vertical trunk and central leader. Evergreen and clump-form trees shall have dense compact growth branched to the ground unless otherwise specified.
2. Trees shall be free of codominant stems and vigorous, upright branches that compete with the central leader. If the original leader has been headed, a new leader at least one-half of the diameter of the original leader shall be present.
3. Main branches shall be well-distributed along the central leader, and not clustered together. They shall form a balanced crown appropriate for the cultivar or species.
4. Branch diameter shall be no larger than two-thirds (one-half is preferred) the diameter of the central leader measured 1 inch above the branch.
5. The attachment of the largest branches (scaffold branches) shall be free of included bark.

C. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

D. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

E. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

F. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

G. Annuals and Biennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

H. Perennials: Plants shall have been growing in the specified container for a minimum of one year (365 days) prior to installation. Root mass shall completely fill the container.

I. Container-grown plants shall have sufficient root growth to hold earth intact when removed from containers. Root-bound plants will not be accepted.

2.2 FERTILIZERS

A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Size: tablets.
2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Double-shredded softwood bark composed primarily of pine and spruce bark. Aged not less than 9 months. Clean and free of foreign matter and disease. Sample to be approved.
2. Color: Natural.

2.4 WEED CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz/ sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist natural encountered chemicals, alkalis, and acids.

2.5 PESTICIDES

A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as

required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.6 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated, pointed at one end.
2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.
3. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
4. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

2.7 LANDSCAPE EDGINGS

A. Aluminum Edging: Standard-profile extruded aluminum edging, ASTM B 221, Alloy 6063-T6, fabricated in standard lengths with interlocking sections with loops stamped from face of sectionsto receive stakes.
1. Basis-of-Design: Subject to compliance with requirements, provide PERMALOC Cleanline XL Aluminum Landscape Edging as manufactured by Permaloc Corporation, (800) 356-9660, or comparable product as approved by the Landscape Architect.
2. Edging Size: 3/16 inch thick by 8 inches deep.
3. Stakes: ASTM B 221, Alloy 6061-T6, approximately 1 ½ inches wide by 18 inches long.
4. Finsh: Mill (natural aluminum).

2.8 MISCELLANEOUS PRODUCTS

A. Antidessicant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mx according to manufacturer’s written instructions.

B. Burlap: Non-synthetic, biodegradable.

C. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329115 "Soil Preparation (Performance Specification)."

B. Placing Planting Soil: Place manufactured planting soil over exposed subgrade.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate according to manufacturer's written recommendations.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
2. Excavate approximately two times as wide as ball diameter for balled and burlapped container-grown stock.
3. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
7. Maintain supervision of excavations during working hours.
8. Keep excavations covered or otherwise protected when unattended by Installer's personnel.

B. Backfill Soil: Subsoil and topsoil removed from excavations may not be used as backfill soil unless otherwise indicated.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes, 24 inches (600 mm) apart, into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to

where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches (50 mm) above adjacent finish grades.

1. Backfill: Planting mixture.
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.

    a. Quantity: According to manufacturer’s written recommendations.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches (50 mm) above adjacent finish grades.

1. Backfill: Planting mixture.
2. Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.

    a. Quantity: According to manufacturer’s written recommendations.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape unless otherwise directed by Landscape Architect. Make clean cuts as close as possible to the trunk or parent branch without cutting into the branch collar or leaving a stub.

B. Do not apply pruning paint to wounds.

3.7 TREE STABILIZATION

A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying: As indicated on Drawings. Set vertical stakes and space to avoid penetrating root balls or root masses.
2. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.8 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.

B. Use planting mixture for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees and Treelike Shrubs in Turf Areas: Apply organic mulch ring of 3-inch (75-mm) average thickness. Do not place mulch within 3 inches (75 mm) of trunks or stems.
2. Organic Mulch in Planting Areas: Apply 3-inch (75-mm) average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches (75 mm) of trunks or stems.

B. Shovel-Cut Edging: Separate mulched areas from turf areas with a 45-degree, 4- to 6-inch-(100- to 150-mm-) deep, shovel-cut edge.

3.10 EDGING INSTALLATION

A. Aluminum Edging: Install aluminum edging where indicated on Drawings according to manufacturer’s written instructions, driven below top elevation of edging.

B. Maintenance Strip Installation:
   1. Excavate for maintenance strip as indicated on Drawings.
   2. Compact subgrades uniformly beneath maintenance strip.
   3. Apply nonselective, pre-emergent herbicide that inhibits growth of grass and weeds.
   4. Install aluminum edgings, delineating the edge of maintenance strip.
   5. Install weed-control barrier before placing stone, covering area of maintenance strip, and overlapping and pinning edges of barrier at least 6 inches and according to manufacturer’s written instructions.
   6. Place indicated thickness of stone, fully covering weed barrier.

3.11 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

D. Upon Final Acceptance at end of Maintenance Period, remove tree stabilization devices.

3.12 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.13 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree.
2. Species of Replacement Trees: Same species being replaced unless otherwise advised by Landscape Architect.

3.14 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.15 MAINTENANCE SERVICE

A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period: 12 months from date of Planting Acceptance or Substantial Completion of the contract, whichever occurs later.

B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period: 12 months from date of Planting Acceptance or Substantial Completion of the contract, whichever occurs later.

END OF SECTION 329300

SECTION 334100 - STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. General:

1. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all sections within DIVISION 01- GENERAL REQUIREMENTS, which are hereby made a part of this section of the specifications.

2. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Pipe and fittings.
2. Manholes.
3. Drain basins.
4. Trench Drain.
5. Stormwater oil and sediment separators.
6. Catch basins.
7. Subsurface infiltration trenches.
8. Pipe outlet.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Manholes, drain basins, trench drain, stormwater oil and sediment separators, catch basins and subsurface infiltration trenches: Include plans, elevations, sections, details, frames, and covers.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Inspect materials delivered to site for damage; store with minimum of handling. Store rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings and structures free of dirt and debris. Handle pipe, fittings and structures

in a manner to ensure safe delivery to the installation location in sound undamaged condition. Carry; do not drag materials to the installation location.

PART 2 - PRODUCTS

2.1 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings 4 through 10-inch: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

B. Corrugated PE Pipe and Fittings 12 through 60-inch: AASHTO M 294M, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.

2.2 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: Provide Connecticut Department of Transportation (CT DOT) structures, ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
4. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
5. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
6. Steps: Individual FRP steps, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12 to 16-inch intervals.
7. Grade Rings: Reinforced concrete rings, 6 to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7 to 9-inch riser with 4-inch minimum width flange and 26-inch diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

C. Drainage Specialties:

1. Drain Basins:

a. Provide 12-inch diameter PVC basins conforming to ASTM D1784 cell class 12454, as manufactured by Nyoplast® or approved equal.
b. Provide flexible elastomeric seals conforming to ASTM F477.
c. Provide ductile iron frame and grate conforming to ASTM A536 grade 70-50-05, painted black.
d. Pipe Connectors: Manufacturer's stub joint for each pipe connection. Joint tightness shall conform to ASTM D 3212.

2. Trench Drain:

a. Provide precast polymer concrete trench drain with longitudinal slot ADA grate model PDX 08-8" as manufactured by Poly®Drain or approved equal.

3. Oil and Sediment Interceptors:

a. Oil and sediment separators shall be inlet type Stormceptor® STC 450i precast concrete structure with fiberglass insert as indicated. The separator shall be circular and constructed from pre-cast concrete circular riser and slab components. The internal fiberglass insert shall be bolted and sealed watertight inside the reinforced concrete component. The separator shall be capable to be used as a bend or junction structure within the stormwater drainage system.
b. All precast concrete components shall be designed and manufactured to a minimum live load of AASHTO HS-20 truck loading or greater based on local regulatory specifications.
c. All reinforced concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C478.
d. The concrete joints shall be water-tight and meet the design criteria according to ASTM C443. Mastic sealants or butyl tape are not an acceptable alternative.
e. The fiberglass portion of the water treatment device shall be constructed in accordance with ASTM D4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.
f. Resilient Pipe Connectors: ASTM C 923, cast or fitted into structure walls for each pipe connection.

2.3 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: Description: Provide Connecticut Department of Transportation (CT DOT) structures, ASTM C 478, precast, reinforced concrete as indicated, with provision for sealant joints.
2. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
3. Resilient Pipe Connectors: ASTM C 923, cast or fitted into structure walls for each pipe connection.

4. Steps: Individual FRP steps, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12 to 16-inch intervals.

2.4 SUBSURFACE INFILTRATION TRENCHES

A. Infiltration trenches shall be StormTech® SC-310 chambers or approved equal. Chambers shall meet ASTM F2922-12 Standard Specification for Polyethylene Corrugated Wall Stormwater Collection Chambers and ASTM F2787, Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers.

2.5 PIPE OUTLETS

A. Provide modified riprap conforming to CT DOT Form 816, Division III, Section M.12.02.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earthwork."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install PE corrugated sewer piping according to ASTM D 2321.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
2. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 MANHOLE AND SPECIALTIES INSTALLATION

A. Standard Precast Concrete Manholes

1. General: Install manholes, complete with appurtenances and accessories indicated.
2. Install precast concrete manhole sections with sealants according to ASTM C 891.

3. Set tops of frames and covers flush with finished surface of manholes that occur in pavements.

B. Drain Basins

1. Drain basins shall be installed in accordance with the manufacturer’s recommended installation guidelines and as indicated.

C. Trench Drain

1. Trench Drain shall be installed in accordance with the manufacturer’s recommended installation guidelines and as indicated.

D. Oil and Sediment Structures

1. Oil oil and sediment separators shall be installed in accordance with the manufacturer’s recommended installation guidelines and as indicated.

3.5 CATCH BASIN INSTALLATION

A. General: Install catch basins, complete with appurtenances and accessories indicated.

B. Set frames and grates to elevations indicated.

3.6 SUBSURFACE INFILTRATION TRENCHES

A. Infiltration trenches shall be installed in accordance with the manufacturer’s recommended installation guidelines and as indicated.

3.7 PIPE OUTLET INSTALLATION

A. Construct outlet protection using filter fabric and riprap as indicated.

3.8 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in the building's storm building drains specified in Section 221000 “Plumbing Piping”.

3.9 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earthwork." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

3.10 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill over pipe is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

END OF SECTION 334100

STATE OF CONNECTICUT
UNIVERSITY OF CONNECTICUT

UCONN

SUSAN HERBST
PRESIDENT

MAIN ACCUMULATION AREA
MAA

FOR REGULATED WASTES

21 C-LOT DRIVEWAY
STORRS, CT

PROJECT NO. : 901807

100% CD SET

APRIL 6, 2015

PREPARED BY:

Tai Soo Kim Partners Architects

RICHTER & CEGAN - LANDSCAPE ARCHITECT

LOUREIRO ENGINEERING ASSOCIATES, INC. - CIVIL, STRUCTURAL, MEP/FP ENGINEERS

DRAWING LIST

GENERAL
A0.00 COVER
A0.01 GENERAL INFORMATION
A0.02 CODE PLAN
A0.03 WALL TYPES

CIVIL
V-1 EXISTING CONDITIONS

CIVIL
C-1 CLEARING AND TREE PROTECTION PLAN
C-2 SITE PLAN
C-3 GRADING AND EROSION CONTROL PLAN
C-4 DRAINAGE & UTILITY PLAN
C-5 PHOTOMETRIC PLAN
C-6 SITE DETAILS
L1.01 LANDSCAPE PLAN
L5.00 LANDSCAPE DETAILS

ARCHITECTURAL
A1.11 FIRST FLOOR PLAN
A1.21 ROOF PLAN & DETAILS
A2.11 FIRST FLOOR REFLECTED CEILING PLAN
A3.01 EXTERIOR ELEVATIONS
A3.11 BUILDING SECTIONS
A4.01 WALL SECTIONS
A4.02 WALL SECTIONS
A4.21 SECTION DETAILS
A4.31 PLAN DETAILS
A5.01 WINDOW SCHEDULE AND DETAILS
A6.01 STAIR PLANS AND SECTIONS
A6.02 STAIR DETAILS
A7.01 TOILET PLANS AND ELEVATIONS
A8.01 INTERIOR ELEVATIONS
A8.02 INTERIOR ELEVATIONS
A9.01 MILLWORK DETAILS & ROOM FINISH SCHEDULE
A11.01 DOOR FRAME TYPES AND DETAILS

STRUCTURAL
S001 STRUCTURAL NOTES
S002 FOUNDATION PLAN
S003 FIRST FLOOR PLAN
S004 ROOF FRAMING PLAN
S100 FOUNDATION DETAILS
S101 FOUNDATION DETAILS
S102 STRUCTURAL FRAMING DETAILS

MECHANICAL
H001 MECHANICAL SCHEDULE
H101 MECHANICAL PLAN
H102 ROOF MECHANICAL PLAN

FIRE PROTECTION
FP101 FIRE PROTECTION PLAN

PLUMBING
P001 PLUMBING DETAILS
P101 PLUMBING PLAN

ELECTRICAL
E001 ELECTRICAL LEGENDS
E002 ELECTRICAL SCHEDULES
E101 POWER PLAN
E102 LIGHTING PLAN
E103 POWER PLAN ROOF EQUIPMENT

TELECOMMUNICATION
T101 TELECOMMUNICATION

FIRE ALARM
FA101 FIRE ALARM

LOCATION PLAN

APPROVALS

PUBLIC WORKS DATE

AGENCY DATE

ANNOTATION LEGEND

SECTION NUMBER
SIM
1
A101
SHEET NUMBER TO WHERE REFERENCED
BUILDING SECTION CUT

DETAIL NUMBER
SIM
1
A101
SHEET NUMBER TO WHERE REFERENCED
DETAILS

A
INDIVIDUAL ELEVATION NUMBER
D A601 B
C
SHEET NUMBER TO WHERE REFERENCED
INTERIOR ELEVATION

INDIVIDUAL ELEVATION NUMBER
A
A601
SHEET NUMBER TO WHERE REFERENCED
EXTERIOR ELEVATION

101
DOOR NUMBER

Room name
101
150 SF
ROOM TITLE & NUMBER

1
REVISION NUMBER

1t
WINDOW TYPE

M88
PARTITION TYPE

Name
Elevation
ELEVATION

0
0
COLUMN GRID CENTERLINE

1i
EQUIPMENT DESIGNATION

ABBREVIATIONS

@	- AT
&	- AND
AC.	- ACOUSTIC, ACOUSTICAL
ACT.	- ACOUSTIC TILE
A.D.	- ACCESS DOOR, AREA DRAIN
ADD	- ADDENDUM
ADH	- ADHASIVE
ADJ	- ADJUSTABLE
AFF	- ABOVE FINISHED FLOOR
ALT	- ALTERNATE
AL. ALUM	- ALUMINUM
APPROX	- APPROXIMATE
ARCH	- ARCHITECTURAL
AWP	- ACOUSTICAL WALL PANEL
AUTO	- AUTOMATIC
AV	- AUDIO VISUAL
BD	- BOARD
BLDG	- BUILDING
BLK(G)	- BLOCK(ING)
BM	- BEAM
BOT.	- BOTTOM
B.O	- BOTTOM OF
BRK.	- BRICK
BSMT	- BASEMENT
BTWN.	- BETWEEN
C	- CHANNEL, COURSE
CAB.	- CABINET
CB	- CATCH BASIN
CCTV	- CLOSED CIRCUIT TV
CER	- CERAMIC
C.G.	- CORNER GUARD
CHAM.	- CHAMFER
CHCK	- CHECK
CIRC.	- CIRCUMFERENCE
CJ	- CONTROL JOINT
CL	- CENTER LINE
CLO	- CLOSET
CLG.	- CEILING
CLK(G)	- CAULK(ING)
CLR	- CLEAR
C.M.U	- CONCRETE MASONRY UNIT
COL	- COLUMN
COMP.	- COMPRESSIBLE
CONC.	- CONCRETE
CONF.	- CONFERENCE
CONST.	- CONSTRUCTION
CONT	- CONTINUATION,CONTINUOUS
COORD	- COORDINATE
CORR.	- CORRIDOR
CPT.	- CARPET
C.S.	- CAST STONE
CT	- CERAMIC TILE
CUH	- CABINET UNIT HEATER
CUH-S	- CABINET UNIT HEATER - SURFACE MOUNTED
CUH-R	- CABINET UNIT HEATER - RECESSED
CUH-SR	- CABINET UNIT HEATER -
SEMI-	RECESSED
DEMO	- DEMOLISH, DEMOLITION
DET.	- DETAIL
DF	- DRINKING FOUNTAIN
DIA	- DIAMETER
DIAG.	- DIAGONAL
DIFF	- DIFFUSER
DIM.	- DIMENSION
DISP	- DISPOSAL
DIV.	- DIVISION
DMPR	- DAMPER
DN	- DOWN
D.O.	- DOOR OPENING
DPFG	- DAMPPROOFING
DPTN	- DEMOUNTABLE PARTITION
DR	- DOOR
DRN	- DRAIN
DW	- DISHWASHER
DWG(S)	- DRAWING(S)
DWR	- DRAWER
E	- EAST
EA.	- EACH
E.F.	- EXHAUST FAN
E.J.	- EXPANSION JOINT
EL.	- ELEVATION
ELEC.	- ELECTRICAL
ELEV	- ELEVATOR
EMERG	- EMERGENCY
ENCL.	- ENCLOSURE
EQ	- EQUAL
EQUIP	- EQUIPMENT
ESCAL	- ESCALATOR
E.W.C.	- ELECTRICAL WATER COOLER
EXH.	- EXHAUST
EXP.	- EXPANSION
EXIST.	- EXISTING
EXTR.	- EXTERIOR
F.A.	- FIRE ALARM
F.A.I	- FRESH AIR INTAKE
F.D.	- FLOOR DRAIN
FND.	- FOUNDATION
F.E.	- FIRE EXTINGUISHER
FEC	- FIRE EXTINGUISHER CABINET
FEC-R	- FIRE EXTINGUISHER CABINET - RECESSED
FEC-SR	- FIRE EXTINGUISHER CABINET - SEMI RECESSED
FEC-S	- FIRE EXTINGUISHER CABINET - SURFACE MOUNTED
FEV	- FUEL EFFICIENT VEHICLE
FF	- FINISH FLOOR
FF&E	- FURNITURE, FINISHES & EQUIPMENT
FHC	- FIRE HOSE CABINET
FIN.	- FINISH(ED)
FIXT.	- FIXTURE
FL	- FLOOR
FLG.	- FLASHING
FLUOR.	- FLUORESCENT
FRTW	- FIRE RETARDANT TREATED WOOD
F.S.P	- FIRE STAND PIPE
FT	- FEET, FOOT
FTG	- FOOTING
FURN	- FURNITURE
FURR.	- FURRED, FURRING
FUT	- FUTURE
F.V.C	- FIRE VALVE CABINET
GA	- GAUGE / GAGE
GALV.	- GALVANIZED
G.B.	- GLAZED BLOCK
G.C.	- GENERAL CONTRACT(OR)
GEN	- GENERATOR
G.F.C	- GROUND FACE CONC. BLOCK
GL.	- GLASS, GLAZING
GL.BLK.	- GLASS BLOCK
GRD	- GROUND
GWB	- GYPSUM WALL BOARD
GYP. BD.	- GYPSUM BOARD
H.C.	- HANDICAP(PED)
HDWR.	- HARDWARE
HEX	- HEXAGON
H.M.	- HOLLOW METAL
HORZ.	- HORIZONTAL
HR	- HOUR
HT	- HEIGHT
HTG.	- HEATING
H.V.A.C.	- HEATING, VENTILATION & AIR CON.
I.D.	- INSIDE DIAMETER
IN	- INCH(ES)
INCL.	- INCLUDED, INCLUDING
INFO	- INFORMATION
INSUL. INS.	- INSULATION
INTR.	- INTERIOR
INTERM	- INTERMEDIATE
INV.	- INVERT
ISO	- ISOLATION
JAN	- JANITOR
J.C.	- JANITOR'S CLOSET
JT.	- JOINT
KD	- KNOCK DOWN
KG	- KILOGRAM
KITC.	- KITCHEN
LAM.	- LAMINATE(D)
LAV.	- LAVATORY
LCC	- LEAD COATED COPPER
LOC	- LOCATION
L.F.	- LINEAR FOOT
LG	- LONG
LGTH.	- LENGTH
LH	- LEFT HAND
LIN	- LINEAR
LL	- LIVE LOAD
LLH	- LONG LEG HORIZONTAL
LLV	- LONG LEG VERTICAL
LN	- LINE
LPB	- LEED PROJECT BOUNDARY
LT	- LIGHTING
LTG	- LIGHTINGING
LT. WT.	- LIGHTING WEIGHT
MACH	- MACHINE
MAN	- MANUAL
M.A.T	- MINERAL ACOUSTIC TILE
MAT	- MATERIAL
MAX	- MAXIMUM
M.B.	- MARKER BOARD
MECH	- MECHANICAL
MED.	- MEDIUM
MEMB	- MEMBRANE
MEZZ	- MEZZANINE
MFR	- MANUFACTURER
MH	- MANHOLE
MIN	- MINIMUM
MISC	- MISCELLANEOUS
M.O.	- MASONRY OPENING
MTD	- MOUNTED
MTG	- MOUNTING
MTL.	- METAL
MULL	- MULLION
N	- NORTH
N.A	- NOT APPLICABLE
N.I.C	- NOT IN CONTRACT
NO.,#	- NUMBER
NOM.	- NOMINAL
NRC	- NOISE REDUCTION COEFFICIENT
N.T.S.	- NOT TO SCALE
O.A.	- OVERALL
O.C	- ON CENTER
O.D	- OUTSIDE DIAMETER / DIMENSION
OHD	- OVER HEAD
O.H.	- OPPOSITE HAND
OPNG	- OPENING
OPP	- OPPOSITE
O.R.D.	- OVERFLOW ROOF DRAIN
ORIG.	- ORIGINAL
OVHD	- OVERHEAD
PART.	- PARTIAL
PERP	- PERPENDICULAR
PL. LAM.	- PLASTIC LAMINATE
PLYWD.	- PLYWOOD
PRF	- POURED RESILIENT FLOORING
PRL.	- PARALLEL
PREFAB	- PREFABRICATED
PROJ	- PROJECT
P.T	- PRESSURE TREATED
PTD	- PAINTED
PVG.	- PAVING
PVMT.	- PAVEMENT
Q.T	- QUARRY TILE
QTY	- QUANTITY
R	- RADIUS OR RISER
R.A.	- RETURN AIR
RAD.	- RADIUS
RCP	- REFLECTED CEILING PLAN
R.D.	- ROOF DRAIN
RECOM.	- RECOMMENDED
RECPT	- RECEPTACLE
REC.	- RECESSED
REF.	- REFERENCE
REFL.	- REFLECTED / REFLECTIVE / REFLECT
REFR.	- REFRIGERATOR
REG.	- REGISTER
REINF.	- REINFORCED / REINFORCING
REQ.	- REQUIRE / REQUIRED
RESIL.	- RESILIENT
REV.	- REVISION, REVISED
RET.	- RETURN
R.H.	- RIGHT HAND
RM.	- ROOM
R.O.	- ROUGH OPENING
RTD	- RATED
RTG	- RATING
R.W.L	- RAIN WATER LEADER
S	- SOUTH
SAN.	- SANITARY
SBB	- SANDBLASTED BLOCK
S.C.	- SOLID CORE
SC	- SEALED CONCRETE
SCHE.	- SCHEDULE
S.D.	- STORM DRAIN
SECT.	- SECTION
SEW.	- SEWER
SF	- SQUARE FEET/FOOT
SHT.	- SHEET
SHWR	- SHOWER
SIM.	- SIMILAR
S.O.G	- SLAB ON GRADE
SPEC.	- SPECIFICATION
SPKLR	- SPRINKLER
SPKR	- SPEAKER
SQ.	- SQUARE
S/S	- SANITARY SINK
S.S	- STAINLESS STEEL
S.STL	- STAINLESS STELLA
ST	- STREET
STA.	- STATION
STC	- SOUND TRANSMISSION CLASS
STD	- STANDARD
STL	- STEEL
STOR.	- STORAGE
STRG.	- STRINGER
STRL	- STRUCTURAL
STRUCT	- STRUCTURAL
SUBCTG	- SUBCATEGORY
SUSP.	- SUSPENDED
SYS	- SYSTEM
T&B	- TOP AND BOTTOM
T&G	- TONGUE AND GROOVE
T	- TREAD
TAN.	- TANGENT
T.B	- TACK BOARD
TEC.	- TECTUM
TEL	- TELEPHONE OR TELECOM
TEMP.	- TEMPORARY
TER.	- TERRAZZO
THK	- THICKNESS
THRES	- THRESHOLD
THRU	- THROUGH
TMPD	- TEMPERED
T.O.	- TOP OF (SEE OTHER WORD)
TV	- TELEVISION
TYP.	- TYPICAL
UNFIN.	- UNFINISHED
U.O.N	- UNLESS OTHERWISE NOTED
UR	- URINAL
U.P.T	- UNGLAZED PORCELAIN TILE
UTIL.	- UTILITY
VAR.	- VARIES
VAC	- VENTILATION AND AIR CONDITIONING
VCT	- VINYL COMPOSITION TILE
VERT.	- VERTICAL
VEST.	- VESTIBULE
V.I.F	- VERIFY IN FIELD
VT	- VINYL TILE
VWC	- VINYL WALL COVERING
W	- WEST
W/	- WITH
WB	- WHITE BOARD
W.C	- WATER CLOSET
WD.	- WOOD
WDW	- WINDOW
W/O	- WITHOUT
WTPFG	- WATERPROOFING
WWF	- WELD WIRE FABRIC
WT	- WEIGHT

GENERAL NOTES

CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO COMMENCING WORK AND BRING ANY DISCREPANCIES TO THE ATTENTION OF THE ARCHITECT.

CONTRACTOR SHALL NOTIFY THE ARCHITECT IMMEDIATELY OF DISCREPANCIES IN THE DRAWINGS.

DO NOT SCALE DRAWINGS, USE WRITTEN DIMENSIONS ONLY.

ALL DIMENSIONS ARE ROUGH FRAMING DIMENSIONS. DIMENSIONS ARE FROM FACE OF METAL STUD, TO FACE OF CONCRETE BLOCK, TO CENTER LINE OF STRUCTURAL GRID. SEE WALL TYPES FOR ADDITIONAL INFORMATION.

GENERAL REQUIREMENTS FOR MASONRY WALLS WHERE NOT SPECIFICALLY DETAILED OTHERWISE.

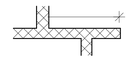
ALL MASONRY DIMENSIONS ARE SHOWN AS MODULAR DIMENSIONS UNLESS OTHERWISE NOTED.

B. MASONRY DIMENSIONS:
UNLESS OTHERWISE INDICATED ALL MASONRY PLAN DIMENSIONS ARE NOMINAL, WITH 'NOMINAL' DEFINED TO MEAN ACTUAL DIMENSION SHOWN OR DIMENSION SHOWN +- 3/8".

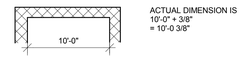
MASONRY DIMENSIONS ARE DEFINED TO BE 3/8" LARGER THAN DIMENSIONS SHOWN EXAMPLE:

OVERALL DIMENSIONS OF MASONRY WALL LENGTH OR THICKNESS ARE DEFINED TO BE 3/8" SMALLER THAN DIMENSIONS SHOWN EXAMPLE:

DIMENSIONS FROM INSIDE TO OUTSIDE CORNERS ARE ACTUAL EXAMPLE:



INSIDE DIMENSIONS OF MASONRY WALL ARE DEFINED TO BE 3/8" LARGER THAN DIMENSIONS SHOWN EXAMPLE:



THE TERM "TYPICAL" IS USED TO DEFINE A GENERAL CONDITION THAT WILL APPLY TO ALL SUCH CONDITIONS EXCEPT AS OTHERWISE NOTED.

ALL INTERIOR WALL SHALL TERMINATE AT BOTTOM OF METAL DECK OR BOTTOM OF STRUCTURAL STEEL.

ALL SMOKE WALLS OR FIRE RATED PARTITIONS WHICH TERMINATE AT UNDERSIDE OF METAL DECK SHALL HAVE FLUTES AT METAL DECK FILLED SOLID WITH FIRE SAFING INSULATION.

STAIR ENCLOSURES SHALL HAVE NO PENETRATIONS OR OPENINGS FOR WIRING, PIPING, DUCTS, ETC.. EXCEPT FOR THOSE REQUIRED TO SERVE THE STAIR.

ALL PIPES, CONDUITS, CABLES, WIRES, DUCTS, ETC. THAT PASS THROUGH FLOOR, SMOKE BARRIERS, FIRE RATED PARTITIONS AND FIRE WALLS SHALL HAVE THE SPACE BETWEEN THE PENETRATING ITEM AND THE WALL FILLED WITH EITHER FIRE RESISTANT JOINT SEALER OR FIRE SAFING INSULATION.

FIRESTOPPING SHALL BE PROVIDED IN CONNECTIONS BETWEEN HORIZONTAL AND VERTICAL SPACES SUCH AS SOFFITS, DROPPED CEILINGS AND COVE CEILINGS. FIRESTOPPING SHALL CONSIST OF APPROVED NON-COMBUSTIBLE MATERIALS, SECURELY FASTENED IN PLACE AND SHALL BE CONTINUOUSLY MAINTAINED. FIRESTOPPING SHALL NOT BE CONCEALED FROM VIEW UNTIL INSPECTED AND APPROVED.

INTERIOR WALL AND CEILING FINISHES SHALL BE CLASS A OR B. INTERIOR FINISHES IN STAIRS, CORRIDORS, LOBBIES AND EXITS SHALL BE CLASS A. FLOOR COVERINGS WITHIN STAIRS, CORRIDORS OR EXITS SHALL BE CLASS I OR II.

COORDINATE LOCATION OF ELECTRICAL DEVICES; I.E.: LIGHTINGS, SWITCHES, OUTLETS, FIRE ALARM DEVICES,
SPEAKERS, ETC.,; WITH ELECTRICAL DRAWINGS AND LOCATIONS INDICATED ON ARCHITECTURAL REFLECTED CEILING PLANS AND INTERIOR ELEVATIONS. IF CONFLICT ARISES BETWEEN ELECTRICAL DRAWINGS AND ARCHITECTURAL DRAWINGS CONTRACTOR SHALL NOTIFY ARCHITECT PRIOR TO INSTALLATION OF DEVICE.

HARDWARE NOTES:

ALL RATED DOORS SHALL HAVE CLOSERS AND POSITIVE LATCHING LOCKSETS OR LATCHSETS.

ALL DOORS EXITING 100 0R MORE PEOPLE SHALL HAVE PANIC EXIT DEVICES.

ALL DOORS LEADING TO HAZARDOUS SPACES SHALL HAVE TACTILE WARNING. HAZARDOUS AREAS INCLUDE: CUSTODIAL SPACES, BOILER ROOM, MECHANICAL ROOMS AND ELECTRICAL CLOSETS.

ACCESSIBLE DOOR HARDWARE FOR PEOPLE WITH DISABILITIES SHALL BE PROVIDED TO COMPLY WITH UNIFORM FEDERAL ACCESSIBILITY STANDARDS.

ALL ACCESSIBLE DOORS ON FRONT APPROACH SHALL MEET THE FOLLOWING CRITERIA:

24" MINIMUM CLEARANCE FROM THE DOOR JAMB ON THE LATCH SIDE OF ADJACENT WALL OR MILLWORK.

12" MINIMUM CLEARANCE FROM THE DOOR JAMB ON THE LATCH SIDE TO THE ADJACENT WALL OR MILLWORK. ADJACENT WALL ON HINGE SIDE REQUIRES NO CLEARANCE.

IF A CONFLICT IN DIMENSIONED DRAWINGS OCCURS WITH THE ABOVE CRITERIA, THE CONTRACTOR SHALL BRING IT TO THE ATTENTION OF THE ARCHITECT BEFORE THE DOOR OPENING IS CONSTRUCTED.

REACH RANGE FOR ACCESSIBILITY SHALL MEET THE FOLLOWING CRITERIA:

A. FORWARD REACH

IF CLEAR FLOOR AREA ONLY ALLOWS FORWARD APPROACH TO AN OBJECT. THE MAXIMUM HIGH FORWARD REACH SHALL BE 48" AND THE MINIMUM LOW FORWARD REACH SHALL BE 15". IF THE HIGH FORWARD REACH IS OVER AN OBSTRUCTION, REACH AND CLEARANCES SHALL BE AS SHOWN IN ICC/ANSI A117.1-2003

IF CLEAR FLOOR SPACE ALLOWS PARALLEL APPROACH BY A PERSON IN A WHEELCHAIR, THE MAXIMUM HIGH SIDE REACH ALLOWED SHALL BE 48" AND THE LOW SIDE REACH SHALL BE NO LESS THAN 15" ABOVE THE FLOOR.

ACCESSIBILITY NOTES:

ALL PROGRAMS ARE ACCESSIBLE TO PERSONS WITH DISABILITIES.

ALL ROOMS USED BY PERSONS WITH DISABILITIES HAVE ACCESSIBLE WORK STATIONS.

ALL ACCESSIBLE ELEMENTS ARE MARKED WITH THE INTERNATIONAL SYMBOL OF ACCESSIBILITY AND THE ACCESSIBLE ROUTE HAS 36 INCH MINIMUM CLEARANCE THROUGHOUT (32 INCH CLEARANCE FOR DOORWAYS).

ALL ITEMS SHALL COMPLY WITH SECTION 504, REHABILITATION ACT 1973.

ALL LABS & SHOPS USED BY PERSON W/ DISABILITIES HAVE ACCESSIBLE EMERGENCY EYEWASH & BODY WASH STATION

HIGH PERFORMANCE NOTES:

PROJECT WILL COMPLY WITH CT HIGH PERFORMANCE MANDATORY REQUIREMENTS AND LEED SILVER CERTIFICATION..

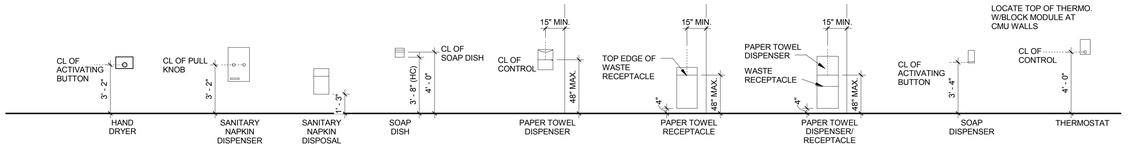
MATERIAL LEGEND

UNDISTURBED SOIL
COMPACTED GRAVEL
CONCRETE
CRUSHED STONE
BRICK
STONE
CONCRETE MASONRY UNIT
METAL FERROUS
METAL NONFERROUS
GROUT / MORTAR
SPLIT FACED CONCRETE MASONRY
FINISH WOOD
ROUGH WOOD CONTINUOUS
ROUGH WOOD NON-CONTINUOUS
NEW BRICK ELEVATION
NEW BRICK ELEVATION
RIGID INSULATION
GLASS FIBER INSULATON
GYPSUM BOARD
PLYWOOD
PLYWOOD
GLASS - PLAN
THIN SET TILE

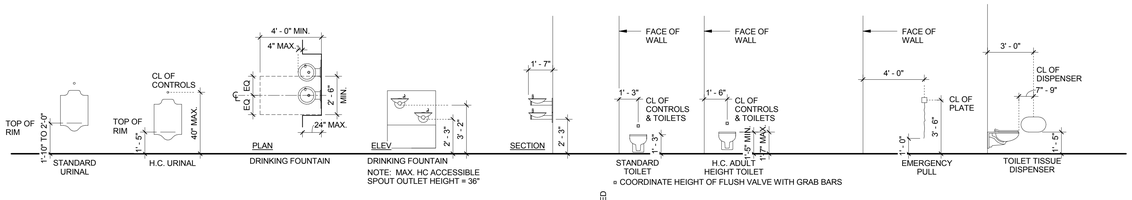
FUTHER GRAPHIC REFERENCES:

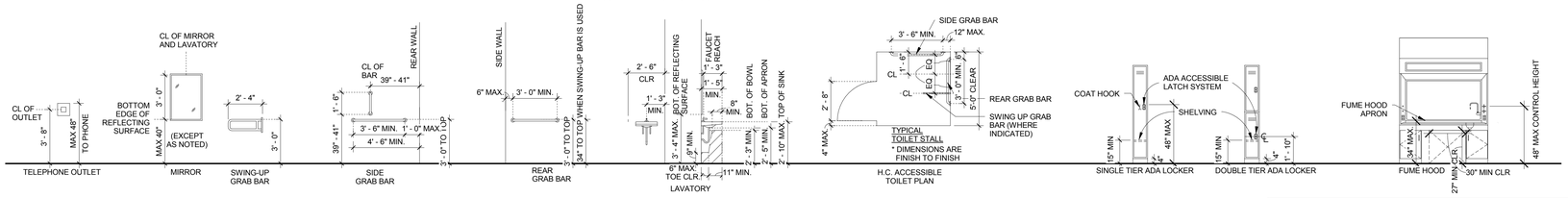
1. GRAPHIC STANDARDS
2. TIME SAVER STANDARDS

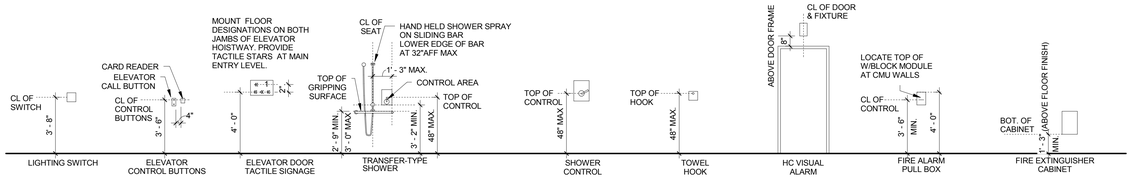
TYPICAL FIXTURE HEIGHTS AND CLEARANCES



NOTE:ALL MOUNTING HEIGHTS SHOWN ON INTERIOR ELEVATIONS SHOULD SUPERSEDE HEIGHTS SHOWN ON THESE DRAWINGS AND ANY DISCREPANCY SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT PRIOR TO INSTALLATION.







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TITLE
GENERAL
INFORMATION

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

UNIVERSITY OF CONNECTICUT

STORRS, CT

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\oct\Documents\140202 UCONN_MAA - Central - CD - 2014_oct.rvt

DATE: 9/10/2014
SCALE: As indicated
DRAWN BY: OCT
CHECKED BY: BH

A0.01

4/6/2015 12:00:10 PM
CAD FILE: C:\Users\oct\Documents\140202 UCONN_MAA - Central - CD - 2014_oct.rvt

1. **USE GROUP CLASSIFICATION (IBC CHAPTER 3)**

SEPARATED USE	H-2 (HIGH HAZARD GROUP)
SEPARATED USE	S-1 (MODERATE HAZARD STORAGE)
SEPARATED USE	B (BUSINESS)

2. **CONSTRUCTION TYPE (IBC CHAPTER 6)**

MINIMUM TYPE REQUIRED	TYPE IIB (FULLY SPRINKLERED)
ACTUAL TYPE PROVIDED	TYPE IIB (FULLY SPRINKLERED)

3. **BUILDING HEIGHT (IBC CHAPTER 5)**

ALLOWABLE HEIGHT (STORY/FEET)	1 STORY / 25 FEET (FULLY SPRINKLERED)
ACTUAL HEIGHT (STORY/FEET)	1 STORY / 18' - 0"
STORIES ABOVE GRADE	1 STORY

4. **BUILDING AREA (IBC CHAPTER 5)**

BUILDING AREA (EACH FLOOR INSIDE FACE OF WALL & OVERHANGS)

FIRST FLOOR:	7,334 SF
TOTAL:	7,334 SF

5. **AREA MODIFICATIONS TO TABLE 503**

	NORTH	EAST	WEST	SOUTH
TOTAL PERIMETER =	85 LF	101 LF	101 LF	85 LF
OPEN PERIMETER =	85 LF	101 LF	101 LF	85 LF

TOTAL PERIMETER (F) = 372 LF

TOTAL OPEN PERIMETER = 372 LF
(BUILDING PERIMETER WHICH FRONTS ON A PUBLIC WAY OR OPEN SPACE HAVING 30' OPEN MIN. WIDTH)

WIDTH OF OPEN SPACE (W) = 30.0
If = 100* [(F/P) - 0.25] * (W/30)

% FRONTAGE INCREASE (LF) = 100*[(372/372) - 0.25] * (30/30) = 75%

% OF ALLOWABLE TABULAR AREA, At (IBC TABLE 503) = 100%

% INCREASE FOR FRONTAGE, If (IBC 506.2) = 75%

% INCREASE FOR AUTOMATIC SPRINKLERS, Is (IBC 506.3) = NP

TOTAL PERCENTAGE FACTOR = 175%

CONVERSION FACTOR (CF) 1.75
(TOTAL PERCENTAGE FACTOR/100%)

6. **MIXED OCCUPANCY SEPARATED USES (IBC 302.3.2) (ALLOWABLE AREA 506.4)**

(Use Group: H-2)		(Use Group: S-1)		(Use Group: B)		
Actual Area / Allowable Area	+	Actual Area / Allowable Area	+	Actual Area / Allowable Area	≤	1
2,273 / 7,000	+	4,191 / 17,500	+	870 / 23,000	≤	1
0.3247	+	0.2395	+	0.0378	= 0.602	≤ 1

ALLOWABLE AREA per floor (Aa)
(Conversion Factor x Tabular Area from Table 503)

1.75 x 7,000 SF (H-2 most restrictive) = 12,250 SF

ACTUAL BUILDING AREA (each floor)

Actual Area 1st Floor : 7,334 SF < 12,250 SF

TOTAL FLOOR AREA (all stories)

7,334 SF

7. **FIRE RESISTANT RATINGS OF STRUCTURAL ELEMENTS (IBC TABLE 601)**

	REQUIRED	PROVIDED
STRUCTURAL FRAME: INCLUDING COLUMNS, GIRDERS, TRUSSES	0	0
BEARING WALLS - EXTERIOR	NA	NA
BEARING WALLS - INTERIOR	NA	NA
NONBEARING WALLS AND PARTITIONS (EXT.) FIRE SEPARATION DISTANCE >30'	0	0
NONBEARING WALLS AND PARTITIONS (INTERIOR)	0	0
FLOOR CONSTRUCTION (INCLUDING SUPPORTING BEAMS AND JOISTS)	0	0
ROOF CONSTRUCTION (INCLUDING SUPPORTING BEAMS AND JOISTS)	0	0
FIRE WALLS	2	2
EXIT ENCLOSURES (LESS THAN 4 STORIES	1	1
SHAFT ENCLOSURES (LESS THAN 4 STORIES)	1	1
MIXED USE SEPARATION	1	1
FIRE SEPARATIONS, SMOKE BARRIERS	1	1

8. **OCCUPANCY LOAD**

DESIGN LOAD FOR EACH FLOOR: FIRST FLOOR	48
TOTAL EXIT CAPACITY FOR EACH FLOOR: FIRST FLOOR	990
DESIGN TOTAL FOR BUILDING:	48
TOTAL EXIT CAPACITY FOR BUILDING:	990

9. **MODIFICATIONS**

NONE

10. **ACCESSIBLE BUILDING**

DESIGNATED

11. **MINIMUM PLUMBING FIXTURE COUNT**

	BUSINESS (B)	TOTAL REQUIRED	TOTAL PROVIDED
WC FEMALE	: 12/50 = .24	= 1	= 1
WC MALE	: 12/50 = .24	= 1	= 1
LAVS	: 23/50 = .46	= 1	= 2
DRINKING F.	: 23/100 = .23	= 1	= 1
SERVICE SINK	: 1	= 1	= 1

DESIGN TOTAL:
H-2 : TOTAL OCCUPANCY = 48

12. **SPRINKLER PROTECTION**

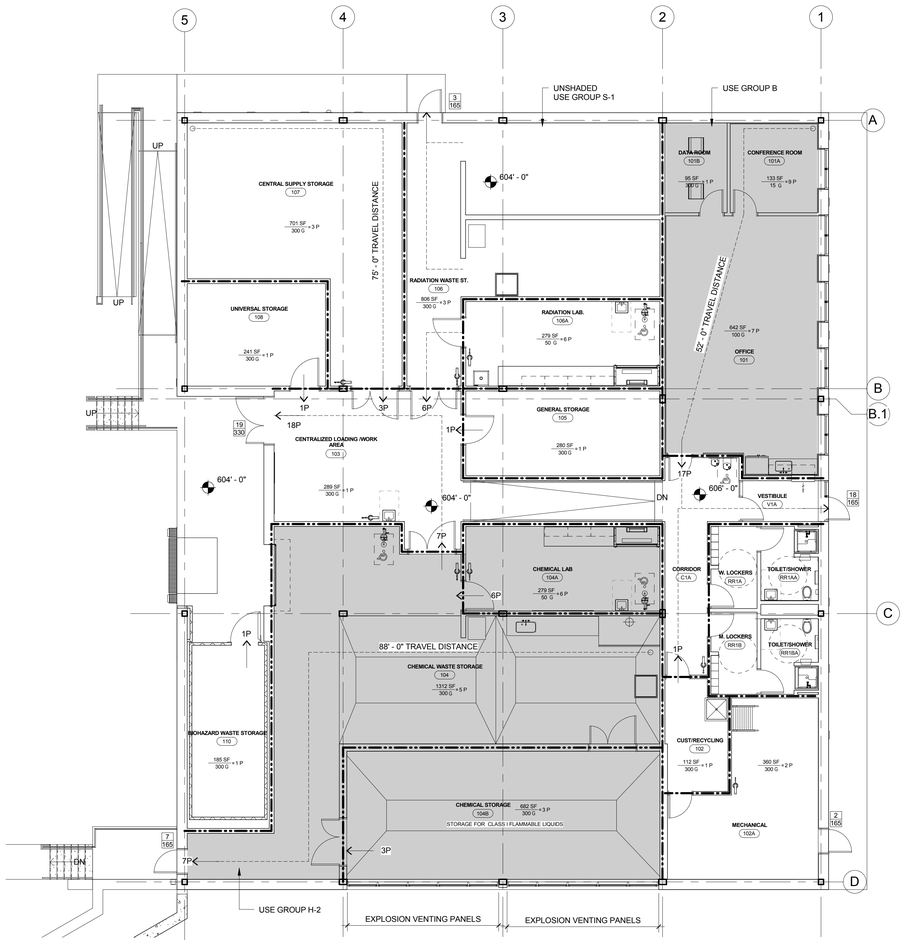
FULLY SPRINKLERED

13. **CODES TO WHICH THIS PROJECT WAS DESIGNED**

A. CURRENT STATE BUILDING CODE W/ SUPPLEMENT:
2003 INTERNATIONAL BUILDING CODE
W/ 2005 CT STATE SUPPLEMENT AND 2009 & 2011 AMENDMENTS
B. CURRENT STATE FIRE CODE W/ SUPPLEMENT:
2003 INTERNATIONAL FIRE CODE
W/ 2005 CT FIRE SAFETY CODE SUPPPLEMENT AND 2009 & 2011 AMENDMENTS
C. STATE HEALTH CODE:
CURRENT CT PUBLIC HEALTH CODE
D. OSHA:
TITLE 29/LABOR
E. AMERICAN NATIONAL STANDARD W/ SUPPLEMENT:
ICC/ANSI A117.1-2003 ACCESSIBLE AND USABLE BUILDINGS
AND FACILITIES, W/ CT STATE SUPPLEMENT
F. HIGH PERFORMANCE BUILDING CONSTRUCTION STANDARDS FOR PUBLIC BUILDINGS
STATE OF CONNECTICUT REGULATION SECTION 16A - 38K1 THROUGH 9
G. ADA - AMERICANS WITH DISABILITIES ACT:
2010 ADA STANDARDS FOR ACCESSIBILE DESIGN
H. CURRENT STATE PLUMBING CODE W/ SUPPLEMENT:
2003 INTERNATIONAL PLUMBING CODE
W/ CT SUPPLEMENT & RELATED DOCUMENT
I. CURRENT STATE MECHANICAL CODE W/ SUPPLEMENT:
2003 INTERNATIONAL MECHANICAL CODE
W/ CT SUPPLEMENT & RELATED DOCUMENT
J. CURRENT STATE ENERGY CODE W/ SUPPLEMENT:
2003 INTERNATIONAL ENERGY CONSERVATION CODE
W/ CT SUPPLEMENT & RELATED DOCUMENT
K. CURRENT STATE ELECTRICAL CODE W/ SUPPLEMENT:
2011 NATIONAL ELECTRICAL CODE (NFPA-70)
W/ CT STATE SUPPLEMENTS, & RELATED DOCUMENTS

14. **THRESHOLD BUILDING CONDITION**

NO



2 FIRST FLOOR PLAN - Code
1/8" = 1'-0"

CHEMICAL STORAGE ROOM 104B - RELIEF (DEFLAGRATION) VENTING CALCULATION PER NFPA 68 (CODE PATH: IBC 415.7.2.9, IFC 2704.6 SECTION 911, NFPA 68)

VENT AREA CALCULATION

ROOM SURFACE AREA/12.5 = REQUIRED VENT AREA

ROOM SURFACE AREA = 2(LxW) + 2 (LxH) + 2 (WxH)

L = 40'-10" W=16'-8" H=14'-0"

ROOM SURFACE AREA = 2(40.83 x 16.67) + 2 (40.83 x 14) + 2 (16.67 x 14)
ROOM SURFACE AREA = 1,361 + 1,143 + 476
ROOM SURFACE AREA = 2,980 SF

ROOM SURFACE AREA/12.5 = 2,980/12.5 = 238.4 SF REQUIRED VENT AREA

PROVIDED VENT AREA = 10 PANELS @ 24.5 SF OPERABLE AREA =245 SF

245 SF PROVIDED VENT AREA > REQUIRED VENT AREA

DRAWING LEGEND

XXX	ROOM NUMBER
875 / 20 ←43P	ROOM OCCUPANCY LOAD: AREA IN SQUARE FEET; ROOM OCCUPANCY LOAD; OCCUPANCY LOAD FACTOR
191	MAX.. ALLOWABLE EGRESS OCCUPANCY OF STAIR
440	MAX.. ALLOWABLE OCCUPANCY OF CORRIDOR
X / 165	EXIT CAPACITY: ACTUAL EGRESS OCCUPANCY OF DOOR OR STAIR; MAX.. ALLOWABLE EGRESS OCCUPANCY OF DOOR OR STAIR
	ACCESSIBLE AREA OR EXIT
	ACCESSIBLE AT GRADE (FLUSH CONDITION)
R	REQUIRED EXTERIOR EXIT
AOR	AREA OF REFUGE
	SMOKE RESISTANT CONSTRUCTION (TIGHT TO DECK ABOVE SEAL ALL PENETRATIONS TO RESIST PASSAGE OF SMOKE)
	3 HOUR FIRE RATED WALL (TIGHT TO DECK ABOVE)
	2 HOUR FIRE RATED WALL (TIGHT TO DECK ABOVE)
	1 HOUR FIRE RATED WALL (TIGHT TO DECK ABOVE)
	LINE OF LUMINESCENT WALL BASE

DOOR CLEAR EGRESS WIDTHS

GENERAL SPACES:
.2 FACTOR

X / 165	3'-0" DOOR (33" CLR.)
X / 330	6'-0" DOOR (66" CLR.)

TABLE 1004.1.2
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

LOCKER ROOMS	=	50 GROSS
OFFICE	=	100 GROSS
ACCESSORY STORAGE AREAS AND MECH... EQUIP. RM...	=	300 GROSS

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TITLE
CODE PLAN

ISSUE DATES

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3	3/23/2015	90% CD
4	4/6/2015	100%CD

UNIVERSITY OF CONNECTICUT

STORRS, CT

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\cct\Documents\140202 UCONN_MAA - Central - CD - 2014_dc.rvt

DATE: 9/10/2014
SCALE: As indicated
DRAWN BY: CCT
CHECKED BY: BH

A0.02

4/6/2015 12:00:14 PM
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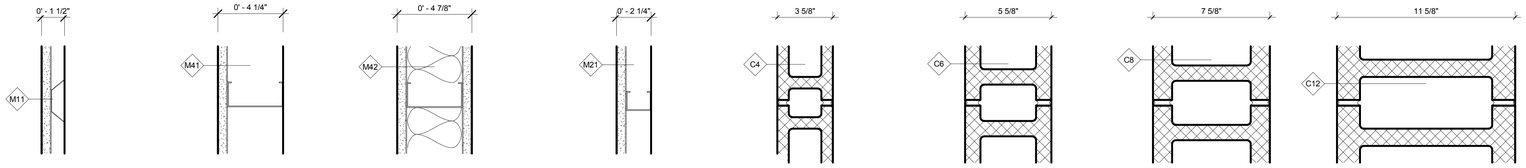


1/3 HOUR RATING
IBC TABLE 721.2.1.4(2)

STC NA

1 LAYER 5/8" GYP BD
7/8" MET FURRING
@ 16" OC

1/3 HOUR RATING
IBC TABLE 721.2.1.4(2)

STC NA

1 LAYER 5/8" GYP BD
3-5/8" MET STUD
@ 16" OC

1 HOUR RATING
UL DES U419

STC 45

2 LAYERS 5/8" GYP BD
3-5/8" MET STUD
@ 16" OC
3-1/2" SOUND
ATTENUATION BATTS

1/3 HOUR RATING
IBC TABLE 721.2.1.4(2)

STC NA

1 LAYER 5/8" GYP BD
1-5/8" MET STUD
@ 16" OC

1 TO 2 HR RATING
IBC TABLE 721.3.2

STC 44

4" CONC MASONRY

1 TO 4 HR RATING
IBC TABLE 721.3.2

STC 46

6" CONC MASONRY

1 TO 4 HR RATING
IBC TABLE 721.3.2

STC 48

8" CONC MASONRY

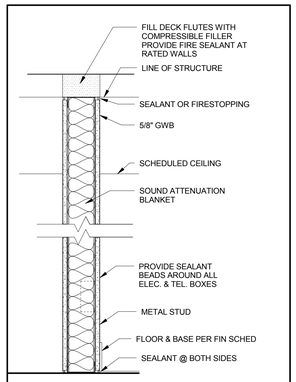
1 TO 4 HR RATING
IBC TABLE 721.3.2

STC 52

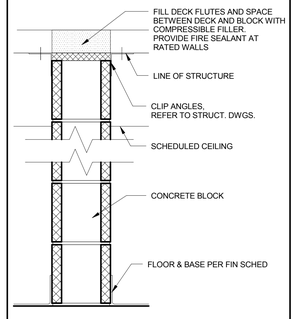
12" CONC MASONRY

GENERAL PARTITION NOTES:

1. ALL PARTITIONS SHALL BE PARTITION TYPE C8 UNLESS OTHERWISE NOTED.
2. ALL PARTITIONS SHALL RUN TO THE UNDERSIDE OF DECK OR BEAM ABOVE.
   A. WHERE THERE IS AN OBSTRUCTION, SUCH AS A BEAM RUNNING PERPENDICULAR TO THE PARTITION, BOX AROUND THE OBSTRUCTION. COMPLETELY FILL ALL VOIDS WITH CONSTRUCTION EQUAL TO THAT OF THE PARTITION.
   B. WHERE A FIRE RATED PARTITION RUNS PARALLEL TO AND TERMINATES AT A BEAM, PROVIDE FIRE RATED CONSTRUCTION TO THE UNDERSIDE OF DECK, WITH RATING EQUAL TO THAT OF THE WALL.
3. PROVIDE MINERAL WOOL BATTS WITH 60% OVERCUT AROUND ALL PENETRATIONSIN ALL WALLS TO ALLOW FOR COMPLETE SMOKE TIGHT CONSTRUCTION IN ACCORDANCE WITH THE CT. STATE FIRE SAFETY CODE.
4. TOILET ROOM PARTITIONS:
   COORDINATE WITH SHEET A7.01 FOR LOCATIONS OF TOILET ACCESSORIES AND CERAMIC TILE.
5. CMU PARTITION TYPES:
   REFER TO SPECIFICATIONS FOR TYPE OF CMU REFER TO STRUCTURAL DRAWINGS FOR FOR REINFORCEMENT REQUIREMENTS.
6. FIRE AND SMOKE RATED PARTITION TYPES:
   FIRE STOP PERIMETER AND ALLPENETRATIONS WITH FIRESAFING AND FIRESTOP SEALANT IN ACCORDANCE WITH A SPECIFIED UL APPROVED SYSTEM.
7. ALL GWB IN FIRE RATED PARTITIONS SHALL BE TYPE "X".
8. PROVIDE BLOCKING WITHIN PARTITIONS FOR INSTALLATION MILLWORK, EQUIPMENT AND FIXTURES.
9. REFERENCE SECTIONS AND DETAILS FOR ADDITIONAL INFORMATION INVOLVING PARTITION CONFIGURATION.
10. REFER TO CODE SHEET A0.02 FOR LOCATION OF FIRE RATED WALL ASSEMBLIES INDICATED ON THIS DRAWING.



NOTE
SEE CODE PLANS FOR LOCATIONS OF
SMOKE RESISTANT AND FIRE RATES PARTITIONS
FOR 1 OR 2 HR RATED PARTITIONS
COMPLY WITH UL# U419



NOTE
SEE CODE PLANS FOR LOCATIONS OF
SMOKE RESISTANT AND FIRE RATED PARTITIONS
FOR 1 OR 2 HR RATED PARTITIONS
COMPLY WITH UL# U906

TAI SOO KIM PARTNERS
ARCHITECTS
146 WYLLYS STREET
HARTFORD, CONNECTICUT
TEL: (860) 547-1970
FAX: (860) 249-0695

TITLE
WALL TYPES

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

UNIVERSITY OF CONNECTICUT

STORRS, CT

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\oct\Documents\140202 UCONN_MAA - Central - CD - 2014_oct.rvt

DATE: 9/10/2014
SCALE: As indicated
DRAWN BY: OCT
CHECKED BY: BH

A0.03

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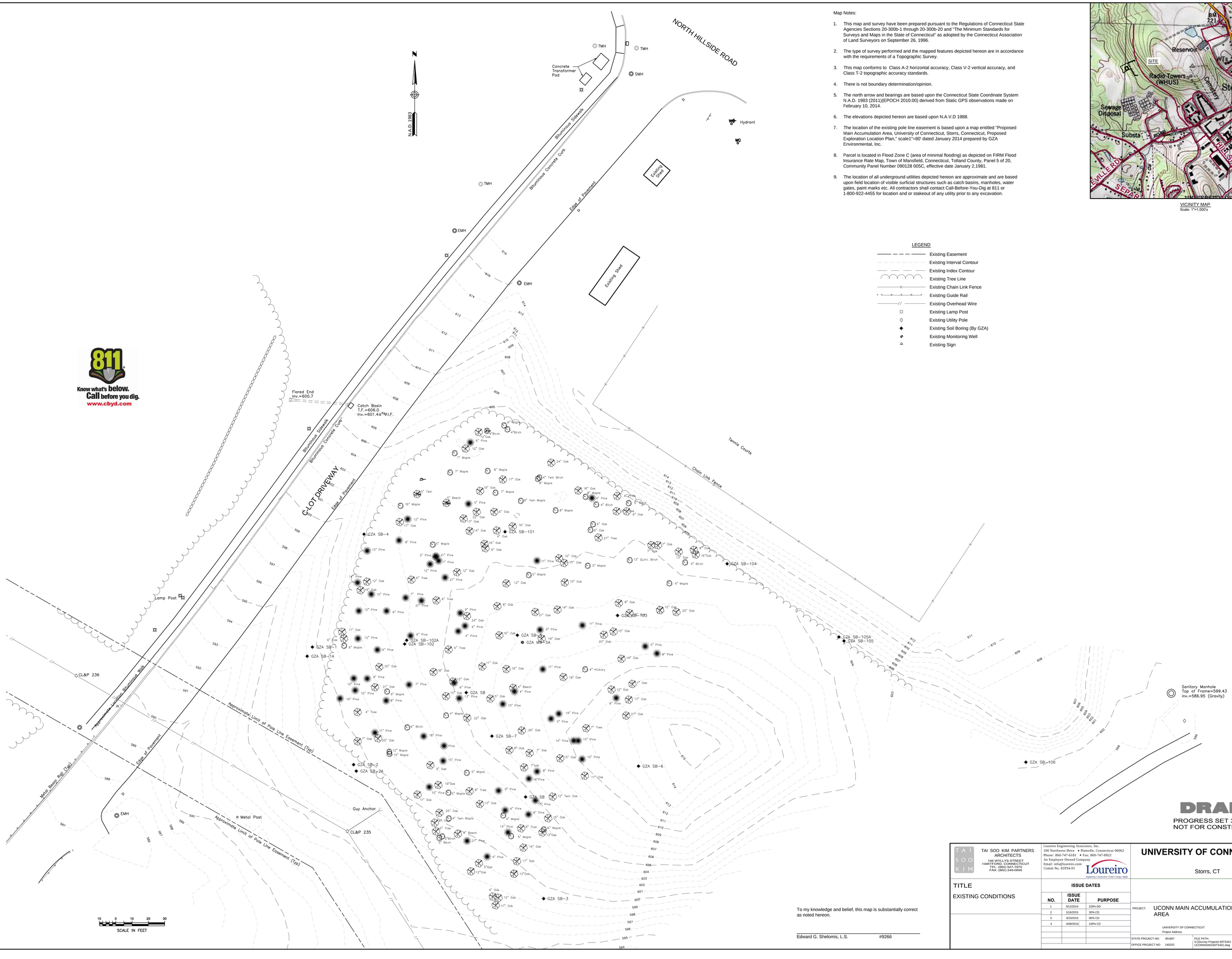
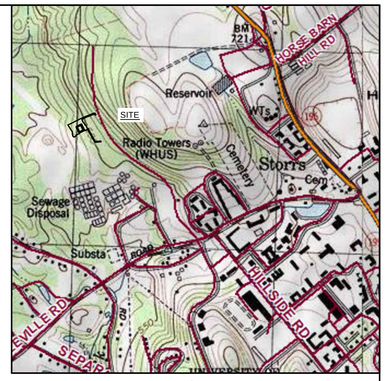
CAD FILE



Map Notes:

1. This map and survey have been prepared pursuant to the Regulations of Connecticut State Agencies Sections 20-300b-1 through 20-300b-20 and "The Minimum Standards for Surveys and Maps in the State of Connecticut" as adopted by the Connecticut Association of Land Surveyors on September 26, 1996.
2. The type of survey performed and the mapped features depicted hereon are in accordance with the requirements of a Topographic Survey.
3. This map conforms to Class A-2 horizontal accuracy, Class V-2 vertical accuracy, and Class T-2 topographic accuracy standards.
4. There is not boundary determination/opinion.
5. The north arrow and bearings are based upon the Connecticut State Coordinate System N.A.D. 1983 (2011)(EPOCH 2010.00) derived from Static GPS observations made on February 10, 2014.
6. The elevations depicted hereon are based upon N.A.V.D 1988.
7. The location of the existing pole line easement is based upon a map entitled "Proposed Main Accumulation Area, University of Connecticut, Storrs, Connecticut, Proposed Exploration Location Plan," scale1"=80' dated January 2014 prepared by GZA Environmental, Inc.
8. Parcel is located in Flood Zone C (area of minimal flooding) as depicted on FIRM Flood Insurance Rate Map, Town of Mansfield, Connecticut, Tolland County, Panel 5 of 20, Community Panel Number 090128 005C, effective date January 2,1981.
9. The location of all underground utilities depicted hereon are approximate and are based upon field location of visible surficial structures such as catch basins, manholes, water gates, paint marks etc. All contractors shall contact Call-Before-You-Dig at 811 or 1-800-922-4455 for location and or stakeout of any utility prior to any excavation.



VICINITY MAP
Scale: 1"=1,000'±

LEGEND

- Existing Easement
- Existing Interval Contour
- Existing Index Contour
- Existing Tree Line
- Existing Chain Link Fence
- Existing Guide Rail
- Existing Overhead Wire
- Existing Lamp Post
- Existing Utility Pole
- Existing Soil Boring (By GZA)
- Existing Monitoring Well
- Existing Sign

Know what's below. Call before you dig. www.cbyd.com

DRAFT
PROGRESS SET 3/23/2015
NOT FOR CONSTRUCTION

To my knowledge and belief, this map is substantially correct as noted hereon.

Edward G. Shelomis, L.S. #9266

TAI SOO KIM PARTNERS ARCHITECTS
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100 Northwest Drive • Plainville, Connecticut 06062
Phone: 860-747-6181 • Fax: 860-747-8822
An Employee Owned Company
Email: info@loureiro.com
Comm No. 83TS4.01

UNIVERSITY OF CONNECTICUT

Storrs, CT

TITLE
EXISTING CONDITIONS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/06/2015	100% CD

PROJECT: UCONN MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
Project Address

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: G:\Survey Projects\83TS401\CONNDWG\83TS401.dwg

DATE: 9/10/2014
SCALE: 1"=20'
DRAWN BY: PAC
CHECKED BY: EGS

V-1

CAD FILE

Know what's below. Call before you dig.
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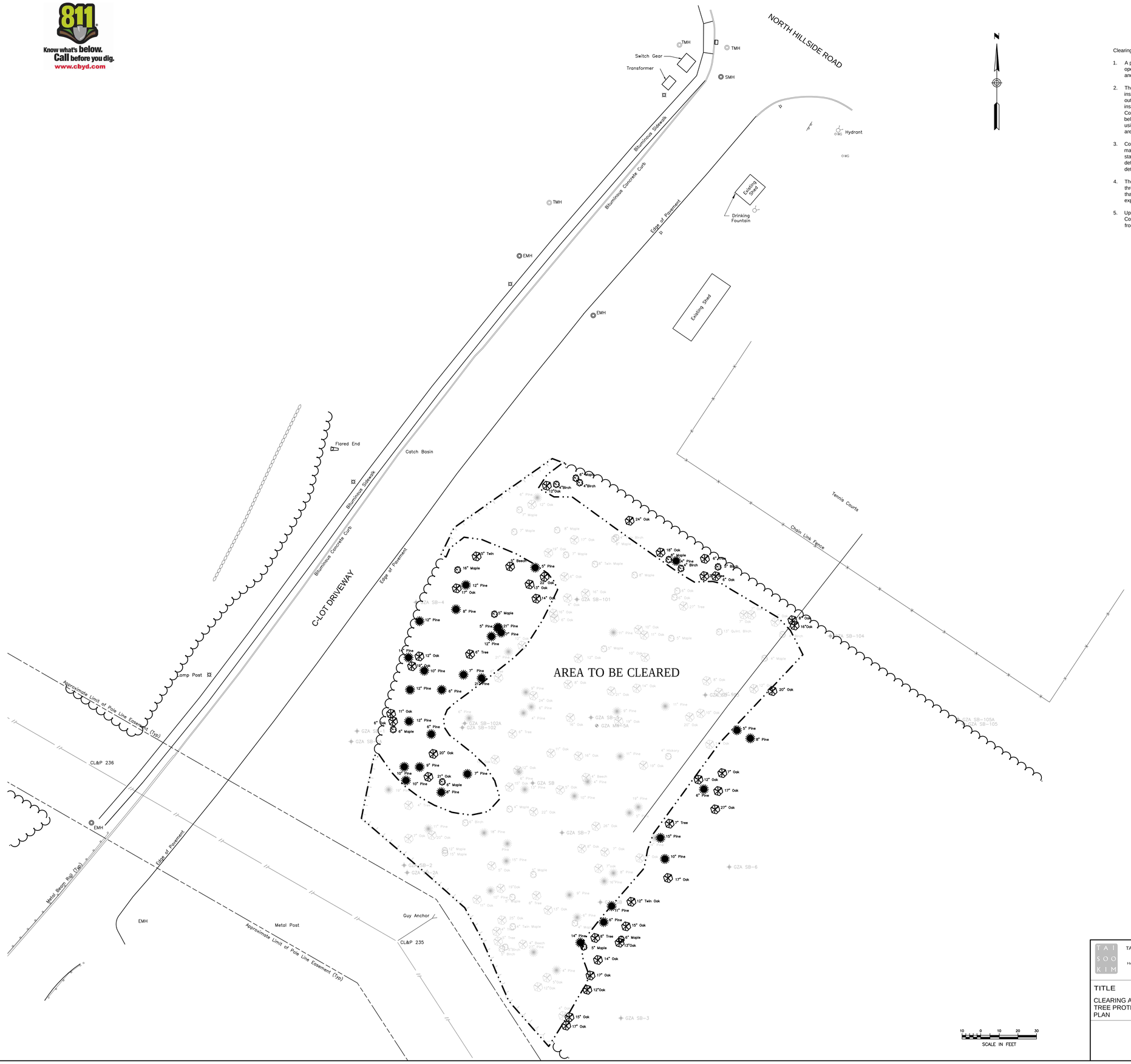

Clearing and Tree Protection Notes:

1. A pre-construction meeting shall be held on-site to explain tree protection measures to operators, construction supervisors, and/or contractor's representatives with the Owner and/or Owner's representatives.

2. The clearing limits line as demarcated hereon shall be delineated in the field using a survey instrument by the contractor. All trees to remain, as noted on this plan, shall be located outside of the clearing limits line. The contractor shall clearly define trees to be removed for inspection by the Owner and/or Owner's representatives before clearing is initiated. Contractor may choose to install his temporary tree protection measures, as described below, before clearing is initiated. Alternatively, the Contractor shall note trees to be cleared using alternative methods such as flagging. No grading or other construction shall begin in areas where tree preservation measures have not been completed.

3. Contractor shall erect robust tree protection measures which will include the installation and maintenance of orange warning barrier fencing (4-foot high staked with steel or hard wood stakes at 10-foot on center maximum) around the perimeter of the clearing limits line as defined hereon. Alternatively, the contractor may install temporary chain link fence as detailed in specification 015639 in lieu of the orange warning barrier fencing.

4. The Contractor shall be responsible for maintenance of the tree protection measures throughout the duration of the project. Trees designated to remain, as indicated hereon, that are damaged during construction shall be restored or replaced at the contractor's expense to the satisfaction of the Owner.

5. Upon completion of the construction activities and stabilization of all disturbed area, the Contractor shall remove all orange warning barrier fencing and stakes or chain link fence from the site.

LEGEND

- Existing Easement
- Existing Interval Contour
- Existing Index Contour
- Existing Tree Line
- Existing Chain Link Fence
- Existing Guide Rail
- Existing Overhead Wire
- Existing Lamp Post
- Existing Utility Pole
- Existing Soil Boring (By GZA)
- Existing Monitoring Well
- Existing Sign
- LEED Project Boundary (LPB)
- Proposed Concrete Surface
- Proposed Catch Basin
- Proposed Sanitary/Drainage Manhole
- Proposed Nyoplast® Yard Drain
- Existing Tree to Remain (Typ)
- Existing Tree to be Removed (Typ)
- Existing Tree Line to Remain
- Clearing Limits Line

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An Employee Owned Company
Email: info@loureiro.com
Comm No. 83TS4.01

UNIVERSITY OF CONNECTICUT

Storrs, CT

TITLE

CLEARING AND TREE PROTECTION PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100% CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
Project Address

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202

FILE PATH: G:\Autocad\Projects\83TS4.01\Task 3/Const-Doc-04-06-2015\Site Plan-Final-04-06-2015.dwg

DATE: 9/10/2014
SCALE: AS NOTED
DRAWN BY: FMC
CHECKED BY: GFA

C-1

CAD FILE
File Path
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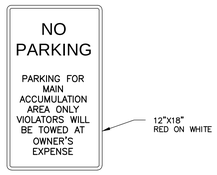
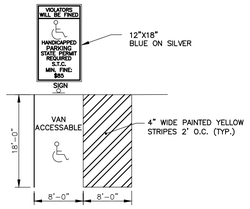
1 C-2 FUEL EFFICIENT VEHICLE PREFERRED PARKING SIGN

SCALE: NONE



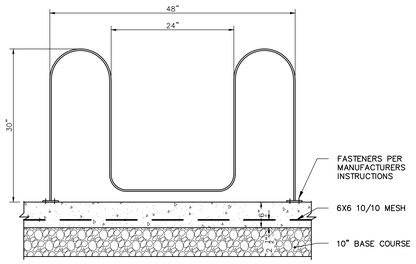
2 C-2 "NO PARKING" SIGN DETAIL

SCALE: NONE



3 C-2 HANDICAP PARKING DETAIL

SCALE: NONE



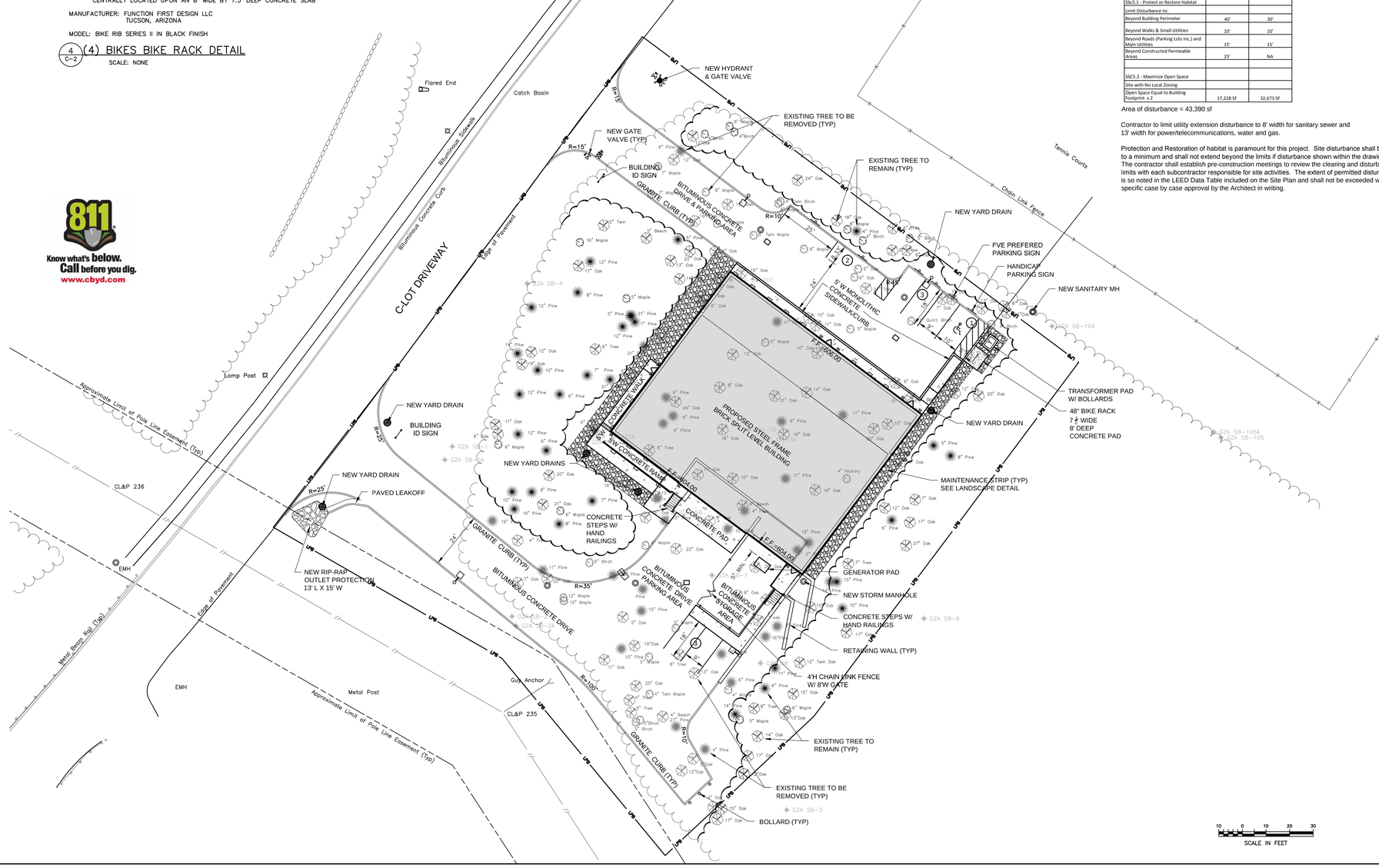
NOTE: SURFACE MOUNT RACK.
CENTRALLY LOCATED UPON AN 8' WIDE BY 7.5' DEEP CONCRETE SLAB

MANUFACTURER: FUNCTION FIRST DESIGN LLC
TUCSON, ARIZONA

MODEL: BIKE RIB SERIES II IN BLACK FINISH

4 C-2 (4) BIKES BIKE RACK DETAIL

SCALE: NONE



Map Notes:

1. The elevations depicted hereon are based upon N.A.V.D 1988.
2. The location of the existing pole line easement is based upon a map entitled "Proposed Main Accumulation Area, University of Connecticut, Storrs, Connecticut, Proposed Exploration Location Plan," scale1"=80' dated January 2014 prepared by GZA Environmental, Inc.
3. Parcel is located in Flood Zone C (area of minimal flooding) as depicted on FIRM Flood Insurance Rate Map, Town of Mansfield, Connecticut, Tolland County, Panel 5 of 20, Community Panel Number 090128 005C, effective date January 2,1981.
4. The location of all underground utilities depicted hereon have been compiled, in part, from record mapping supplied by the University and from other sources of information. They are to be must be considered approximate in nature. Additionally other such features may exist the existence of which is unknown to Loureiro. The size, location and existence of all such features must be field determined and verified by the appropriate authority prior to construction. Call-Before-You-Dig at 811 or 1-800-922-4455.
5. Map References:
   A. "Prepared for O&G, Data Accumulation Plan, As-Built - Roadway Improvements, University of Connecticut North Campus Utility Extension, Storrs, Connecticut," scale "=40' dated September 23, 2004 prepared by O'Brien Associates, Inc.
   B. "Remedial Action Plan Implementation, Landfill and Former Chemical Pits, Project No. 900748, Storrs, Connecticut, Lighting, Ductwork and Lighting Layout Plan, Sheet C-27," scales as shown, dated 10/26/2005 prepared by EarthTech.
   C. University of Connecticut, Storrs, Connecticut, Topographic Survey," scale: 1"=20' dated 2/12/2014 prepared by Loureiro Engineering Associates, Inc., (Loureiro).
6. Site is located in Zone C, area of minimal flooding as depicted on FIRM Floor Insurance Rate Map, Town of Mansfield, Connecticut, Tolland County, Panel 5 of 20, Community-Panel Number 090128 005 C, effective date January 2, 1981.

General Notes:

1. Total parking spaces provided: 9 (8 regular spaces including (1) FVE prefered space and (1) handicap space).
2. Contractor shall be provided wit hthe cad file associated with the "C" series drawings for use in layout. Site control shall also be provided by Loureiro Engineering Associates, Inc.

LEED Data Table		
LEED Project Area	58,803 SF	
Development Footprint	26,130 SF	
Open Space	32,673 SF	(56%)
Building Footprint	8,614 SF	
Description	**Required**	**Provided**
SSc5.1 - Protect or Restore Habitat		
Limit Disturbance to:		
Beyond Building Perimeter	40'	30'
Beyond Walks & Small Utilities	10'	10'
Beyond Roads (Parking Lots Inc.) and Main Utilities	15'	15'
Beyond Constructed Permeable Areas	25'	NA
SSC5.2 - Maximize Open Space		
Site with No Local Zoning		
Open Space Equal to Building Footprint x 2	17,228 SF	32,673 SF

Area of disturbance = 43,390 sf

Contractor to limit utility extension disturbance to 8' width for sanitary sewer and 13' width for power/telecommunications, water and gas.

Protection and Restoration of habitat is paramount for this project. Site disturbance shall be kept to a minimum and shall not extend beyond the limits if disturbance shown within the drawing set. The contractor shall establish pre-construction meetings to review the clearing and disturbance limits with each subcontractor responsible for site activities. The extent of permitted disturbances is so noted in the LEED Data Table included on the Site Plan and shall not be exceeded without specific case by case approval by the Architect in writing.

LEGEND

- Existing Easement
- Existing Interval Contour
- Existing Index Contour
- Existing Tree Line
- Existing Chain Link Fence
- Existing Guide Rail
- Existing Overhead Wire
- Existing Lamp Post
- Existing Utility Pole
- Existing Soil Boring (By GZA)
- Existing Monitoring Well
- Existing Sign
- LPB — LEED Project Boundary (LPB)
- Proposed Concrete Surface
- Proposed Catch Basin
- Proposed Sanitary/Drainage Manhole
- Proposed Nyoplast® Yard Drain
- Proposed Tree Line
- Existing Tree to Remain (Typ)
- Existing Tree to be Removed (Typ)
- Existing Tree Line to be Removed

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An Employee Owned Company
Email: info@loureiro.com
Comm No. 83TS4.01
Loureiro Engineering • Construction • Field • Energy • Water

UNIVERSITY OF CONNECTICUT

Storrs, CT

TITLE
SITE PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100% CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
Project Address

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202

FILE PATH
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Const-Doc-04-06-2015\Site
Plan-Final-04-06-2015.dwg

DATE: 9/10/2014
SCALE: AS NOTED
DRAWN BY: FMC
CHECKED BY: GFA

C-2

CAD FILE
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File Path

SOIL EROSION AND SEDIMENTATION CONTROL NOTES:

The purpose of this project is to construct a new maintenance storage facility on the University of Connecticut Campus on the east side of the C-Lot driveway.

Prior to any clearing, all erosion control barriers shall be placed to confine sediment as shown on drawings and where required by the owner's representative. Erosion control shall be left in place and maintained until the construction work has been completed and surfaces stabilized, at which time all erosion control measures shall be removed from the site. This plan recognizes the difficulties associated with clearing and grubbing after installation of erosion controls. The contractor shall coordinate these activities to mitigate disturbance and immediately restore temporarily removed or damaged erosion control structures.

It shall be the responsibility of the contractor to monitor the condition of the erosion control structures. If the effectiveness or integrity of the structures is found to be insufficient or if the structures are damaged in any way, the contractor shall make whatever repairs are necessary to ensure that proper erosion control is maintained. Monitoring of the erosion control is particularly important in the areas where excavation or construction is taking place or following periods of rainfall. All repairs of erosion control structures shall be made by the contractor as soon as the damage is discovered.

If additional erosion and sedimentation control structures are necessary to minimize erosion and sedimentation as determined in the field, the contractor shall install structures as required.

It is noteworthy that the proposed construction on this site includes structures on steep slopes. Care will be required to ensure that erosion controls and construction limits are effectively honored during the performance of the construction activities. Further, specific care shall be exercised in the vicinity of the watercourse located along the southeast portion of the parcel.

Suggested sequence of construction activities

1. Acquire any and all permits required to perform the work (including town and/or state permits). Since this site is less than 5 acres of disturbed area, registration under the state of Connecticut General Permit for the Discharge of Stormwater and Dewatering Wastewaters from construction activities is not required.
2. Install perimeter silt fence at down-gradient locations as shown on drawing or as determined necessary to facilitate the work and mitigate the discharge of sediment. The contractor shall coordinate his demolition, clearing and grubbing activities during fine weather and immediately follow these activities with the installation of the erosion control structures. See note above.
3. Perform utility disconnects with the proper authorization of the utility purveyors. Prepare structural units for demolition including any environmental mitigation required such as asbestos abatement or other hazardous building materials. Demolish all structures on the site and utilize clean concrete on site and dispose of Construction and Demolition Debris (C&DD) off site.
4. Coordinate access and barricade work zones. Construct the construction access anti-tracking pad. Remove pavement to facilitate building and parking lot development.
5. Strip and stockpile any and all topsoil immediately prior to building and parking improvements.
6. Maintain existing sedimentation structure as long as possible throughout construction.
7. Excavate as necessary to support the new foundation for the building and the concrete column piers for the new covered training area.
8. Construct all drainage structures and storm water management areas. Protect all drainage features from sedimentation. Evacuate any accumulated sediment from structures prior to commissioning.
9. Construct all new utilities.
10. Construct new drives and parking areas with base materials.
11. Pave all disturbed pavement areas as necessary. Construct paved areas in phases providing binder course first and wearing course after construction of the buildings and completion of the landscaping.
12. Construct all new sidewalks, equipment pads, building access structures and all related improvements.
13. Restore all disturbed unpaved areas designated for lawn with topsoil, seed and mulch. Provide crushed stone finish throughout all other disturbed unpaved area that are not designated for landscape improvements.
14. Remove erosion control measures following site stabilization. Install wearing course of pavement and stripe.

The contractor shall be responsible for mitigating dust throughout his/her site operations. Dust control shall be accomplished by chemical (salt) or water applications.

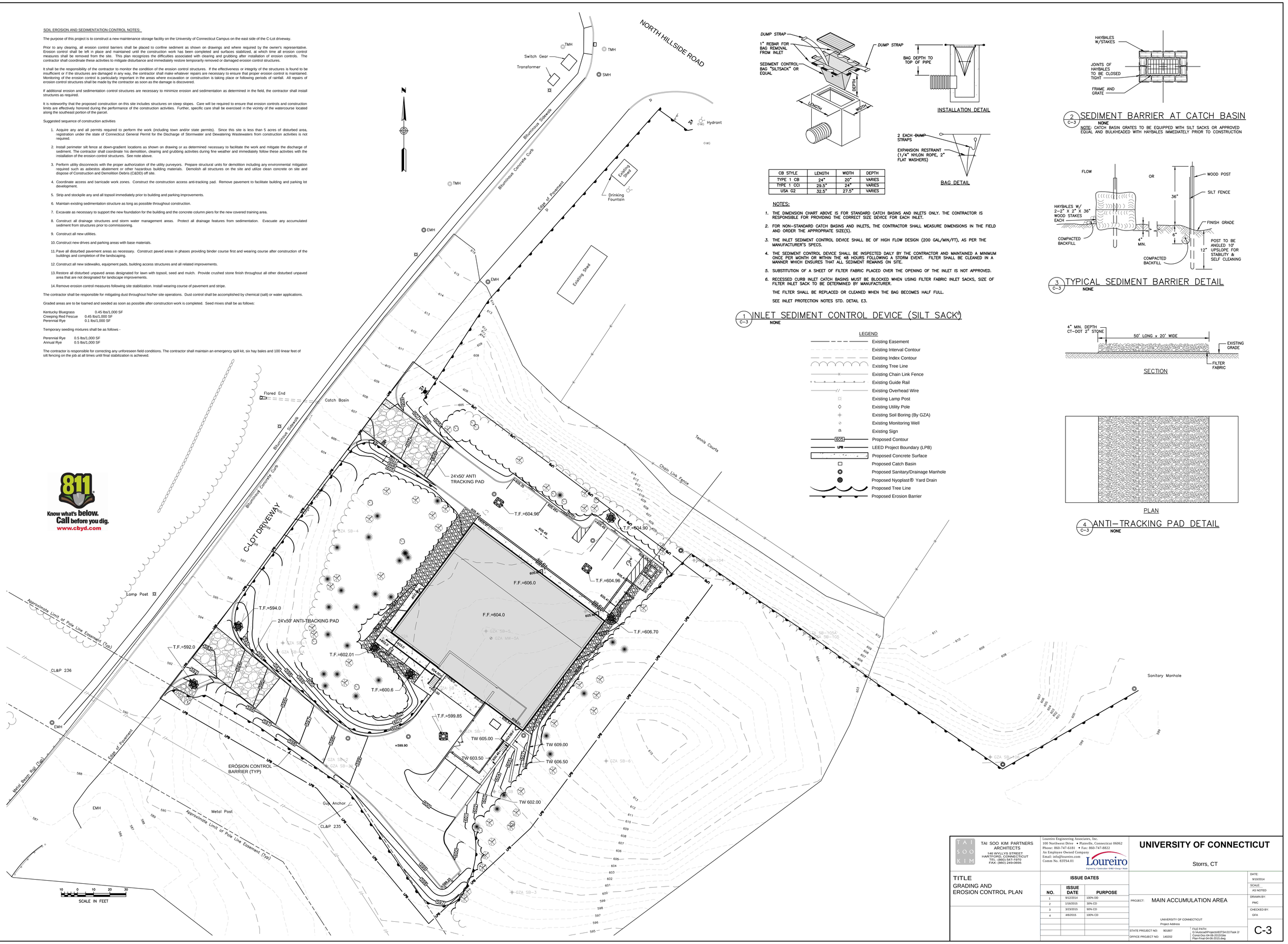
Graded areas are to be loamed and seeded as soon as possible after construction work is completed. Seed mixes shall be as follows:

Kentucky Bluegrass	0.45 lbs/1,000 SF
Creeping Red Fescue	0.45 lbs/1,000 SF
Perennial Rye	0.1 lbs/1,000 SF

Temporary seeding mixtures shall be as follows -

Perennial Rye	0.5 lbs/1,000 SF
Annual Rye	0.5 lbs/1,000 SF

The contractor is responsible for correcting any unforeseen field conditions. The contractor shall maintain an emergency spill kit, six hay bales and 100 linear feet of silt fencing on the job at all times until final stabilization is achieved.



CB STYLE	LENGTH	WIDTH	DEPTH
TYPE 1 CB	24"	20"	VARIES
TYPE 1 CCI	29.5"	24"	VARIES
USA G2	32.5"	27.5"	VARIES

NOTES:

1. THE DIMENSION CHART ABOVE IS FOR STANDARD CATCH BASINS AND INLETS ONLY. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE CORRECT SIZE DEVICE FOR EACH INLET.
2. FOR NON-STANDARD CATCH BASINS AND INLETS, THE CONTRACTOR SHALL MEASURE DIMENSIONS IN THE FIELD AND ORDER THE APPROPRIATE SIZE(S).
3. THE INLET SEDIMENT CONTROL DEVICE SHALL BE OF HIGH FLOW DESIGN (200 GAL/MIN/FT), AS PER THE MANUFACTURER'S SPECS.
4. THE SEDIMENT CONTROL DEVICE SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED A MINIMUM ONCE PER MONTH OR WITHIN THE 48 HOURS FOLLOWING A STORM EVENT. FILTER SHALL BE CLEANED IN A MANNER WHICH ENSURES THAT ALL SEDIMENT REMAINS ON SITE.
5. SUBSTITUTION OF A SHEET OF FILTER FABRIC PLACED OVER THE OPENING OF THE INLET IS NOT APPROVED.
6. RECESSED CURB INLET CATCH BASINS MUST BE BLOCKED WHEN USING FILTER FABRIC INLET SACKS, SIZE OF FILTER INLET SACK TO BE DETERMINED BY MANUFACTURER.

THE FILTER SHALL BE REPLACED OR CLEANED WHEN THE BAG BECOMES HALF FULL.

SEE INLET PROTECTION NOTES STD. DETAIL E3.

1 C-3 INLET SEDIMENT CONTROL DEVICE (SILT SACK)
NONE

LEGEND

- Existing Easement
- Existing Interval Contour
- Existing Index Contour
- Existing Tree Line
- Existing Chain Link Fence
- Existing Guide Rail
- Existing Overhead Wire
- Existing Lamp Post
- Existing Utility Pole
- Existing Soil Boring (By GZA)
- Existing Monitoring Well
- Existing Sign
- Proposed Contour
- LEED Project Boundary (LPB)
- Proposed Concrete Surface
- Proposed Catch Basin
- Proposed Sanitary/Drainage Manhole
- Proposed Nyoplast® Yard Drain
- Proposed Tree Line
- Proposed Erosion Barrier

2 C-3 SEDIMENT BARRIER AT CATCH BASIN
NONE

NOTE: CATCH BASIN GRATES TO BE EQUIPPED WITH SILT SACKS OR APPROVED EQUAL AND BULKHEADED WITH HAYBALES IMMEDIATELY PRIOR TO CONSTRUCTION

3 C-3 TYPICAL SEDIMENT BARRIER DETAIL
NONE

SECTION

PLAN

4 C-3 ANTI-TRACKING PAD DETAIL
NONE

Know what's below. Call before you dig.
www.cbyd.com

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100 Northwest Drive • Plainville, Connecticut 06062
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Comm No. 83TS4.01
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UNIVERSITY OF CONNECTICUT
Storrs, CT

TITLE
GRADING AND EROSION CONTROL PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100% CD

PROJECT: MAIN ACCUMULATION AREA
UNIVERSITY OF CONNECTICUT
Project Address
STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: G:\Autocad\Projects\83TS4.01\Task 2/Const-Doc-04-06-2015\Site Plan-Final-04-06-2015.dwg

DATE: 9/10/2014
SCALE: AS NOTED
DRAWN BY: PHC
CHECKED BY: GFA

C-3

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Flip Path
CAD FILE

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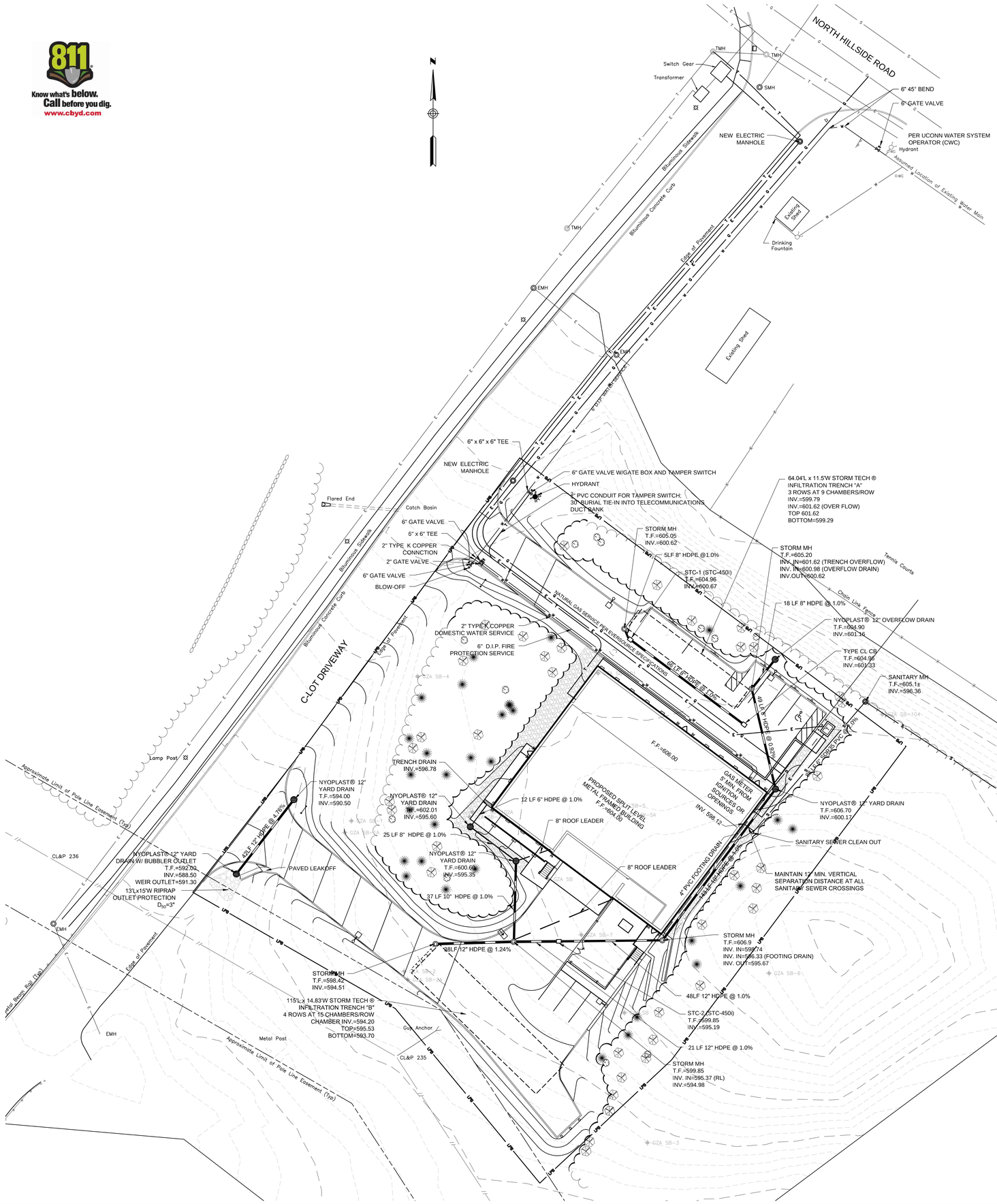

LEGEND

- Existing Easement
- Existing Interval Contour
- Existing Index Contour
- Existing Tree Line
- Existing Chain Link Fence
- Existing Guide Rail
- Existing Overhead Wire
- Existing Underground Electric
- Existing Gas Main
- Existing Sanitary
- Existing Storm Drain
- Existing Underground Telecommunications
- Existing Water Main
- Existing Lamp Post
- Existing Utility Pole
- Existing Soil Boring (By GZA)
- Existing Monitoring Well
- Existing Sign
- Proposed Contour
- Proposed Electric
- Proposed Gas
- Proposed Sanitary
- Proposed Storm Drain
- Proposed Telecommunications
- Proposed Water
- LEED Project Boundary (LPB)
- Proposed Concrete Surface
- Proposed Catch Basin
- Proposed Sanitary/Drainage Manhole
- Proposed Nyoplast® Yard Drain
- Proposed Tree Line

Map Notes:

1. Contractor to verify the location and size of the existing water main at the intersection of North Hillside Road and report any discrepancies to the design engineer.
2. The location of all underground utilities depicted hereon have been compiled, in part, from record mapping supplied by the University and from other sources of information. They are to be considered approximate in nature. Additionally, other such features may exist the existence of which is unknown to Loureiro. The size, location and existence of all such features must be field determined and verified by the appropriate authority prior to construction. Call-Before-You-Dig at 811 or 1-800-922-4455.
3. Typical water service installation with meter located inside utility room. Water services to be constructed in accordance with Rules & Regulations, Connecticut Water Company, July 14, 2010.
4. Typical gas service installation with meter located along exterior southeast wall. Gas service to be installed in accordance with Connecticut Natural Gas Corporation Rules and Regulations, February 1, 2014.
5. Typical telecommunications service installation with connection into the IT room. Telecommunications services to be constructed in accordance with University of Connecticut Telecommunication Design Guide and Standards, April 2011.
6. Typical power service installation with connection into utility room. No external meter required.

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UNIVERSITY OF CONNECTICUT

Storrs, CT

TITLE
DRAINAGE & UTILITY PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100% CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
Project Address

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: G:\AutocadProjects\83T54.01\Task 2/Coord Doc-04-06-2015\Site Plan-Final-04-06-2015.dwg

DATE: 9/10/2014
SCALE: AS NOTED
DRAWN BY: PMC
CHECKED BY: GFA

C-4

CAD FILE
File Path
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Know what's below. Call before you dig.
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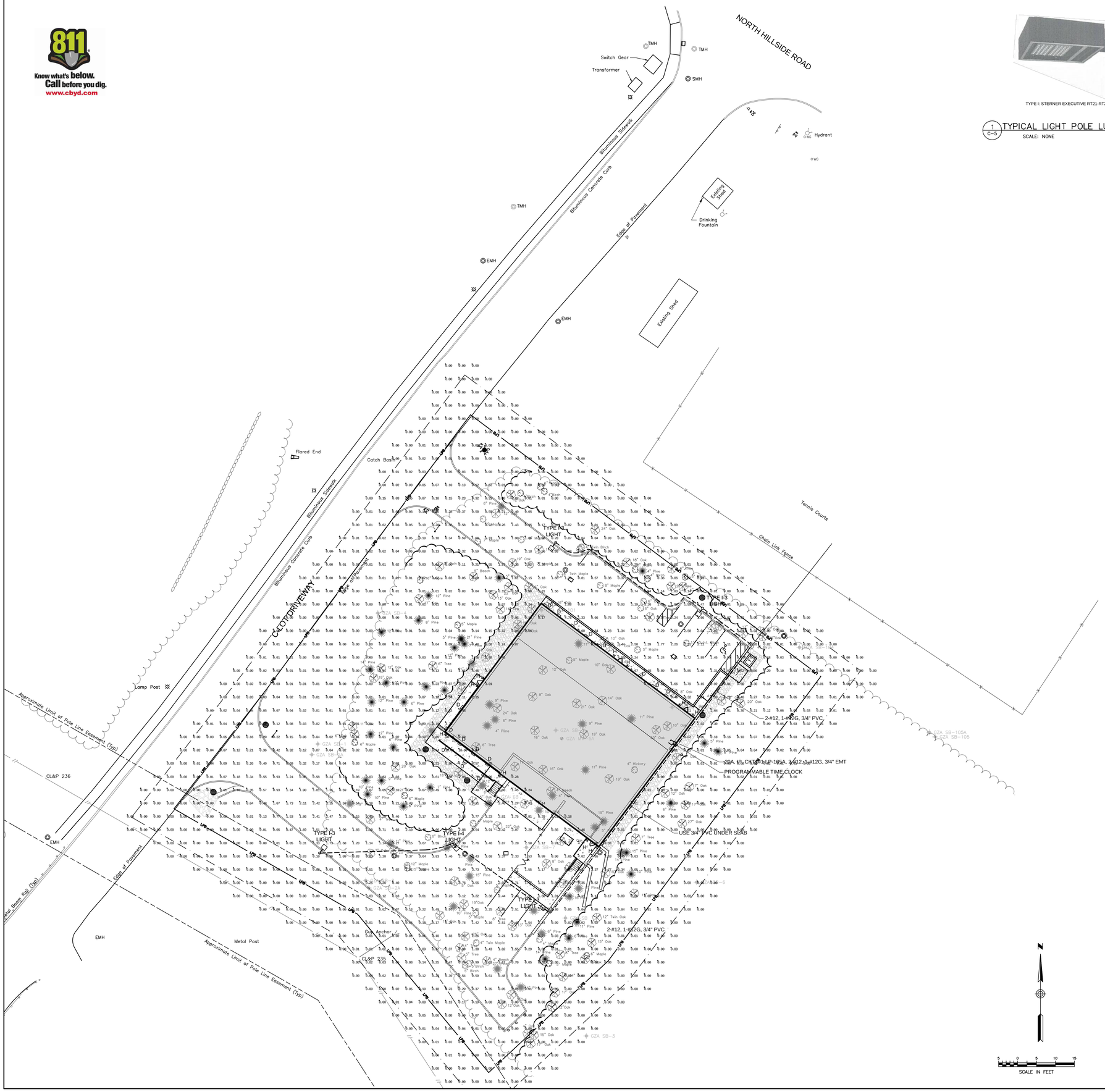
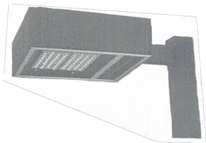
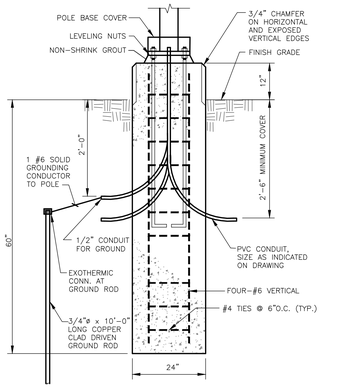




TYPE I: STERNER EXECUTIVE RT21-RT24-LED

1 C-5 TYPICAL LIGHT POLE LUMINAIRE DETAIL

SCALE: NONE

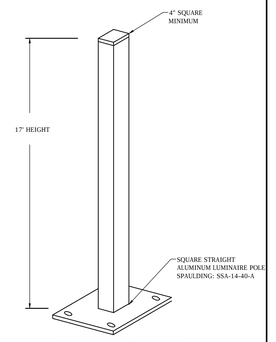


NOTES

1. CONCRETE SHALL BE 3000 PSI COMPRESSIVE STRENGTH AT 28 DAYS.
2. REINFORCING STEEL SHALL BE ASTM A615 GRADE 60.
3. LAP ALL BARS 36 BAR DIAMETERS.
4. GRIND AND GROUT CLEAN ALL EXPOSED CONCRETE SURFACES TO OBTAIN UNIFORM FINISH APPEARANCE.
5. BASE CAN BE CAST-IN-PLACE OR PRECAST AT CONTRACTOR'S OPTION.

2 C-5 TYPICAL LIGHT POLE BASE DETAIL

SCALE: NONE



NOTE: COORDINATE POLE WITH BASE.

3 C-5 ALUMINUM LUMINAIRE POLE

NOT TO SCALE

LEGEND

- Existing Easement
- Existing Interval Contour
- Existing Index Contour
- Existing Tree Line
- Existing Chain Link Fence
- Existing Guide Rail
- Existing Overhead Wire
- Existing Lamp Post
- Existing Utility Pole
- Existing Soil Boring (By GZA)
- Existing Monitoring Well
- Existing Sign
- Proposed Lighting Conduit
- LPB — LEED Project Boundary (LPB)
- Proposed Concrete Surface
- Proposed Catch Basin
- Proposed Sanitary/Drainage Manhole
- Sanitary Manhole — Proposed Nyoplast® Yard Drain
- Proposed Tree Line
- LEED Project 15 Foot Offset

LUMINAIRE SCHEDULE

SYMBOL	QUANITITY	LABEL	ARRANGEMENT	DESCRIPTION	MOUNTING HEIGHT
	4	TYPE I-3 LIGHT	SINGLE	Sterner#EXEC-RT21-30L-4K-3-BC	18 FT.
	16	D	SINGLE	Cole#L609-HO	30 IN.
	1	TYPE I-4 LIGHT	SINGLE	Sterner#EXEC-RT-21-60L-4K-5M	18 FT.
	10	H	SINGLE	Hubble#LNC-5LU-4K-4-X	6 FT.

* 30" MINIMUM HEIGHT EXCEPT ON OUTER HANDICAPPED RAMP.
REFER TO DRAWING E-1.02 FOR DETAILS ON ALL WALL MOUNTED LUMINAIRES.

In accordance with LEED requirement for Light Pollution Reduction, this site is equipped with LED Dark Sky fixtures designed and located to reduce light trespass, while maintaining security effectively throughout the facility. The photometrics for the site document that the initial illuminance values at the LEED Project Boundary (LPB) is no greater than 0.20 fc and no greater than 0.01 fc at 15-feet beyond the LPB.

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TITLE
PHOTOMETRIC PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100% CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
Project Address

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202

FILE PATH
G:\AutocadProjects\83TS4.01\Task 2/Const-Doc-04-06-2015\Site Plan-Final-04-06-2015.dwg

DATE: 9/10/2014
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DRAWN BY: PWC
CHECKED BY: GFA

C-5

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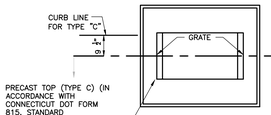
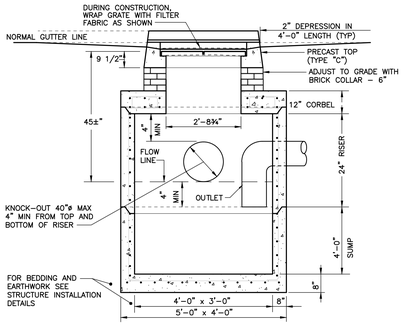


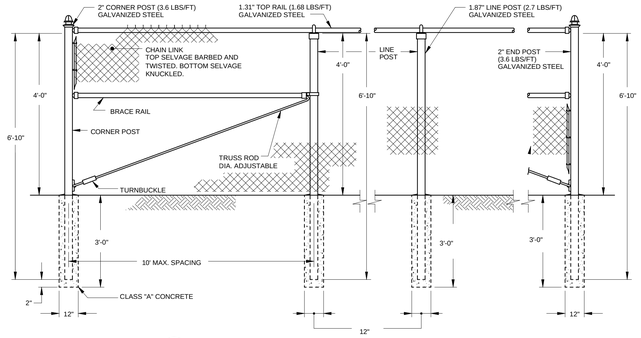
PLAN



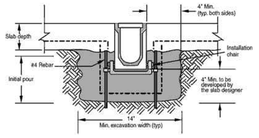
SECTION

NOTES:
1. PROVIDE 90° BAFFLE ELBOW OR GALVANIZED STEEL BAFFLE ON ALL PIPES ENTERING AND EXITING BASINS, SUBMERGE BAFFLE 4 INCHES BELOW INVERT OUT.

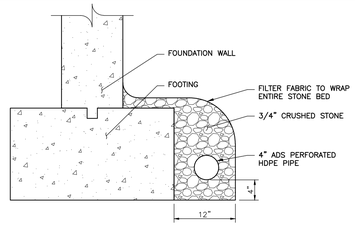
1 C-6 PRECAST CONCRETE CATCH BASIN 4', TYPE "C", WITH SUMP & OIL TRAP
SCALE: NONE



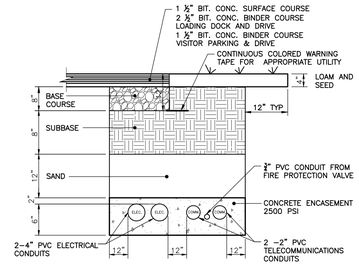
5 C-6 STRAIGHT RUN - CHAIN LINK FENCE DETAILS
SCALE: NONE



13 C-6 TRENCH DRAIN DETAIL
SCALE: NONE

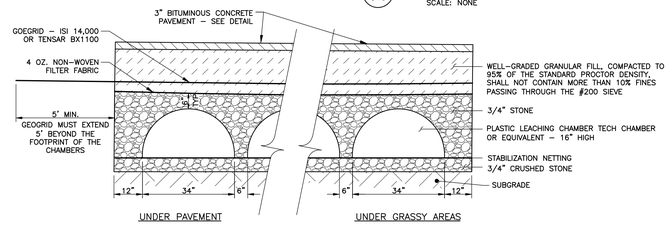


18 C-6 TYPICAL FOOTING DRAIN DETAIL
SCALE: NONE

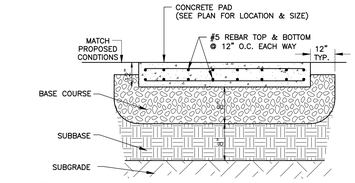


19 C-6 TYPICAL BURIED UTILITY TRENCH DETAIL
SCALE: NONE

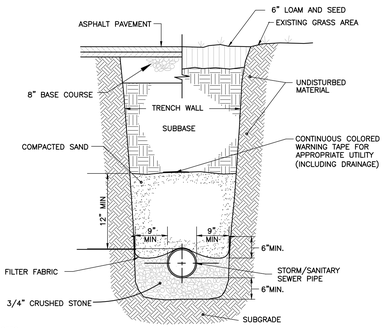
NOTES:
1. NUMBER OF CONDUITS/PIPES TO BE COORDINATED WITH UTILITY PURVEYORS.
2. ALL BENDS SHAL HAVE A MINIMUM 36" RADIUS.



14 C-6 STORM TECH INFILTRATION DETAIL
SCALE: NONE

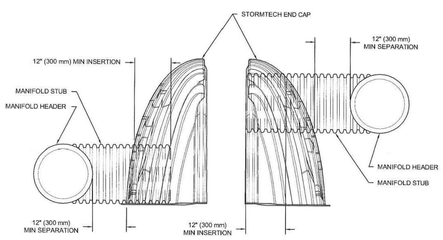


6 C-6 GENERATOR PAD AND LOADING DOCK DETAIL
SCALE: NONE



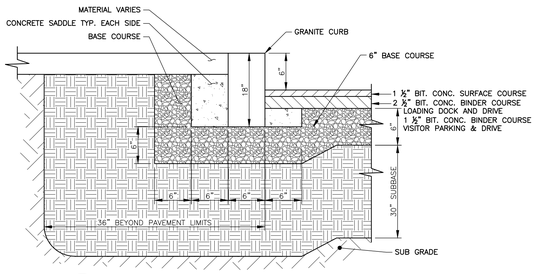
NOTES:
1. SEE STATE AND/OR LOCAL HIGHWAY DEPARTMENT SPECIFICATIONS FOR ADDITIONAL PAVING REQUIRED WHEREVER APPLICABLE.
2. DEEP FOUNDATIONS: WHERE SPECIAL DEEP FOUNDATIONS ARE REQUIRED, BECAUSE OF VERY SOFT SOIL FOUNDATION, CRUSHED STONE OR PROCESSED GRAVEL SHALL BE USED TO A POINT 24" DEEPER THAN FLOW LINE OF PIPE. ADDITIONAL FOUNDATION DEPTH BELOW THIS POINT MAY BE OTHER SELECTED MATERIAL, AS SPECIFIED AND AS REQUIRED BY THE ENGINEER IN THE FIELD.

10 C-6 TYPICAL STORM/SANITARY SEWER TRENCH DETAIL
SCALE: NONE

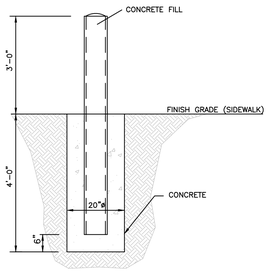


NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

15 C-6 INFILTRATION TRENCH HEADER DETAIL
SCALE: NONE

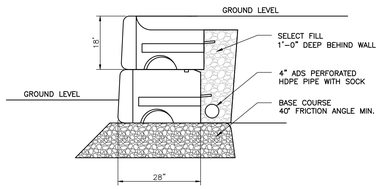


20 C-6 GRANITE CURB & ASPHALT PAVEMENT DETAIL
SCALE: NONE



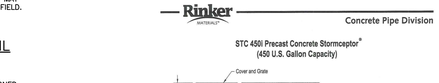
2 C-6 TYPICAL BOLLARD DETAIL
SCALE: NONE

NOTE: CONCRETE: ACI301, 3000 PSI COMPRESSIVE STRENGTH AT 28 DAYS

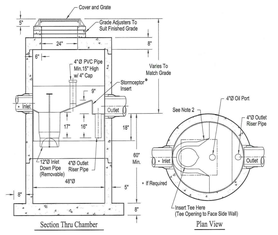


7 C-6 ANCHOR RETAINING BLOCK WALL SYSTEM
SCALE: NONE

Detail and block selection presented is for preliminary bidding only. Final engineered walls are the responsibility of the successful bidder and the wall system manufacturer selected. Contractor to submit samples for owner's color and block texture choice. Submit final design to architect for approval.



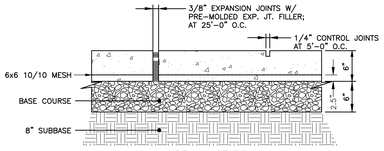
STC 450i Precast Concrete Stormceptor®
(450 U.S. Gallon Capacity)



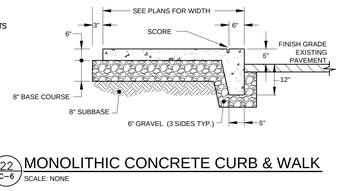
Notes:
1. The Use Of Flexible Connection is Recommended at The Inlet and Outlet Where Applicable.
2. The Cover Should be Positioned Over The Inlet Drop Pipe and The Oil Port.
3. The Stormceptor System is protected by one or more of the following U.S. Patents: 44985148, 85498331, 85225760, 85755115, 85849181, 86008765, 86371690.
4. Contact a Concrete Pipe Division representative for further details not listed on this drawing.

Rinker 027

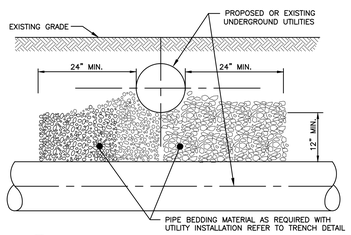
16 C-6 PRECAST CONCRETE STORMCEPTOR
SCALE: NONE



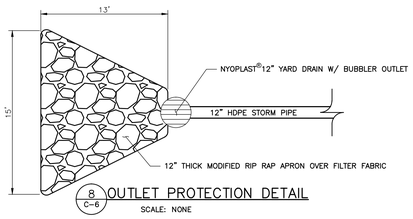
21 C-6 CONCRETE WALK DETAIL
SCALE: NONE



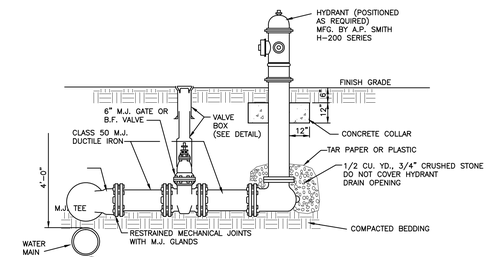
22 C-6 MONOLITHIC CONCRETE CURB & WALK
SCALE: NONE



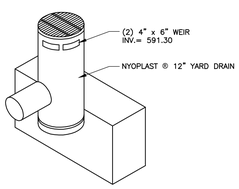
3 C-6 UTILITY PIPE SEPARATION DETAIL
SCALE: NONE



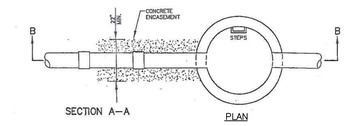
8 C-6 OUTLET PROTECTION DETAIL
SCALE: NONE



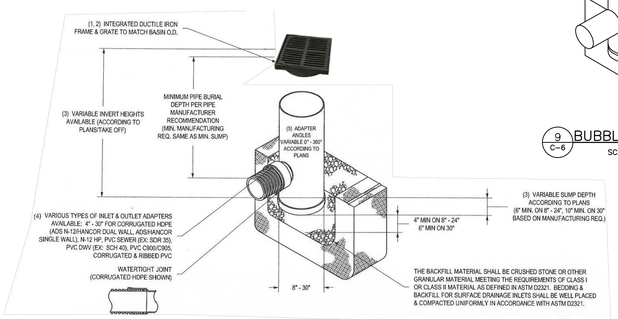
11 C-6 TYPICAL HYDRANT INSTALLATION
SCALE: NONE



9 C-6 BUBBLER OUTLET DETAIL
SCALE: NONE

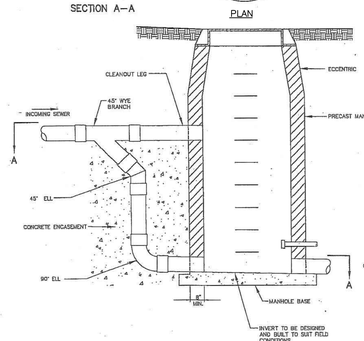


SECTION A–A PLAN

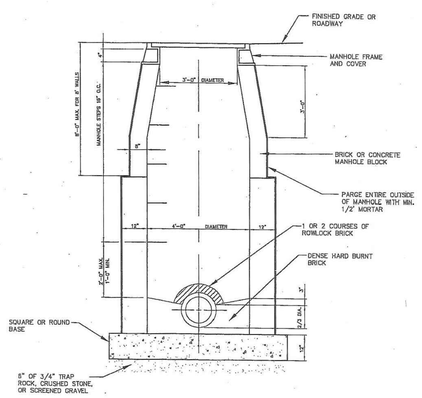


1. 8"– 30" STANDARD GRATES & FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70–50–05.
2. 8" & 10" FRAMES FIT DIRECTLY ONTO DRAIN BASIN WITH THE USE OF A PVC BODY TOP.
3. DRAIN BASINS TO BE CUSTOM MANUFACTURED ACCORDING TO THE PLAN.
4. DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS N–12/HARDCOR DUAL WALL),N–12 HP, & PVC SEWER (4"–24")
5. ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0°–360°.
6. 12"–30" GRATES SHALL MEET H–20 LOADING.
7. 8" & 10" GRATES ARE RATED FOR LIGHT DUTY APPLICATIONS ONLY. NO CONCRETE COLLAR IS NEEDED FOR LIGHT DUTY RATING.

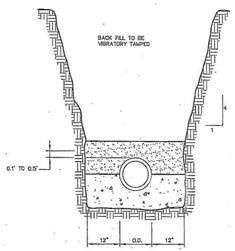
4 C-6 NYOPLAST® DRAIN BASIN WITH STANDARD GRATE
SCALE: NONE



12 C-6 DROP INLET MANHOLE
SCALE: NONE

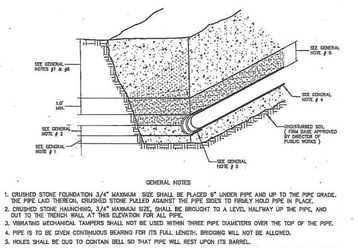


17 C-6 TYPICAL MANHOLE
SCALE: NONE



THE STRENGTH OF THE PIPE REQUIRED BY THIS SPECIFICATION IS DESIGNED TO CARRY LIVE AND DEAD LOADS AS CALCULATED AT A POINT ONE FOOT ABOVE THE TOP OF PIPE. WHERE THE SPECIFIED TRENCH WIDTH IS EXCEEDED BY THE OPERATIONS OF THE CONTRACTOR, THE ENGINEER WILL RECHECK THE DESIGN OF THE PIPE.

23 C-6 TYPICAL TRENCH
SCALE: NONE



GENERAL NOTES
1. CRUSHED STONE FOUNDATION 3/4" MAXIMUM SIZE SHALL BE PLACED 8" UNDER PIPE AND UP TO THE PIPE GRADE. THE PIPE LAID THEREON. CRUSHED STONE PULLED AGAINST THE PIPE SIDES TO FIRMLY HOLD PIPE IN PLACE.
2. CRUSHED STONE HAUNCHING, 3/4" MAXIMUM SIZE, SHALL BE BROUGHT TO A LEVEL HALFWAY UP THE PIPE, AND OUT TO THE TRENCH WALL AT THIS ELEVATION FOR ALL PIPE.
3. VIBRATING MECHANICAL TAMPERS SHALL NOT BE USED WITHIN THREE PIPE DIAMETERS OVER THE TOP OF THE PIPE.
4. PIPE IS TO BE GIVEN CONTINUOUS BEARING FOR ITS FULL LENGTH, BRIDGING WILL NOT BE ALLOWED.
5. HOLES SHALL BE DUG TO CONTAIN BELL SO THAT PIPE WILL REST UPON ITS BARREL.
6. COARSE SAND OR FINE GRAVEL (3/4" MAX.) SUITABLE FOR BACK FILL SHALL BE PLACED IN LAYERS OF 4" PUDDLED OR TAMPED PER TOWN OF MANSFIELD SPECIFICATIONS AND/OR AS ORDERED BY THE DIRECTOR OF PUBLIC WORKS.
7. 1" AROUND PIPE TO ROADWAY BASE WITH FINE GRAINING MATERIAL (6" MINIMUM) AND BACK FILL SHALL BE PLACED IN LAYERS NOT TO EXCEED 12" AND PUDDLED OR TAMPED PER TOWN OFF MANSFIELD SPECIFICATIONS AND AS ORDERED BY THE DIRECTOR OF PUBLIC WORKS.
8. IN EXCESS OF 8'–0" SHORING AND BRACING SHALL BE REQUIRED.

24 C-6 TYPICAL TRENCH SECTION
SCALE: NONE

TAI SOO KIM PARTNERS ARCHITECTS
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Email: info@loureiro.com
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UNIVERSITY OF CONNECTICUT
Storrs, CT

TITLE
SITE DETAILS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100% CD

PROJECT: MAIN ACCUMULATION AREA
UNIVERSITY OF CONNECTICUT
Project Address

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH G:\AutocadProjects\83TS4.01\Task 2/Const-Doc-04-06-2015\Site Plan-Final-04-06-2015.dwg

DATE: 9/10/2014
SCALE: AS NOTED
DRAWN BY: PMC
CHECKED BY: GFA

C-6

10/1/2015 9:48:17 PM
Flat Path
CAD FILE

SPECIMEN TREE

SHADE TREE

ORNAMENTAL TREE

EVERGREEN TREE

PERENNIAL/ GROUNDCOVER

LAWN

CONSERVATION SEED MIX

SEEDED LAWN (TYP.)

1 CS

1 AR

3 QP

CONSERVATION SEED MIX (TYP.)

1 AS1

2 AR

5 BN

1 AS

CONSERVATION SEED MIX (TYP.) EXTEND SEEDING TO TOE OF SLOPE.

3 QP

2 AR

SEEDED LAWN (TYP.)

2 CS

1 QR

1 AS1

31 SA

50 SA

SEEDED LAWN (TYP.)

3 LT

1 CS

CONSERVATION SEED MIX

6 L5.00 MAINTENANCE STRIP - TYPE B.

6 L5.00 MAINTENANCE STRIP - TYPE A.

ALIGN MAINTENANCE STRIP EDGE WITH EDGE OF CONCRETE. EXTEND MAINTENANCE STRIP EDGE PARALLEL TO CONCRETE RAMP.

40 SA

2 CC

3 CC

6 L5.00 MAINTENANCE STRIP - TYPE B.

1 CS

1 AR1

SEEDED LAWN (TYP.)

ALIGN MAINTENANCE STRIP EDGE WITH CORNER OF WALL. EXTEND MAINTENANCE STRIP EDGE PARALLEL TO BUILDING FACE.

CONSERVATION SEED MIX (TYP.)

7 TC

1 UM

1 UM

4 AS

3 AR

3 SA

27 SA

2 L5.00 GROUNDCOVER/ PERENNIALS CONTINUOUS PLANTING BED (TYP.)

1 L5.00 TREE PLANTING WITH TRUNK STABILIZATION (TYP.)

3 AC

Catch Basin

Tennis Courts

Assumed Location of Existing Water Main

Alternate Location for Alternate Water Main

Alternate Location for Alternate Water Main

Alternate Location for Alternate Water Main

Gas Easement

Gas Easement

Lamp Post

CL&P 236

CL&P 235

Guy Anchor

Metal Post

EMH

0 10 20 40'

SCALE: 1" = 20' - 0"

TAI SOO KIM

TAI SOO KIM PARTNERS ARCHITECTS
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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE

LANDSCAPE PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100% CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CONNECTICUT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH:

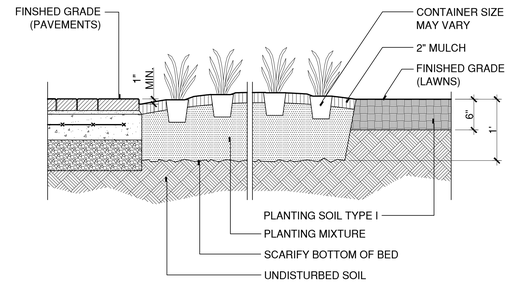
DATE: 09/10/2014
SCALE: 1" = 20-0'
DRAWN BY: EW
CHECKED BY: WR

L1.01

PLANT SCHEDULE						
CATEGORY	SYM	BOTANICAL NAME	COMMON NAME	QUANTITY	SIZE	COMMENTS
SPECIMEN TREE	AR1	ACER RUBRUM 'OCTOBER GLORY'	OCTOBER GLORY RED MAPLE	1	3 - 3 1/2" CAL.	B&B; SPECIMEN
	AS1	ACER SACCHARUM 'COMMEMORATION'	COMMEMORATION SUGAR MAPLE	2	3 - 3 1/2" CAL.	B&B; SPECIMEN
	QR	QUERCUS RUBRA	QUERCUS RUBRA	1	3 - 3 1/2" CAL.	B&B; SPECIMEN
	LT	LIRIODENDRON TULIPIFERA	TULIP TREE	3	3 - 3 1/2" CAL.	B&B; SPECIMEN
	UM	ULMUS X 'MORTON GLOSSY'	TRIUMPH ELM	2	3 - 3 1/2" CAL.	B&B; SPECIMEN
SHADE TREE	AR	ACER RUBRUM 'OCTOBER GLORY'	OCTOBER GLORY RED MAPLE	7	2 1/2 - 3" CAL.	B&B
	AS	ACER SACCHARUM 'COMMEMORATION'	COMMEMORATION SUGAR MAPLE	5	2 1/2 - 3" CAL.	B&B
	QP	QUERCUS PALUSTRIS	PIN OAK	6	2 1/2 - 3" CAL.	B&B
ORNAMENTAL TREE	AC	AMELANCHIER CANADENSIS	SERVICEBERRY	3	10-12'	B&B CLUMP
	BN	BETULA NIGRA 'DURA-HEAT'	DURA-HEAT RIVER BIRCH	5	12-14' HT.	B&B CLUMP
	CC	CERCIS CANADENSIS 'FOREST PANSY'	FOREST PANSY EASTERN REDBUD	5	2 - 2 1/2" CAL.	B&B
	CS	CORNUS X 'STELLAR PINK'	RUTGER'S STELLAR PINK	5	2 - 2 1/2" CAL.	B&B
EVERGREEN TREE	TC	TSUGA CANADENSIS	CANADIAN HEMLOCK	7	8-10' HT.	B&B
PERENNIAL/ GROUNDCOVER	SA	SESLERIA AUTUMNALIS	AUTUMN MOOR GRASS	151	#1 CONTAINER	30" O.C. SPACING

NOTES:

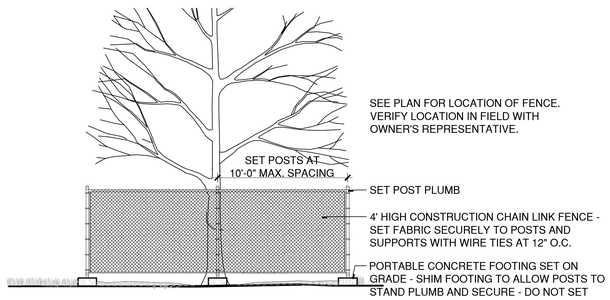
1. ALL EXTERIOR GROUND AREAS DISTURBED BY CONSTRUCTION AND NOT COVERED BY BUILDINGS, STRUCTURES, PAVING, CONTINUOUS PLANTING BEDS OR OTHER SITE IMPROVEMENTS SHALL BE GRADED, TOPSOILED WITH SOIL PREPARATION TO A DEPTH OF 6" AND SEEDED.
2. ALL MATERIALS SHALL CONFORM TO THE REQUIREMENTS OF THE AMERICAN STANDARD FOR NURSERY STOCK ANSI Z60.1-(CURRENT EDITION).
3. ALL TREE STAKING OR GUYING SHALL BE DONE IMMEDIATELY AFTER PLANTING, BUT IN NO INSTANCE MORE THAN 24 HOURS AFTER PLANTING. SEE STAKING/GUYING DETAIL. AT COMPLETION OF MAINTENANCE PERIOD REMOVE ALL STAKES, FLAGS, GUYS, TREE WRAP, AND ANCHORS.
4. MULCH ALL NEW SHRUB BEDS AND PLANT PITS TO ACHIEVE A 3" DEPTH (AFTER SETTLEMENT). MULCH ALL GROUNDCOVER BEDS TO ACHIEVE A 2" DEPTH (AFTER SETTLEMENT). MULCH FOR SAUCERS AND PLANTING AREAS TO BE A DOUBLE SHREDDED BARK MULCH.
5. ALL LAWN AND PLANTING AREA SOIL PREPARATION SHALL BE FERTILIZED AND AMENDED ACCORDING TO RECOMMENDATIONS OF A SOIL ANALYSIS PROVIDED BY AN APPROVED SOIL TESTING LABORATORY, AND APPROVED BY THE LANDSCAPE ARCHITECT.
6. FOR TREE AND SHRUB PLANTING REQUIREMENTS SEE TREE PLANTING AND SHRUB PLANTING DETAILS.
7. SITE LIGHTING IS SHOWN FOR COORDINATION PURPOSES ONLY. SEE SITE IMPROVEMENTS PLAN FOR SPECIFIC SITE LIGHTING LOCATIONS.SEE SITE UTILITIES AND SITE LIGHTING AND POWER PLANS FOR ADDITIONAL INFORMATION.



NOTES:
1. SET CROWN OF ROOT BALL LEVEL WITH FINISH GRADE.
2. MAINTAIN MINIMUM OF 4" PLANTING SOIL BELOW EACH INDIVIDUAL PLANT.
3. MULCH ENTIRE AREA OF GROUNDCOVER, PERENNIALS OR ANNUALS.
4. MULCH CAREFULLY AROUND EACH PLANT. DO NOT COVER CROWNS OF PLANTS WITH MULCH.

2 GROUNDCOVERS / PERENNIALS CONTINUOUS PLANTING BED

SCALE: 1"=1' X:\CADSTANDARD\DETAILS\329300-C.DWG



7 TYPICAL TREE PROTECTION

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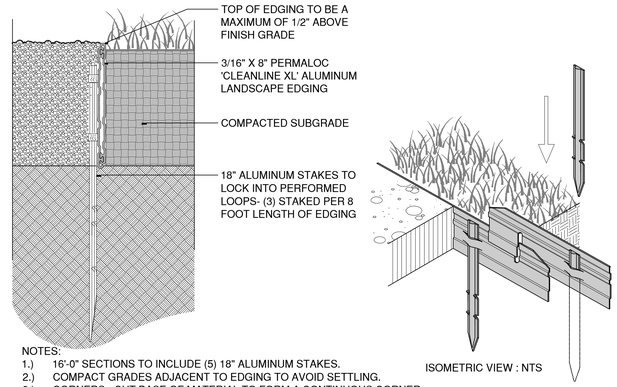
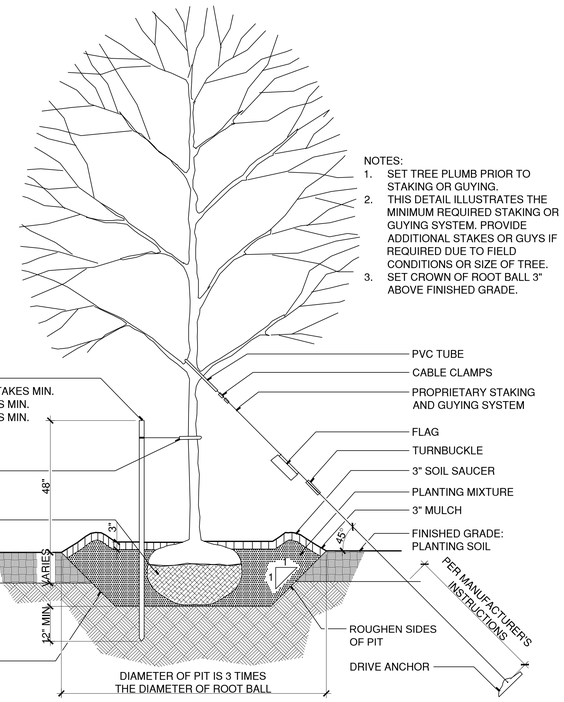


NOTES:
1.) 16'-0" SECTIONS TO INCLUDE (5) 18" ALUMINUM STAKES.
2.) COMPACT GRADES ADJACENT TO EDGING TO AVOID SETTLING.
3.) CORNERS - CUT BASE OF MATERIAL TO FORM A CONTINUOUS CORNER.
4.) PERMALOC 'CLEANLINE XL' ALUMINUM LANDSCAPE EDGING AS MANUFACTURED BY PERMALOC CORPORATION, HOLLAND, MI., 1-800-356-9660. OR AN APPROVED EQUAL.

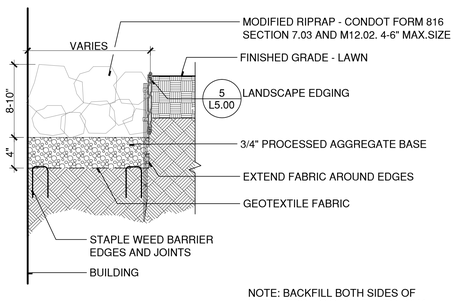
5 LANDSCAPE EDGING

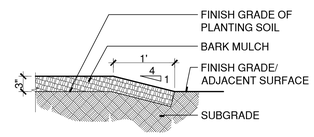
SCALE: 3"=1' X:\CADSTANDARD\DETAILS\055000-A.DWG



1 TREE PLANTING WITH TRUNK STABILIZATION

SCALE: 1/2"=1' X:\CADSTANDARD\DETAILS\329300-A.DWG





4 BARK MULCH SURFACING

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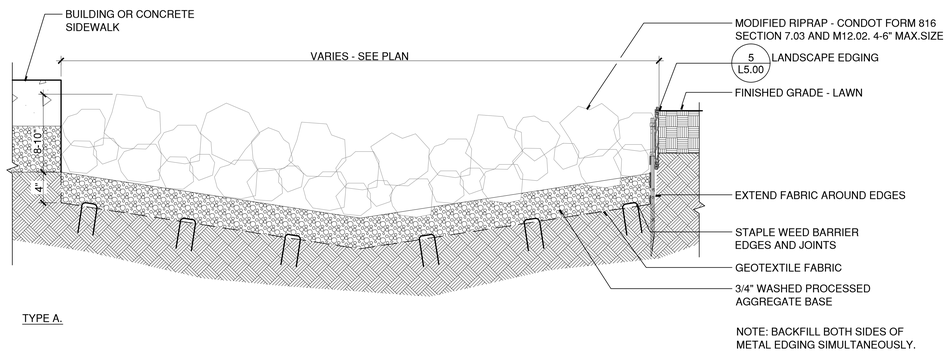
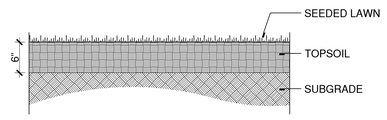


6 MAINTENANCE STRIP

SCALE: 1 1/2"=1' W:\2011015\DETAILS\A15\321500-C.DWG



3 SEEDED LAWN

SCALE: 1"=1' X:\CADSTANDARD\DETAILS\329200-C.DWG

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UNIVERSITY OF CONNECTICUT
STORRS, CT

TITLE: LANDSCAPE DETAILS

ISSUE DATES

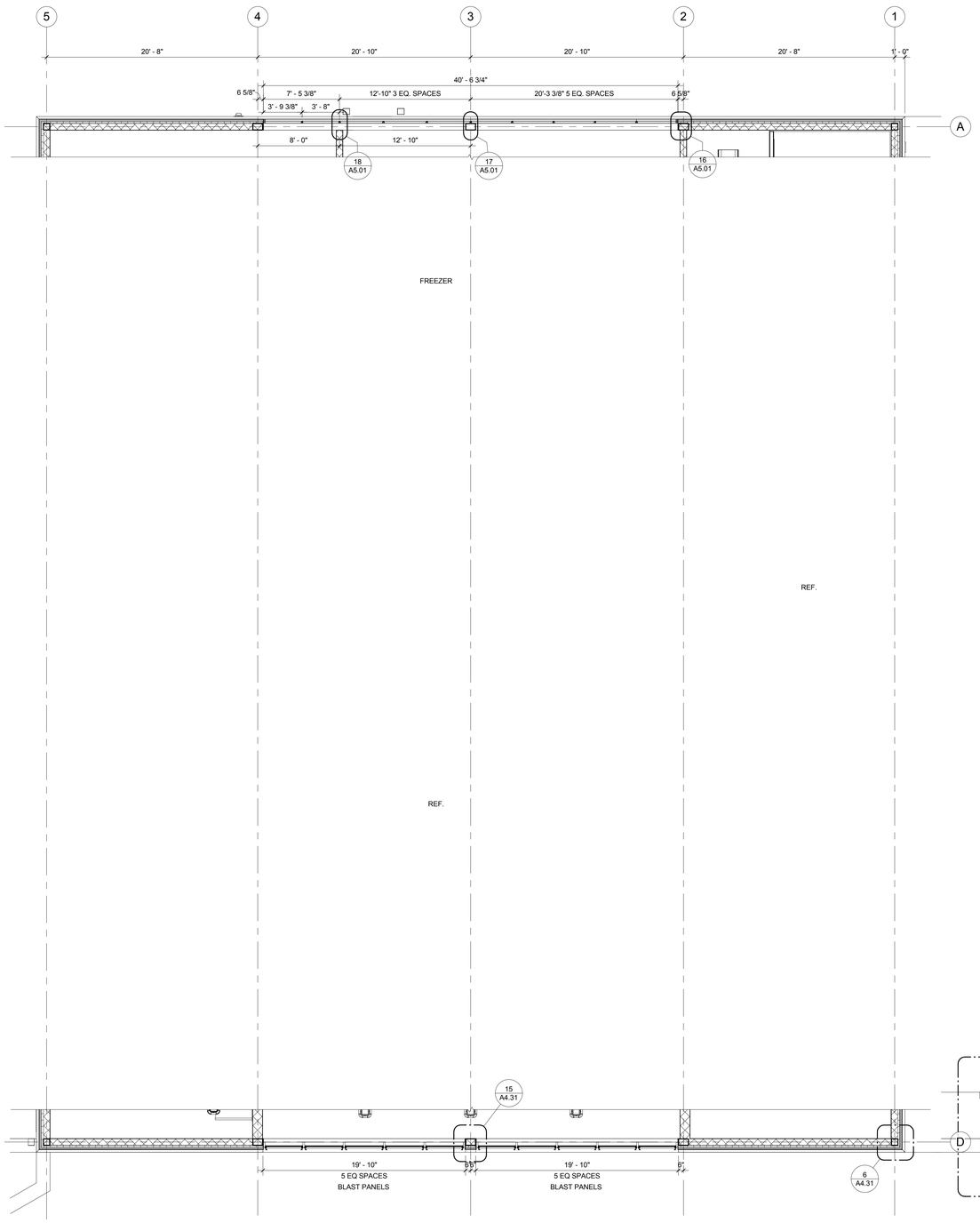
NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2014	90% CD
4	4/6/2015	100% CD

PROJECT: MAIN ACCUMULATION AREA
UNIVERSITY OF CONNECTICUT
STORRS, CONNECTICUT

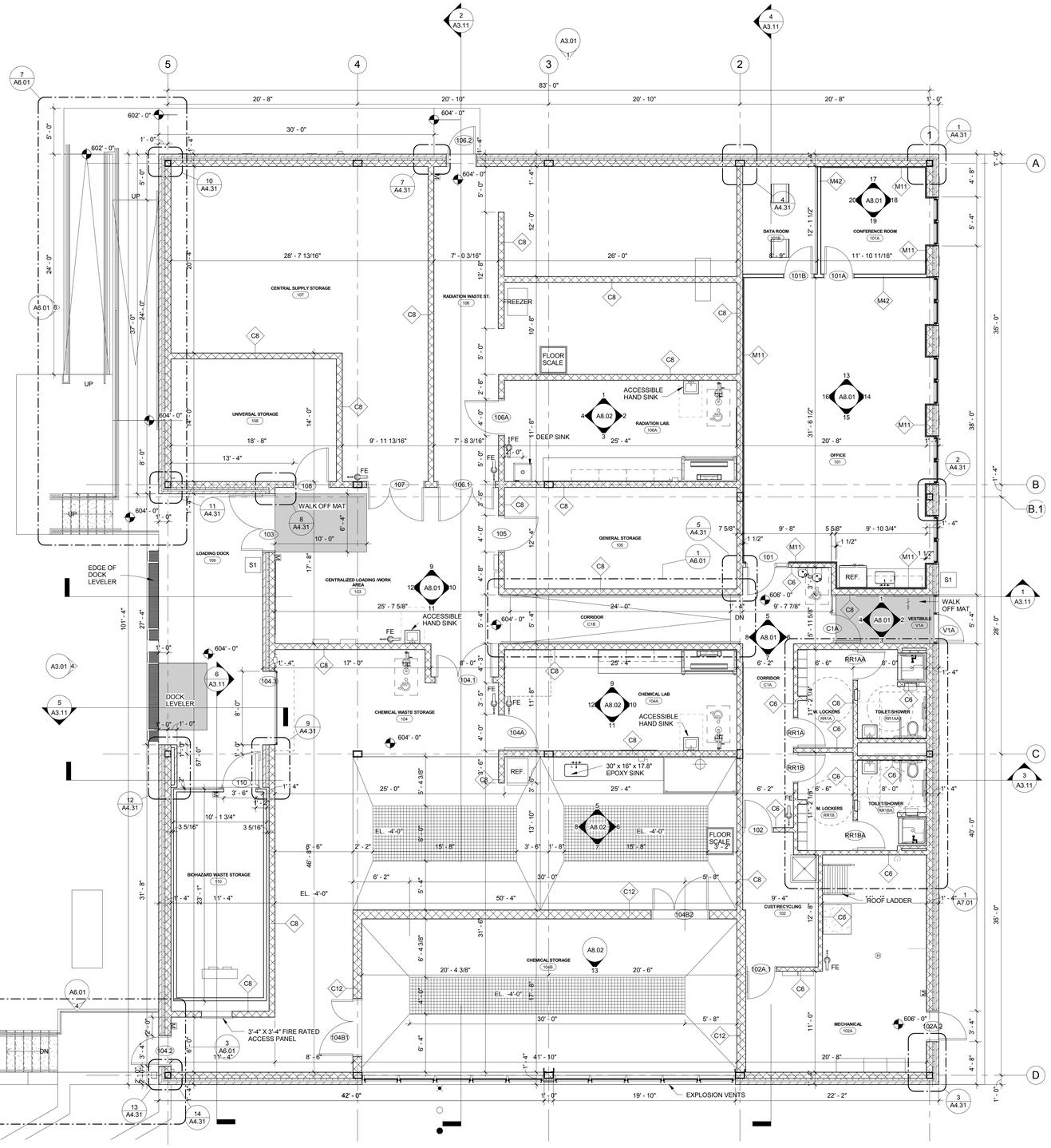
STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH:

DATE: 09/10/2014
SCALE: AS NOTED
DRAWN BY: EW
CHECKED BY: WR

L5.00



2 CLERESTORY PLAN
3/16" = 1'-0"



1 FIRST FLOOR PLAN
3/16" = 1'-0"

SIGNAGE KEY

NOTE: LOCATIONS SHOWN FOR INFORMATION ONLY. SIGNAGE SHOWN ON THIS DRAWING WILL BE PROVIDED BY THE OWNER.

S1 - LEED IEQp2 ENVIRONMENTAL TOBACCO SMOKE CONTROL

TEXT: "NO SMOKING WITHIN THE BUILDING OR WITHIN 25 FEET OF THE BUILDING"

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FAX: (860) 249-0695

UNIVERSITY OF CONNECTICUT

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TITLE
FIRST FLOOR PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\oct\Documents\140202 UCONN_MAA - Central - CD - 2014_oct.rvt

DATE: 9/10/2014
SCALE: 3/16" = 1'-0"
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CHECKED BY: BH

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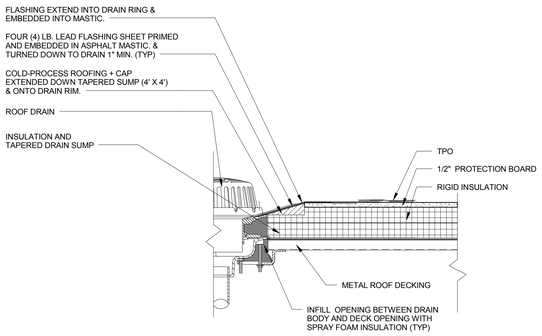
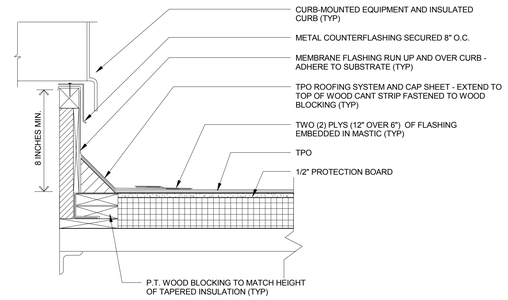


5 ROOF DRAIN DETAIL - TYPICAL
1 1/2" = 1'-0"



2 MECHANICAL CURB FLASHING DETAIL 1 - TYPICAL
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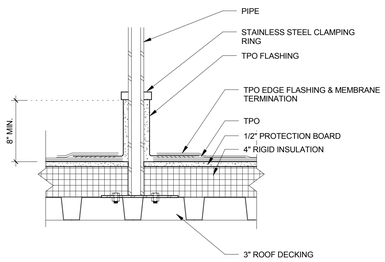

6 PIPE FLASHING DETAIL - TYPICAL
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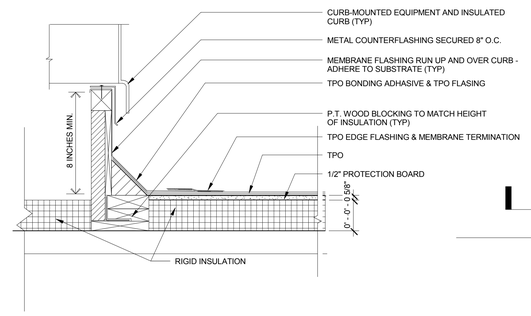

3 MECHANICAL CURB FLASHING DETAIL 2 - TYPICAL
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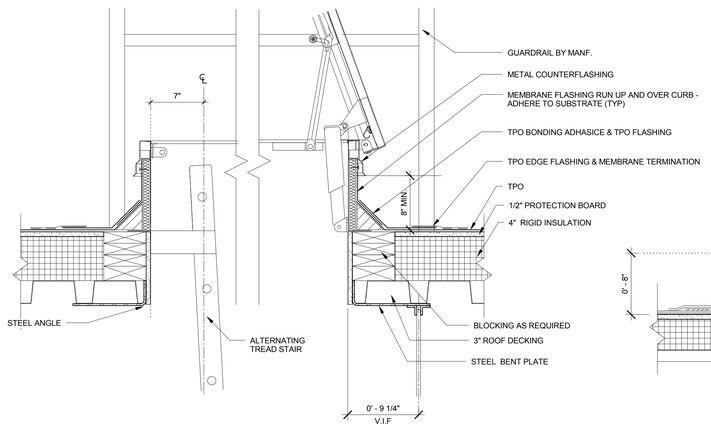
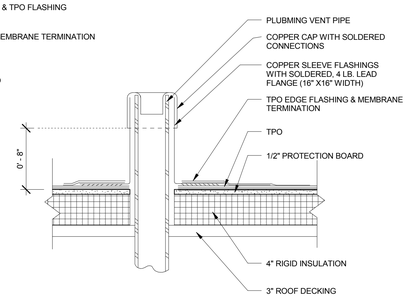
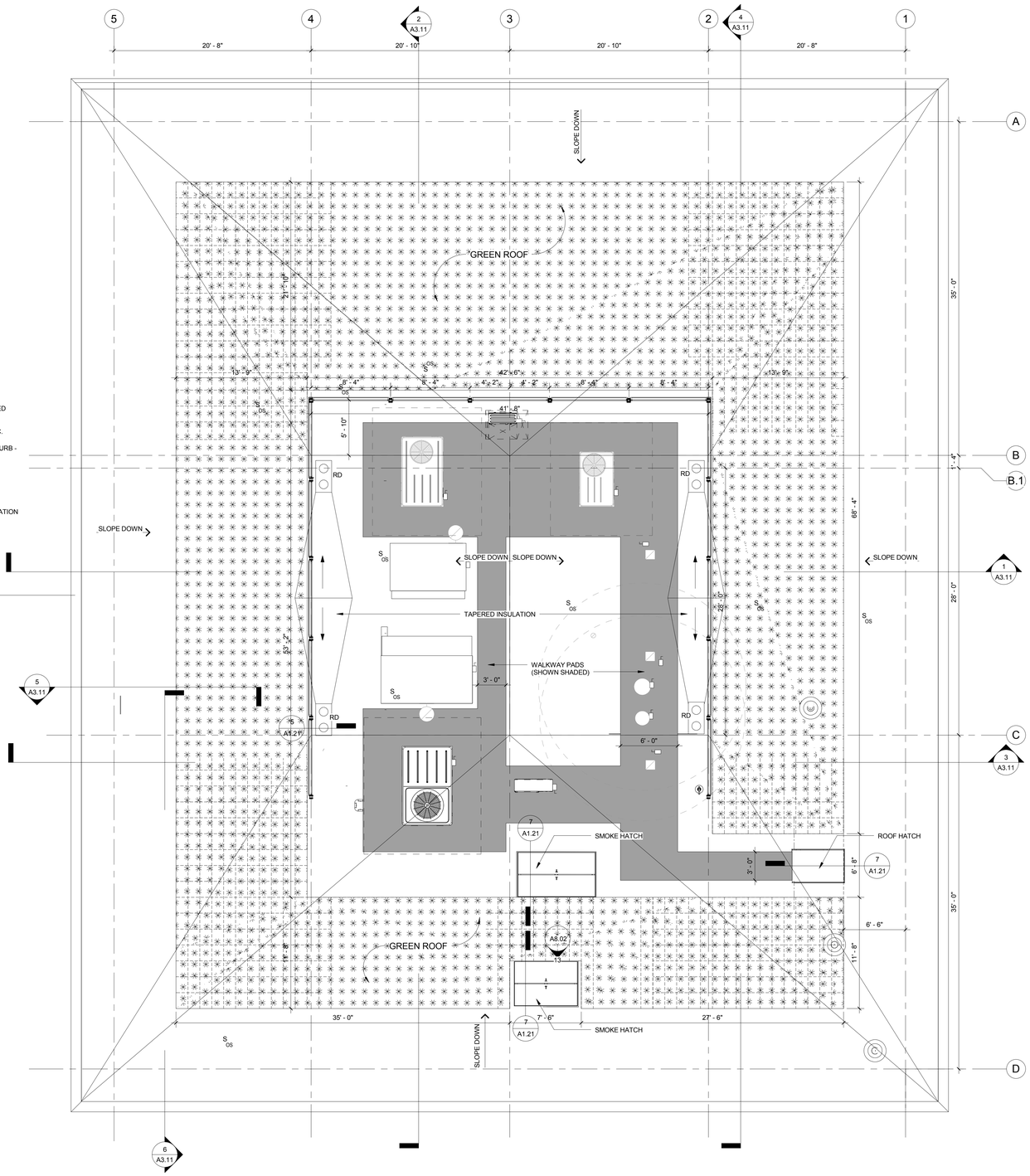


7 ROOF HATCH/SMOKE VENT DETAIL - TYPICAL
1 1/2" = 1'-0"



4 VENT PIPE FLASHING DETAIL - TYPICAL
1 1/2" = 1'-0"



1 ROOF PLAN
3/16" = 1'-0"

TYPICAL ROOF SYSTEM:

- TPO MEMBRANE
- 1/2" COVER BOARD
- 2 LAYERS, 2" THICK POLYISOCYANURATE INSULATION (R=20)
- METAL ROOF DECK

NOTE:
PRE-GROWN VEGETATIVE MODULAR TRAY SYSTEM WHERE SHOWN

TAI SOO KIM PARTNERS ARCHITECTS
146 WYLLYS STREET
HARTFORD, CONNECTICUT
TEL: (860) 547-1970
FAX: (860) 249-0695

UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
ROOF PLAN & DETAILS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
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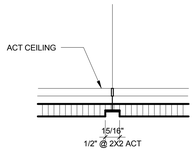
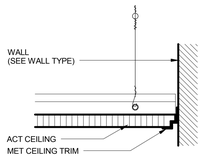


2 ACT CEILING (TYP.)
3" = 1'-0"



3 ACT CEILING AT WALL (TYP.)
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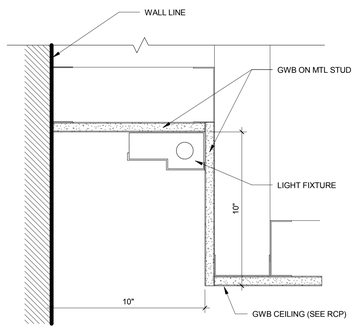

4 LIGHT POCKET AT TOILET
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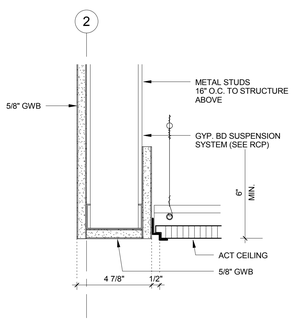
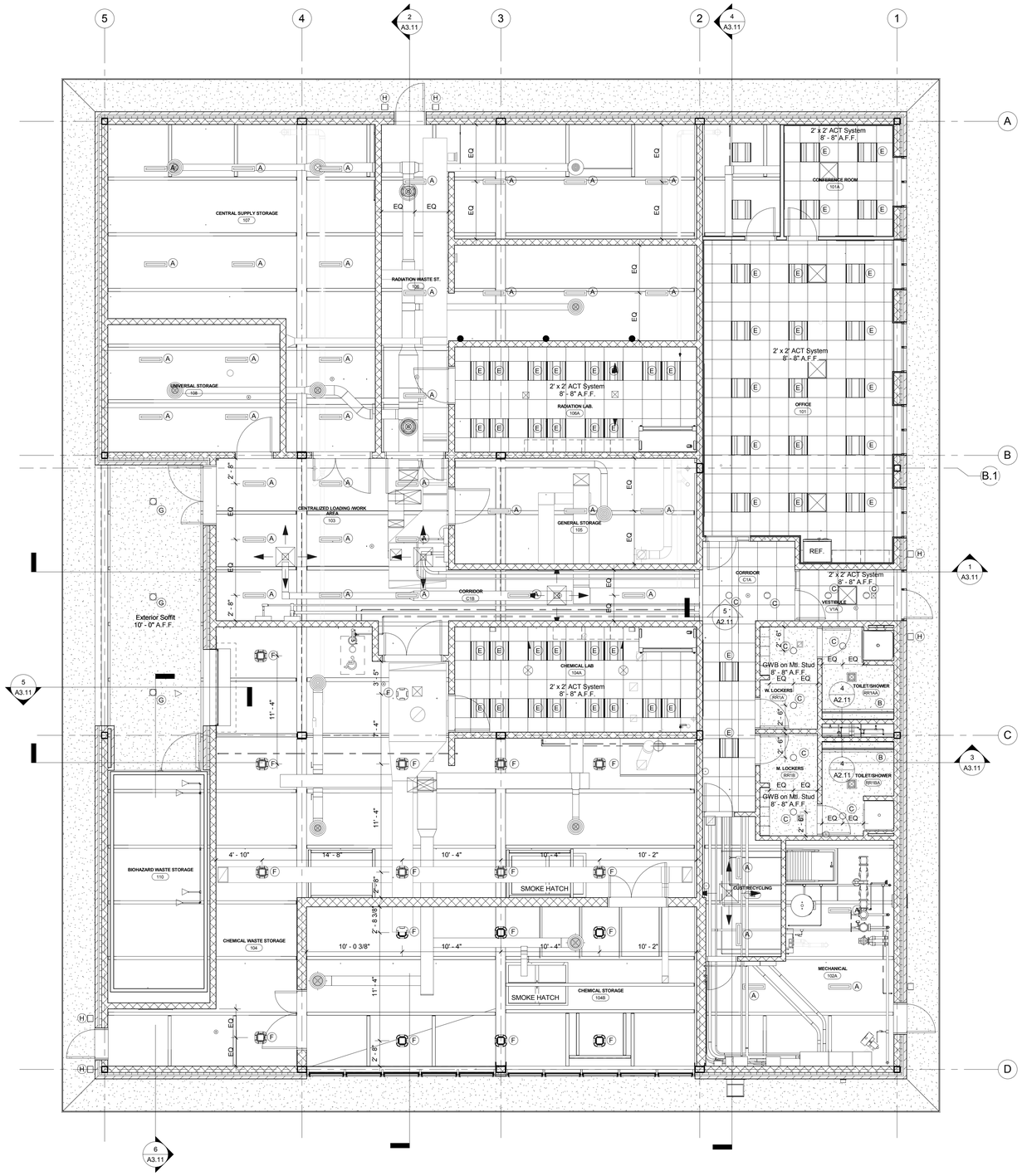


5 GWB SOFFIT DETAIL
3" = 1'-0"



1 FIRST FLOOR RCP
3/16" = 1'-0"

TAI SOO KIM PARTNERS ARCHITECTS
146 WYLLYS STREET
HARTFORD, CONNECTICUT
TEL: (860) 547-1010
FAX: (860) 249-0695

UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
REFLECTED CEILING PLAN
& DETAILS

ISSUE DATES		
NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\oct\Documents\140202 UCONN_MAA - Central - CD - 2014_oct.rvt

DATE: 9/10/2014
SCALE: As indicated
DRAWN BY: OCT
CHECKED BY: BH

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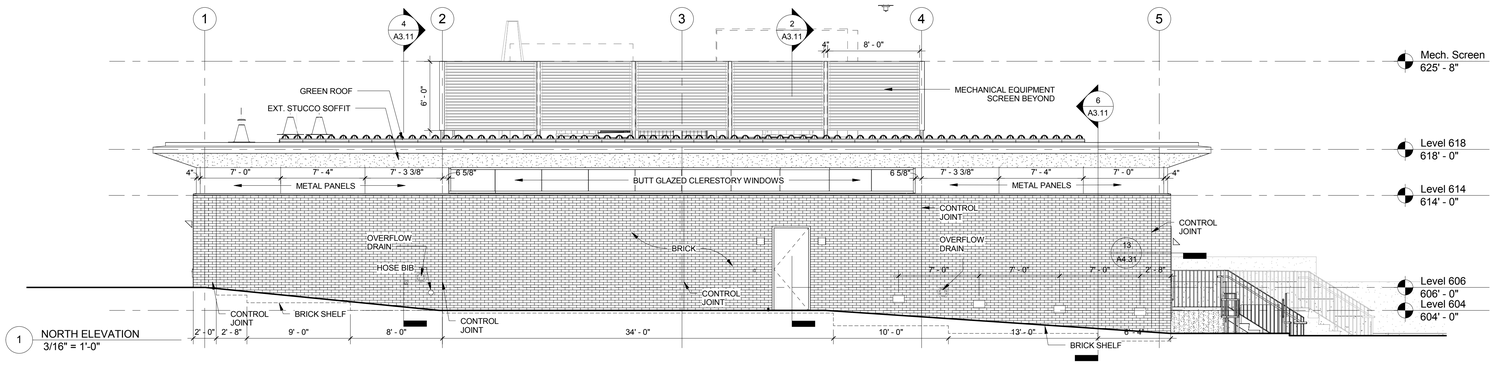
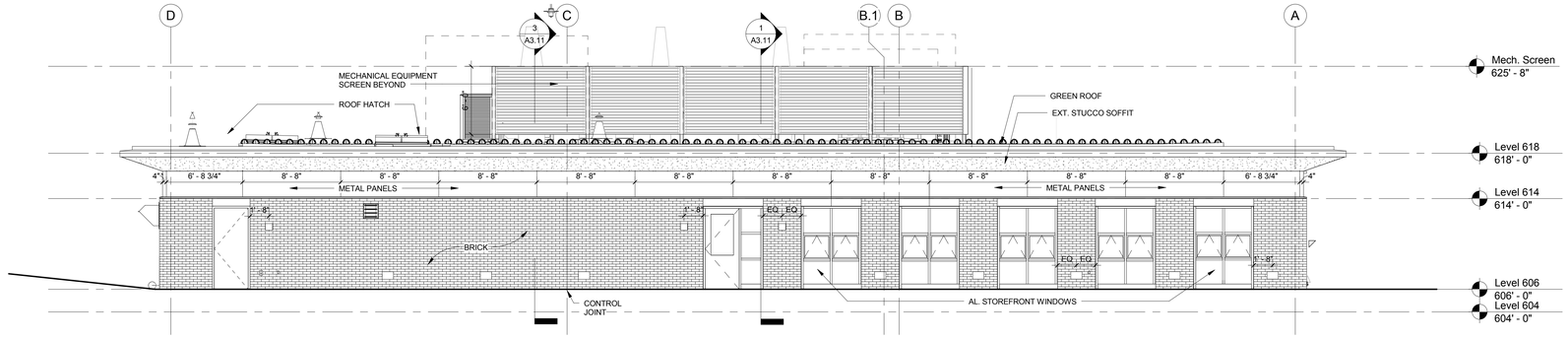
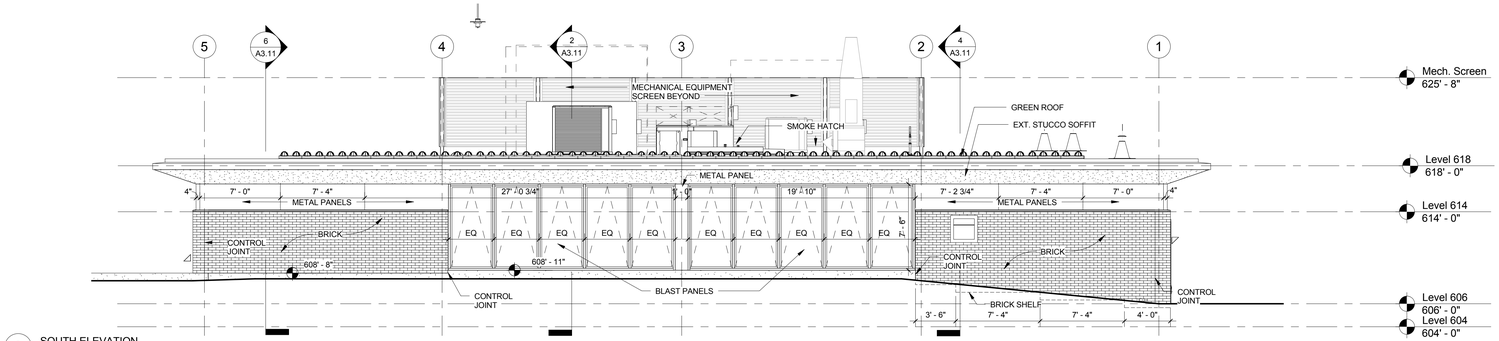


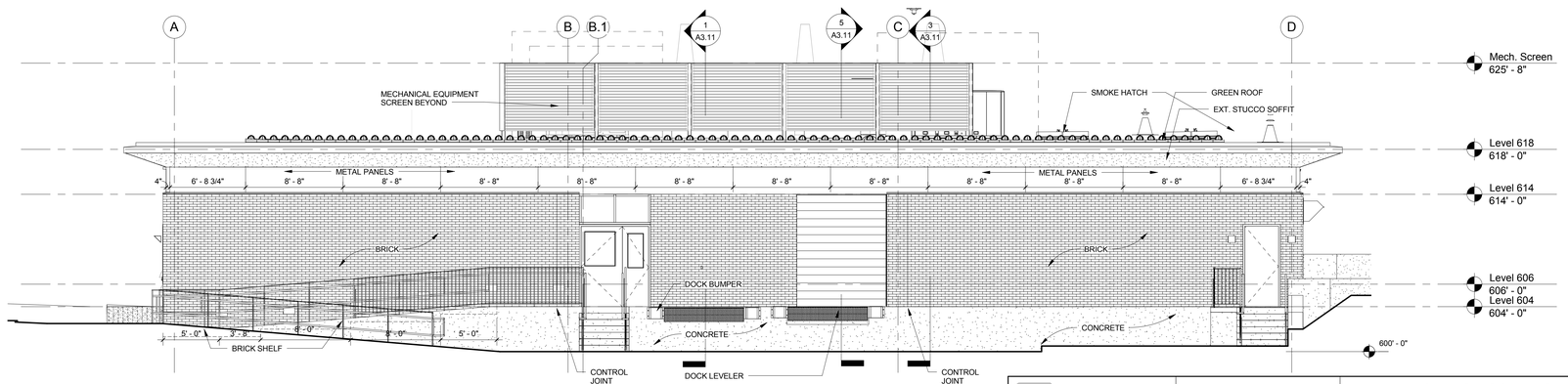
1 NORTH ELEVATION
3/16" = 1'-0"



2 EAST ELEVATION
3/16" = 1'-0"



3 SOUTH ELEVATION
3/16" = 1'-0"



4 WEST ELEVATION
3/16" = 1'-0"

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
ELEVATIONS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA
UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\oct\Documents\140202 UCONN_MAA - Central - CD - 2014_oct.rvt

DATE: 9/10/2014
SCALE: 3/16" = 1'-0"
DRAWN BY: OCT
CHECKED BY: BH

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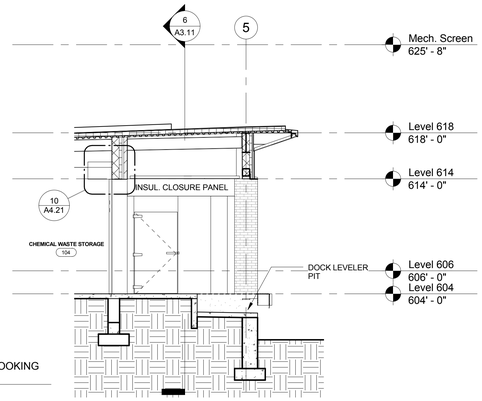
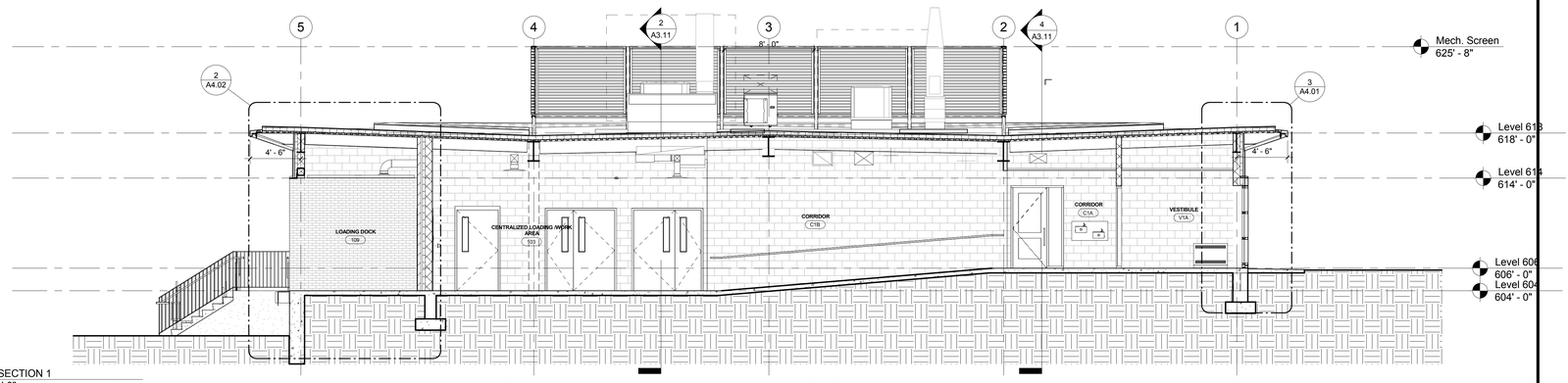
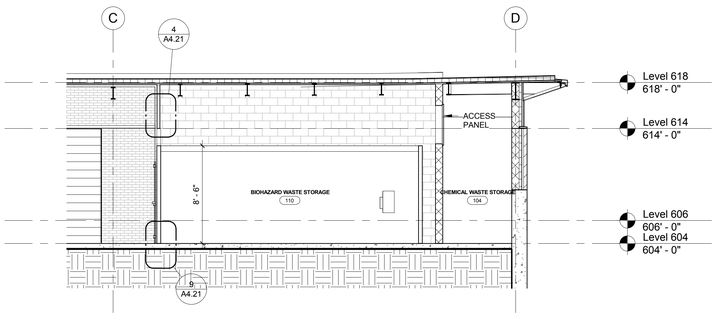


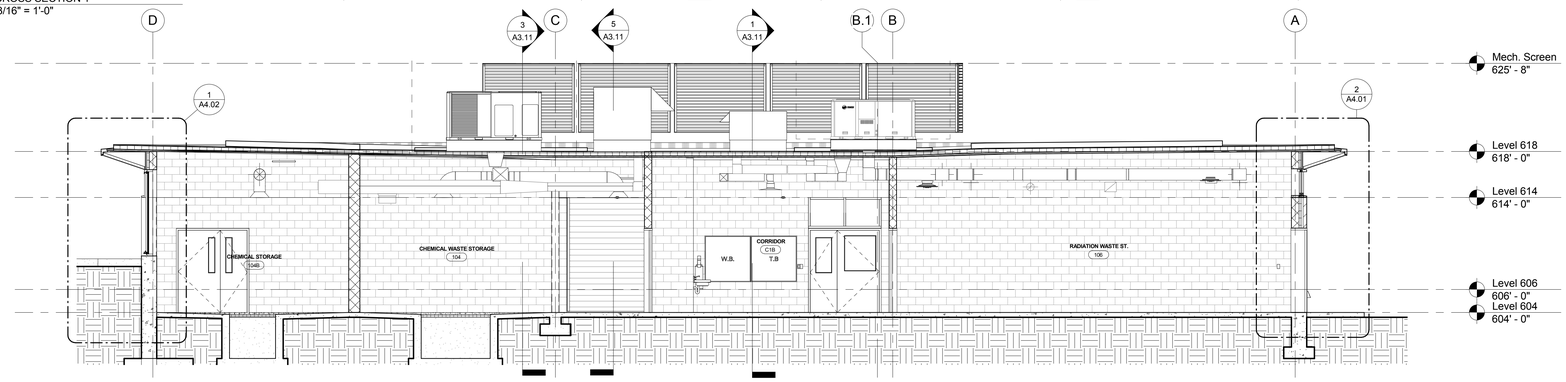
5 SECTION AT LOADING DOCK LOOKING SOUTH
3/16" = 1'-0"



1 CROSS SECTION 1
3/16" = 1'-0"



6 SECTION AT WALK IN COOLER
3/16" = 1'-0"



2 CROSS SECTION 2
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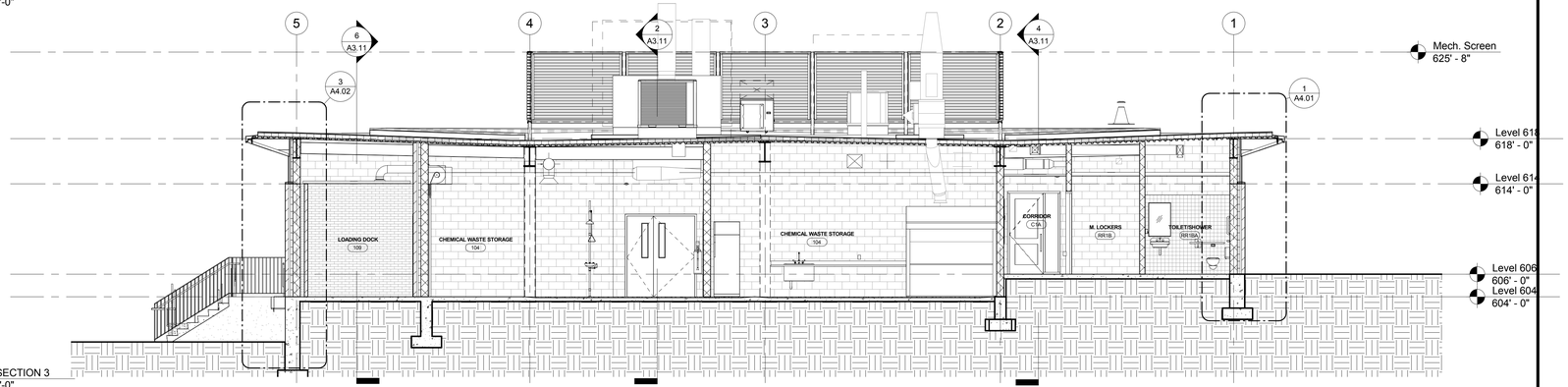
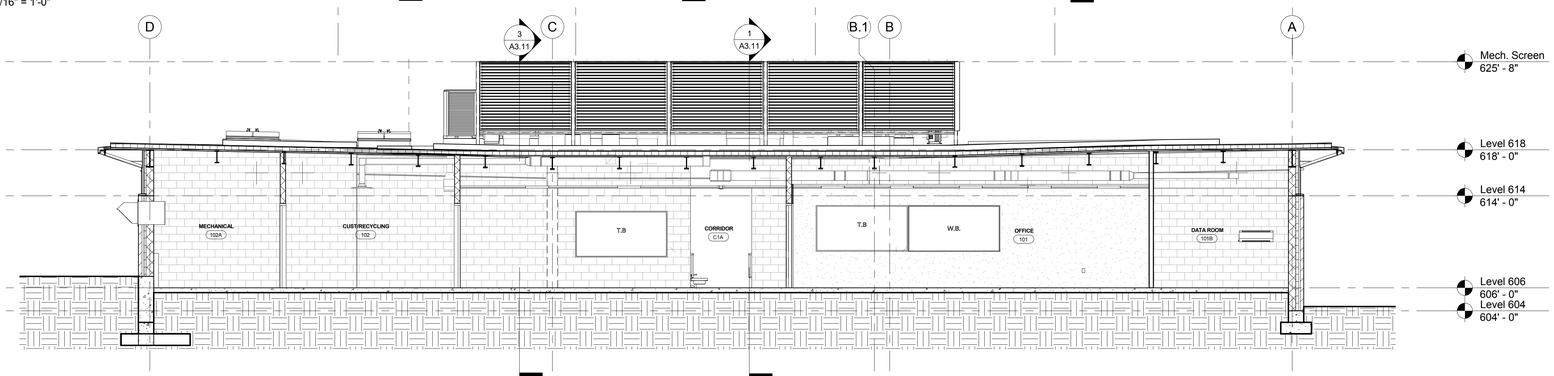


3 CROSS SECTION 3
3/16" = 1'-0"



4 CROSS SECTION 4
3/16" = 1'-0"

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146 WYLLYS STREET
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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
BUILDING SECTIONS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA
UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\oct\Documents\140202 UCONN_MAA - Central - CD - 2014_oct.rvt

DATE: 9/10/2014
SCALE: 3/16" = 1'-0"
DRAWN BY: OCT
CHECKED BY: BH

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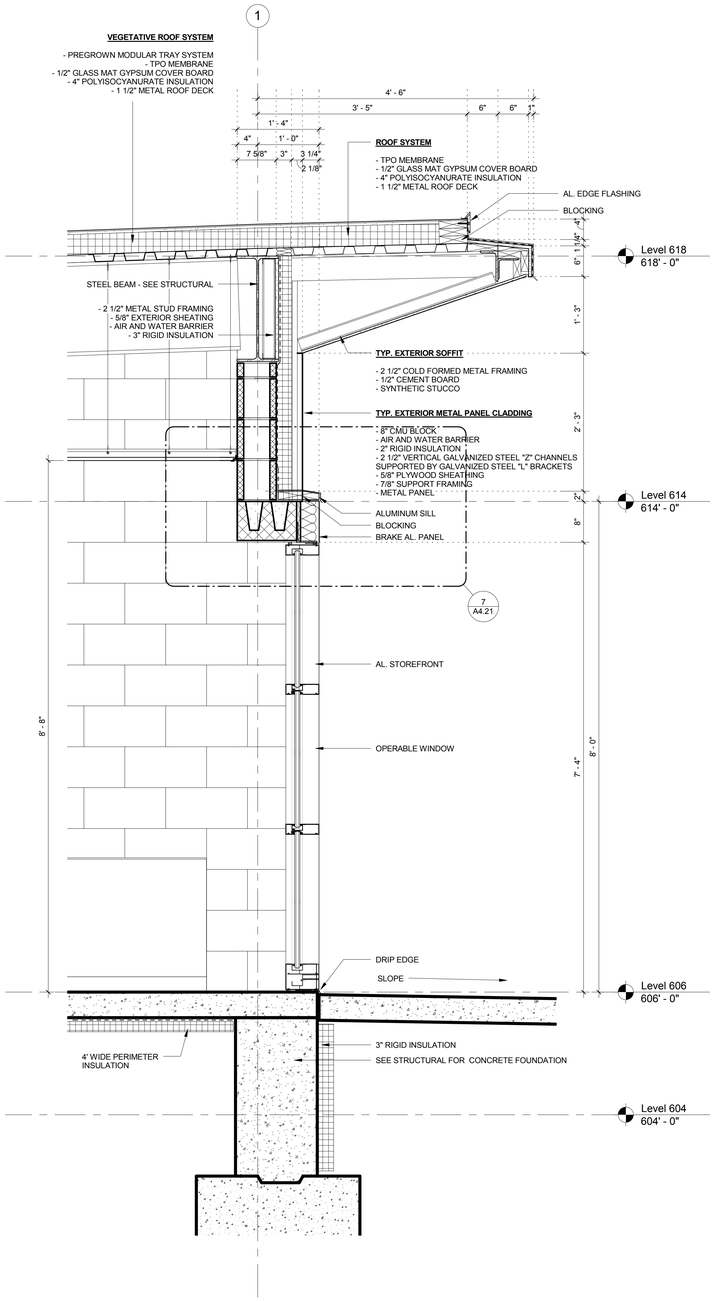
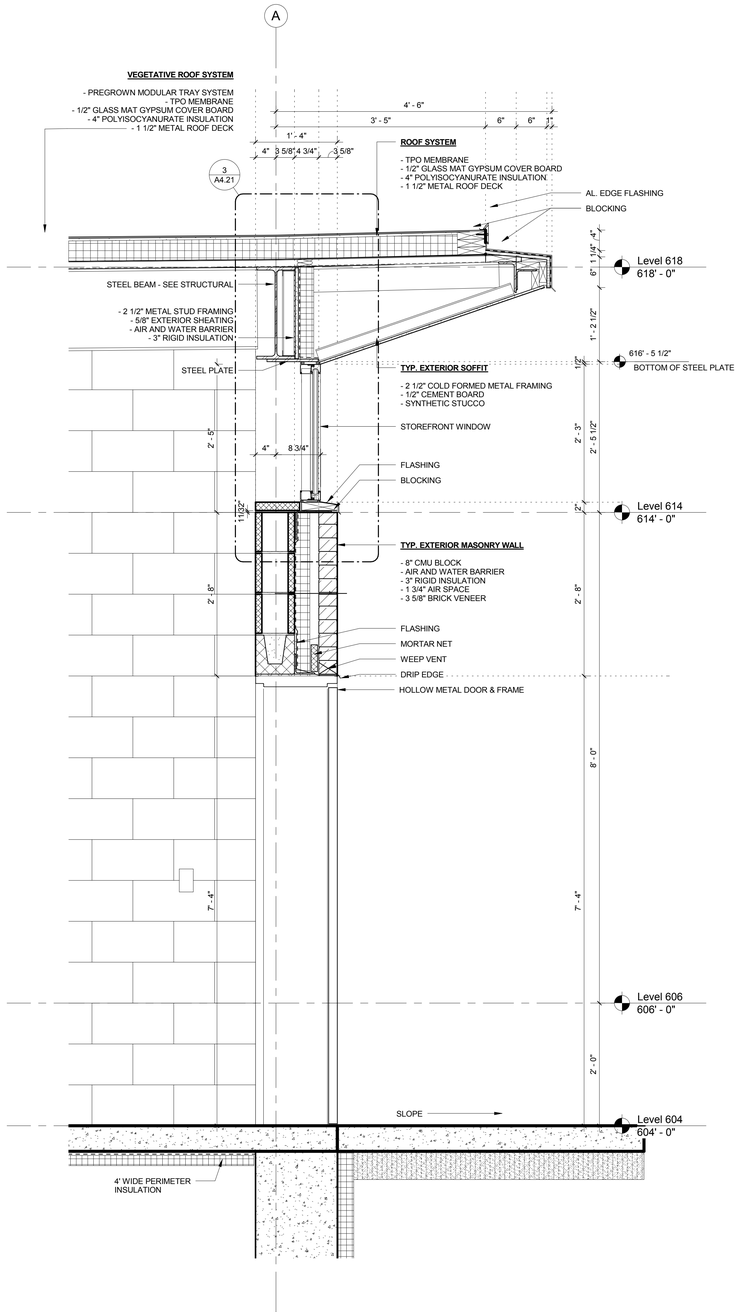
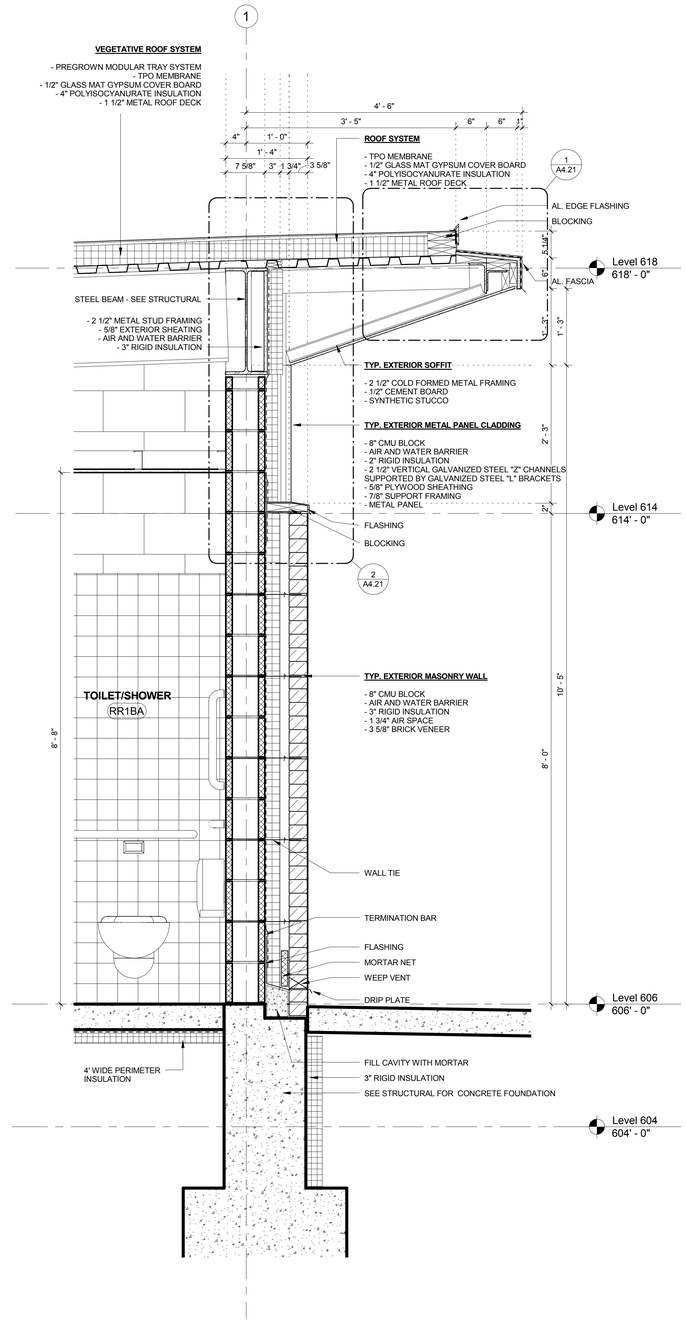


3 WALL SECTION 3
1" = 1'-0"



2 WALL SECTION 2
1" = 1'-0"



1 WALL SECTION 1
1" = 1'-0"

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
WALL SECTIONS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202

FILE PATH
C:\Users\oc\Documents\140202 UCONN_MAA - Central - CD - 2014_oc.rvt

DATE: 9/10/2014
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DRAWN BY: OCT
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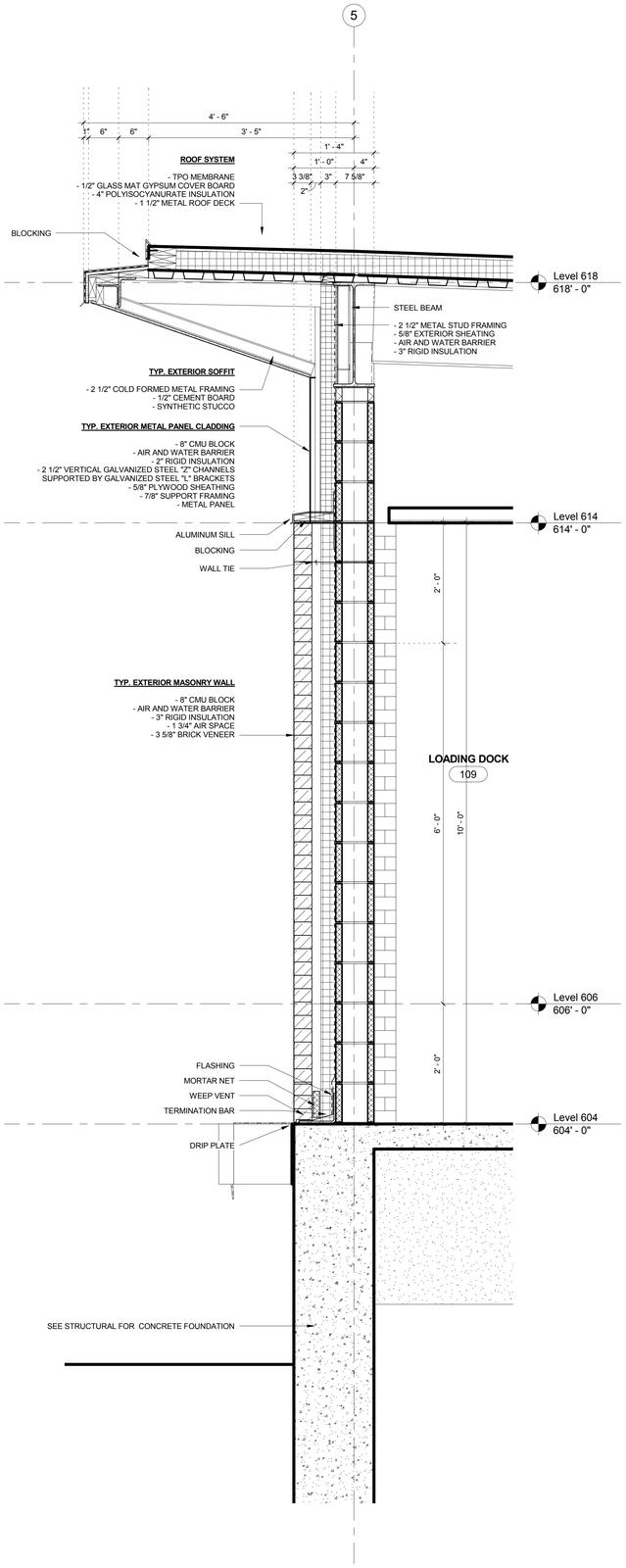
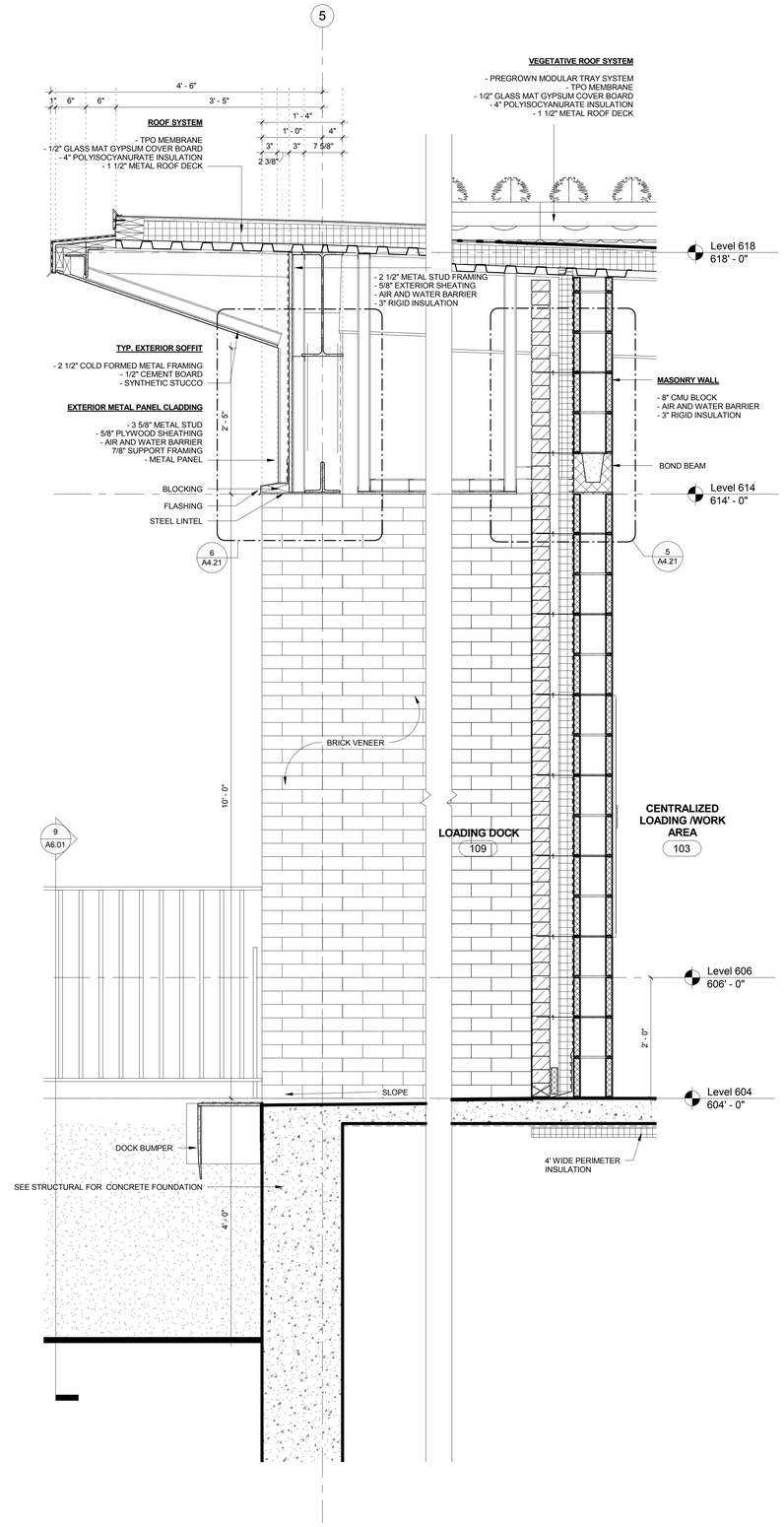


3 WALL SECTION 6
1" = 1'-0"



2 WALL SECTION 5
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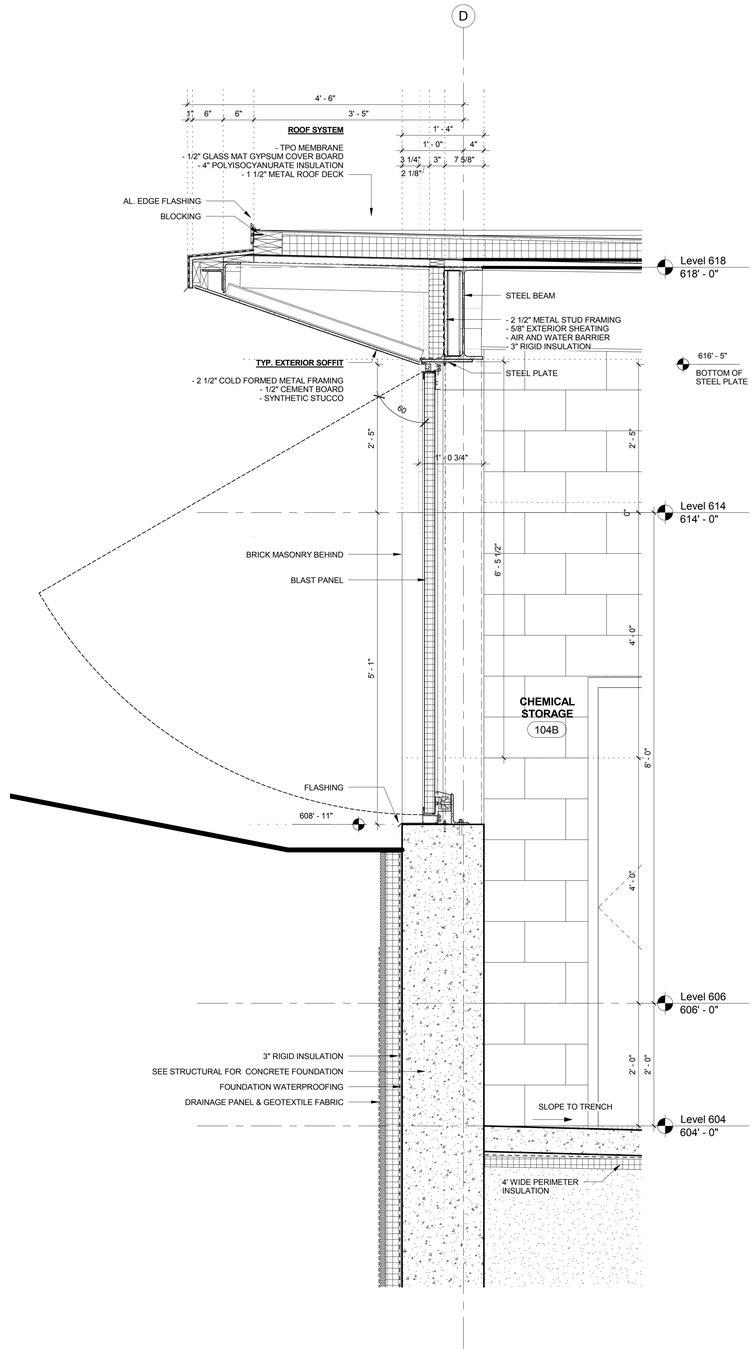

1 WALL SECTION 4
1" = 1'-0"

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
WALL SECTIONS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\oc\Documents\140202 UCONN_MAA - Central - CD - 2014_oc.rvt

DATE: 9/10/2014
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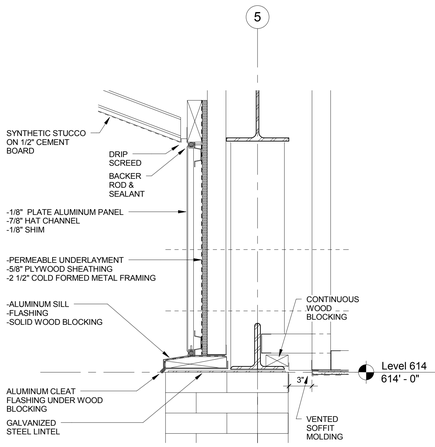
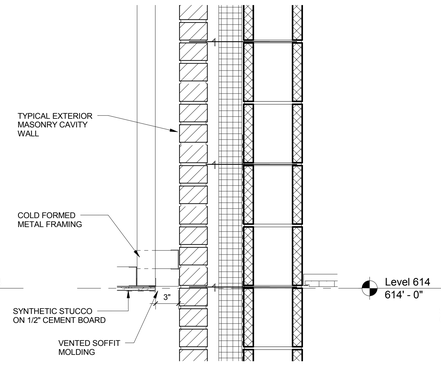
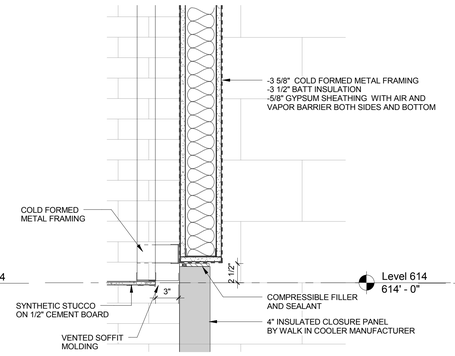


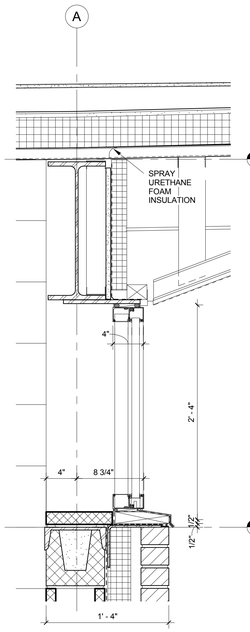
6 SECTION DETAIL ABOVE LOADING
1 1/2" = 1'-0"



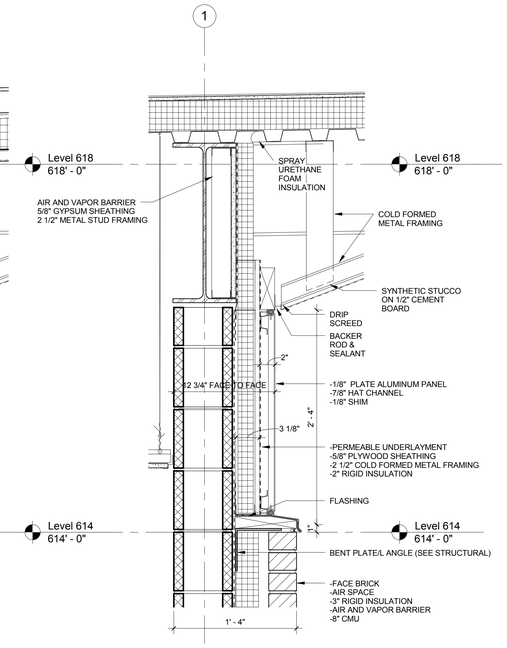
5 SECTION DETAIL ABOVE LOADING DOCK
1 1/2" = 1'-0"



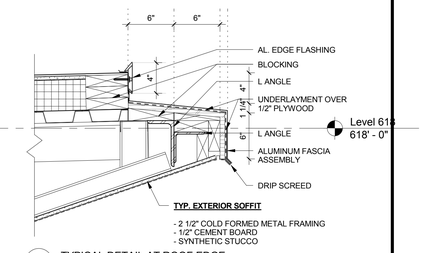
4 DETAIL AT WALK IN SOFFIT
1 1/2" = 1'-0"



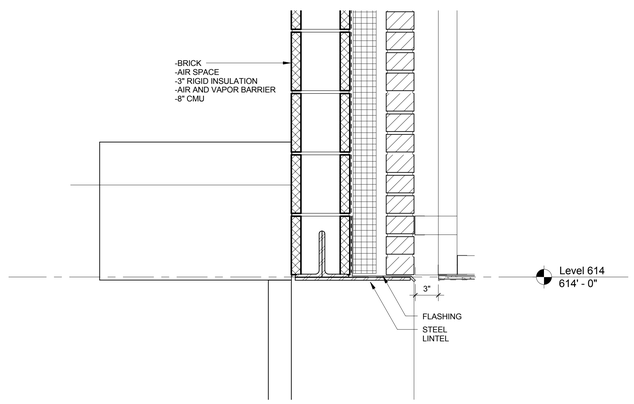
3 TYPICAL DETAIL - TOP OF WALL AT WINDOW
1 1/2" = 1'-0"



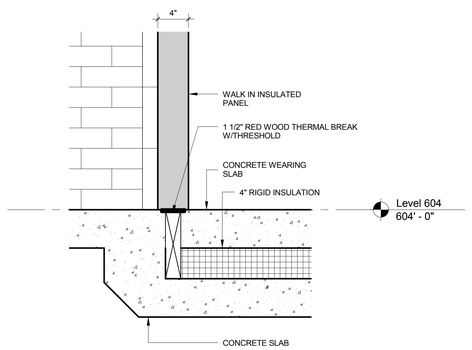
2 TYPICAL DETAIL - TOP OF WALL AT METAL PANEL
1 1/2" = 1'-0"



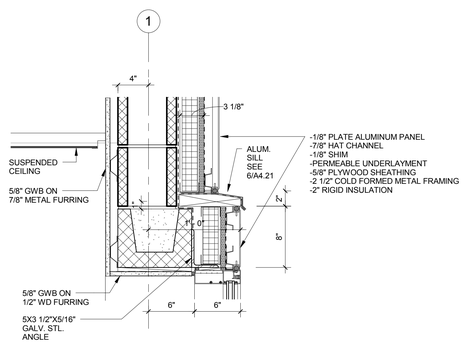
1 TYPICAL DETAIL AT ROOF EDGE
1 1/2" = 1'-0"



10 SECTION DETAIL AT ROLL UP DOOR
1 1/2" = 1'-0"



9 SILL DETAIL AT WALK IN COOLER
1 1/2" = 1'-0"



7 SECTION DETAIL AT WINDOW HEAD
1 1/2" = 1'-0"

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
SECTION DETAILS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 90187
OFFICE PROJECT NO: 140202
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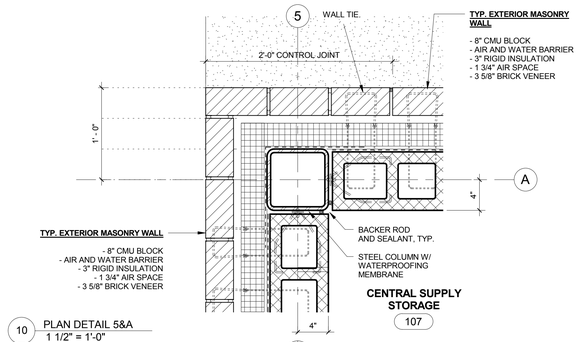
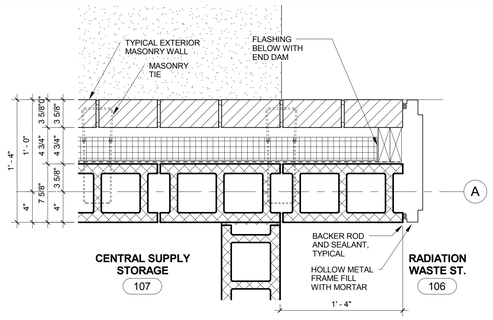
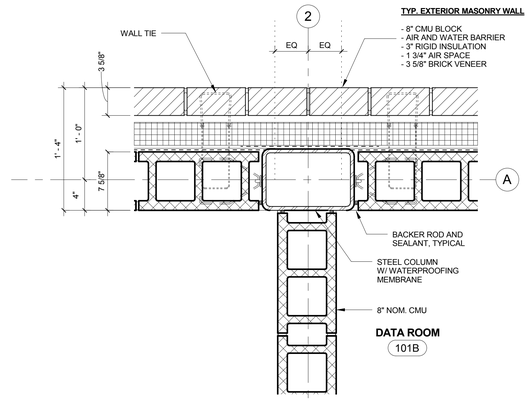


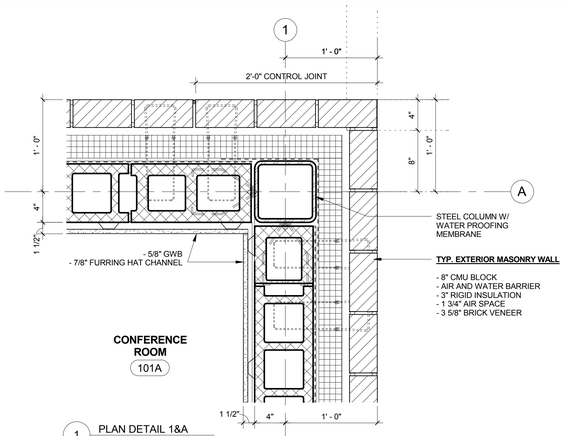
10 PLAN DETAIL 5&A
1 1/2" = 1'-0"



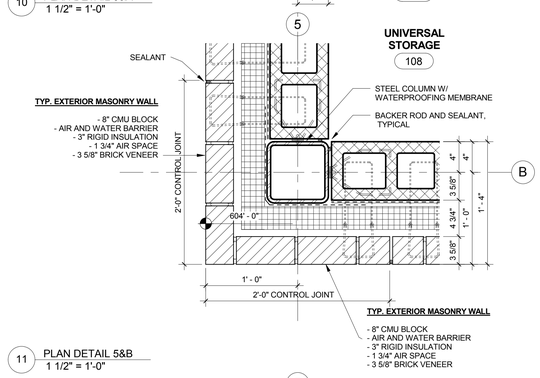
7 PLAN DETAIL 3-4&A
1 1/2" = 1'-0"



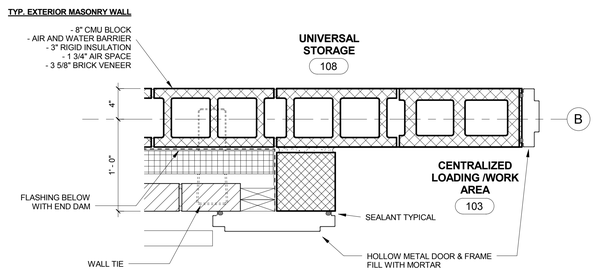
4 PLAN DETAIL 2&A
1 1/2" = 1'-0"



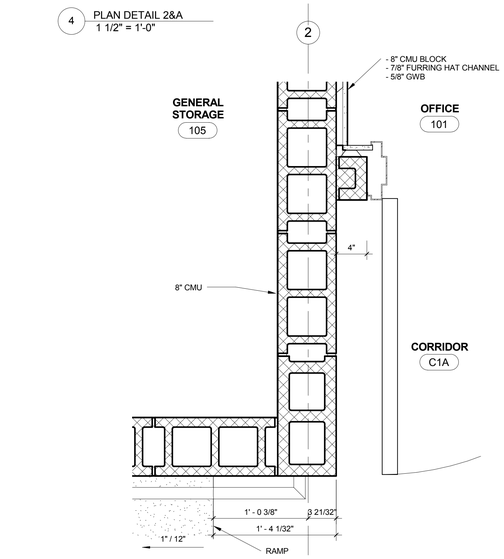
1 PLAN DETAIL 1&A
1 1/2" = 1'-0"



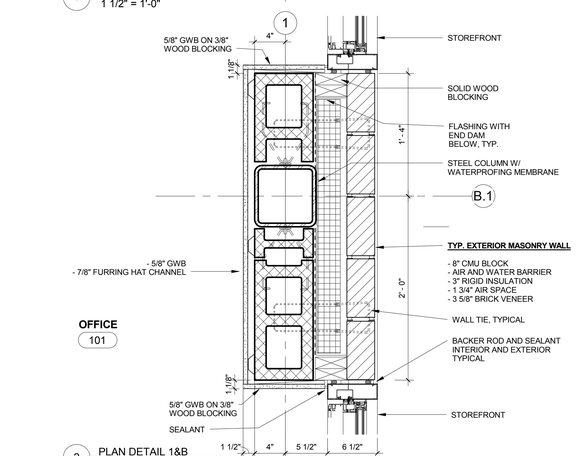
11 PLAN DETAIL 5&B
1 1/2" = 1'-0"



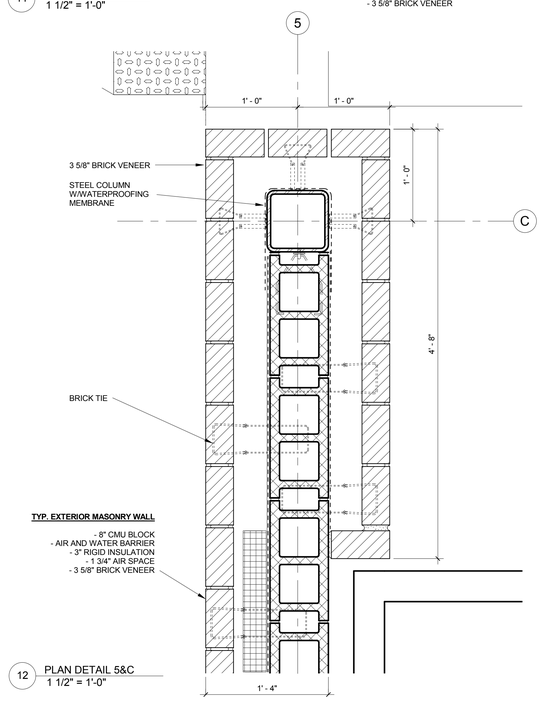
8 PLAN DETAIL 4-5&B
1 1/2" = 1'-0"



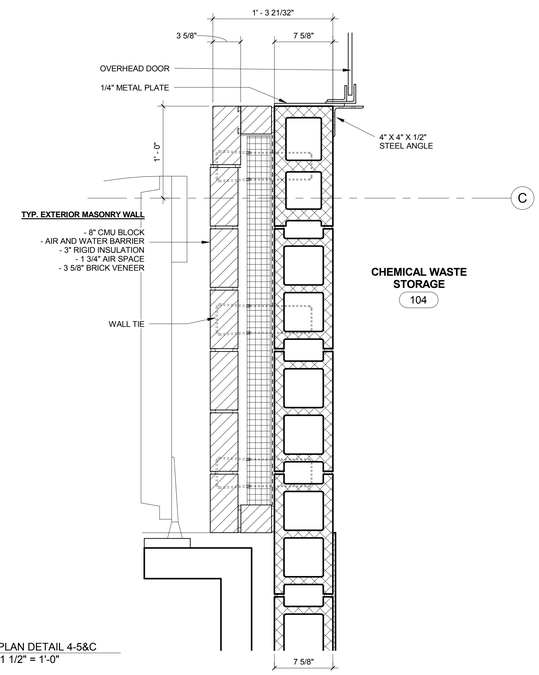
5 PLAN DETAIL 2&B
1 1/2" = 1'-0"



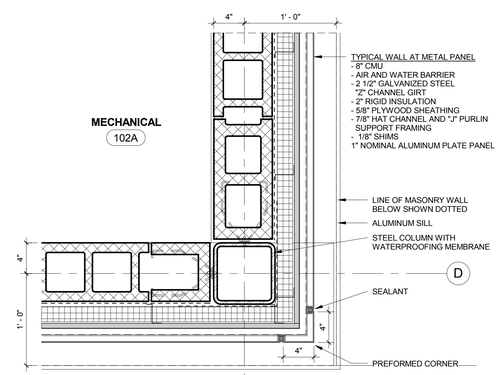
2 PLAN DETAIL 1&B
1 1/2" = 1'-0"



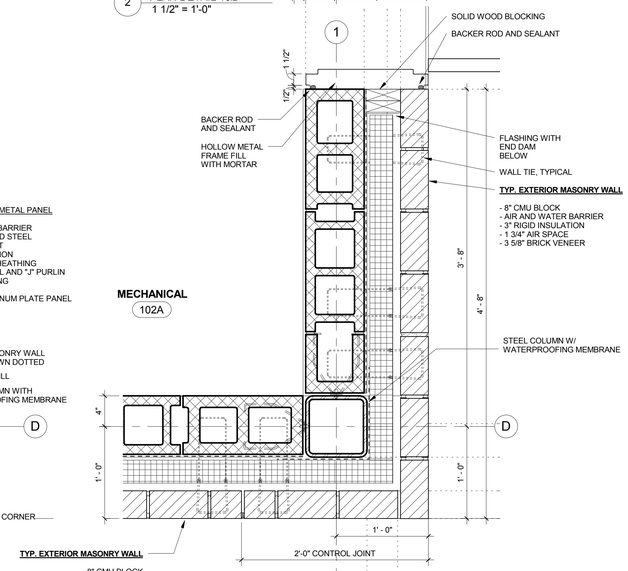
12 PLAN DETAIL 5&C
1 1/2" = 1'-0"



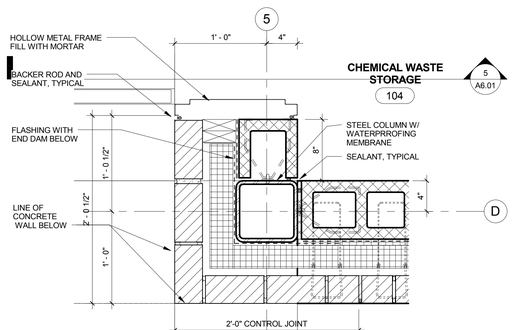
9 PLAN DETAIL 4-5&C
1 1/2" = 1'-0"



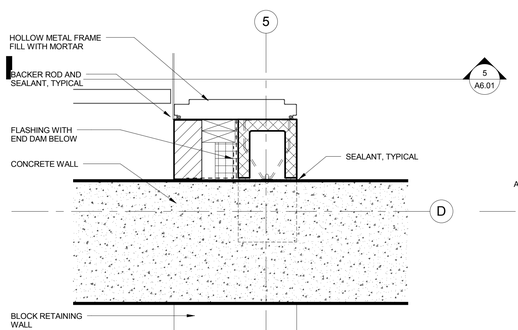
6 PLAN DETAIL 1&D ABOVE
1 1/2" = 1'-0"



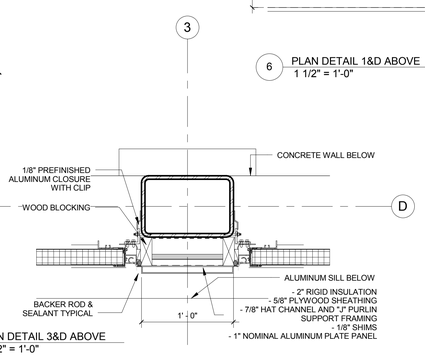
3 PLAN DETAIL 1&D
1 1/2" = 1'-0"



13 PLAN DETAIL 5&D
1 1/2" = 1'-0"



14 PLAN DETAIL 5&D BELOW
1 1/2" = 1'-0"



15 PLAN DETAIL 3&D ABOVE
1 1/2" = 1'-0"

TAI SOO KIM PARTNERS ARCHITECTS
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FAX: (860) 249-0695

UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
PLAN DETAILS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\cc\Documents\140202 UCONN_MAA - Central - CD - 2014_cc.rvt

DATE: 9/10/2014
SCALE: 1 1/2" = 1'-0"
DRAWN BY: OCT
CHECKED BY: BH

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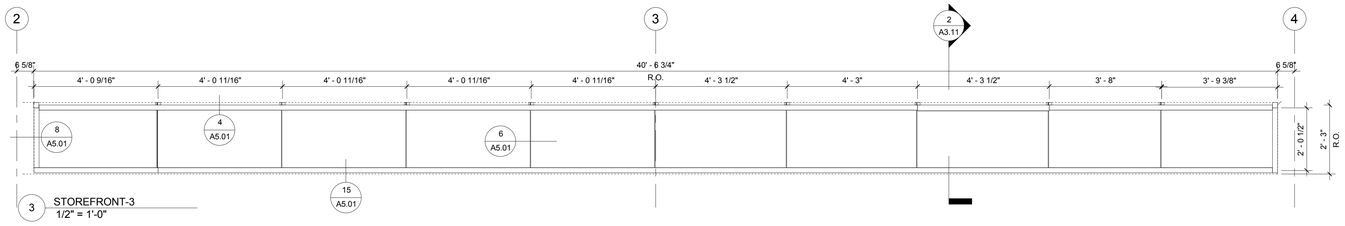
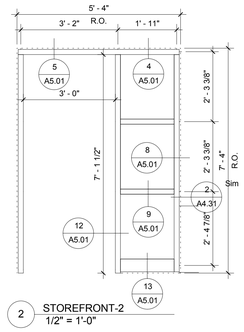
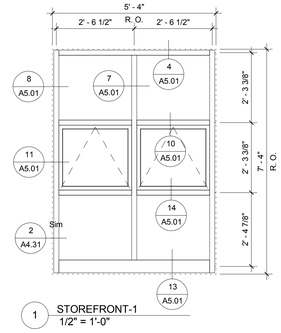
CAD FILE



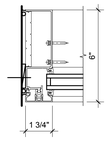
3 STOREFRONT-3
1/2" = 1'-0"



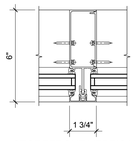
2 STOREFROUNT-2
1/2" = 1'-0"



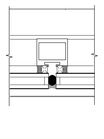
1 STOREFRONT-1
1/2" = 1'-0"



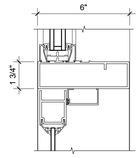
8 STOREFRONT JAMB DETAIL
3" = 1'-0"



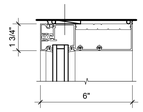
7 STOREFRONT VERTICAL MULLION DETAIL
3" = 1'-0"



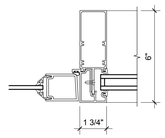
6 STOREFRONT BUTT JOINT DETAIL
3" = 1'-0"



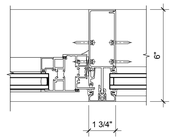
5 STOREFRONT DOOR HEAD DETAIL
3" = 1'-0"



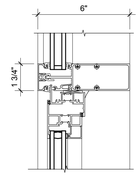
4 STOREFRONT HEAD DETAIL
3" = 1'-0"



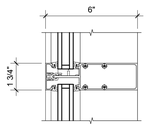
12 STOREFRONT DOOR JAMB DETAIL
3" = 1'-0"



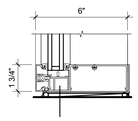
11 STOREFRONT WINDOW JAMB DETAIL
3" = 1'-0"



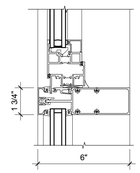
10 STOREFRONT WINDOW HEAD DETAIL
3" = 1'-0"



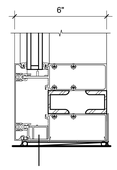
9 STOREFRONT HORIZONTAL MULLION DETAIL
3" = 1'-0"



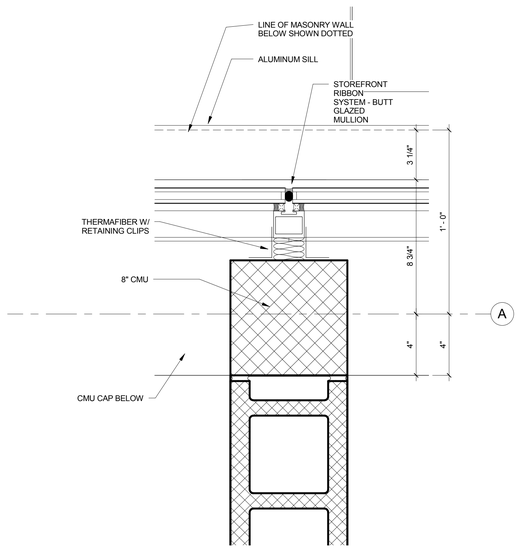
15 STOREFRONT SILL DETAIL1
3" = 1'-0"



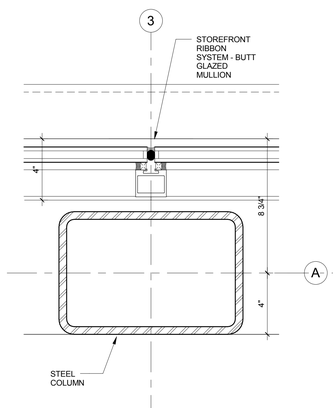
14 STOREFRONT WINDOW SILL DETAIL
3" = 1'-0"



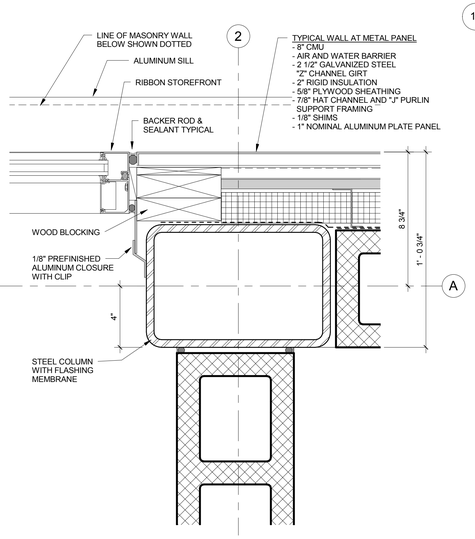
13 STOREFRONT SILL DETAIL
3" = 1'-0"



18 PLAN DETAIL 3-4&A ABOVE
3" = 1'-0"



17 PLAN DETAIL 3&A ABOVE
3" = 1'-0"



16 PLAN DETAIL 2&A ABOVE
3" = 1'-0"

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE

WINDOW SCHEDULE & DETAILS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 142202
FILE PATH: C:\Users\ocr\Documents\142202 UCONN_MAA - Central - CD - 2014_oc.rvt

DATE: 9/10/2014
SCALE: As indicated
DRAWN BY: OCT
CHECKED BY: BH

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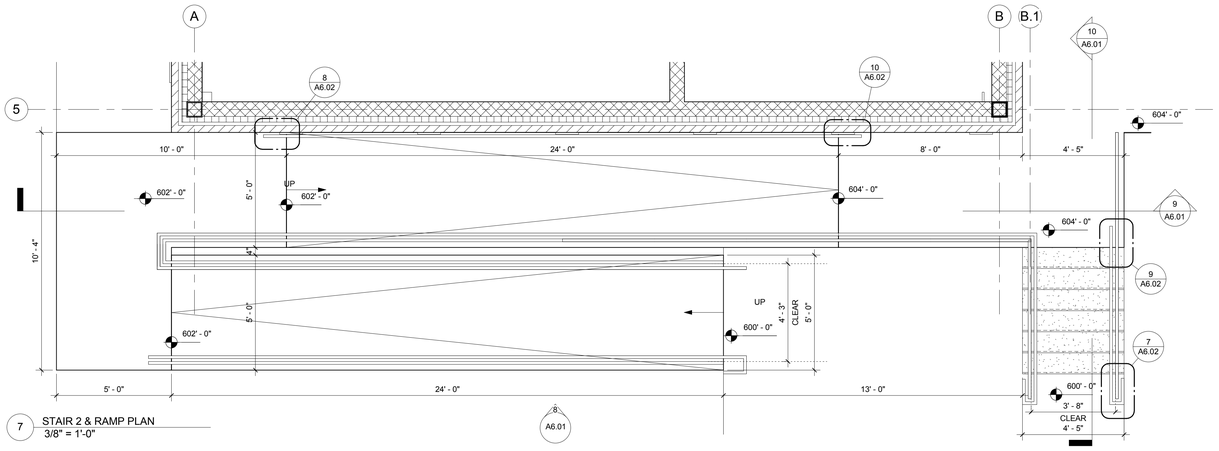
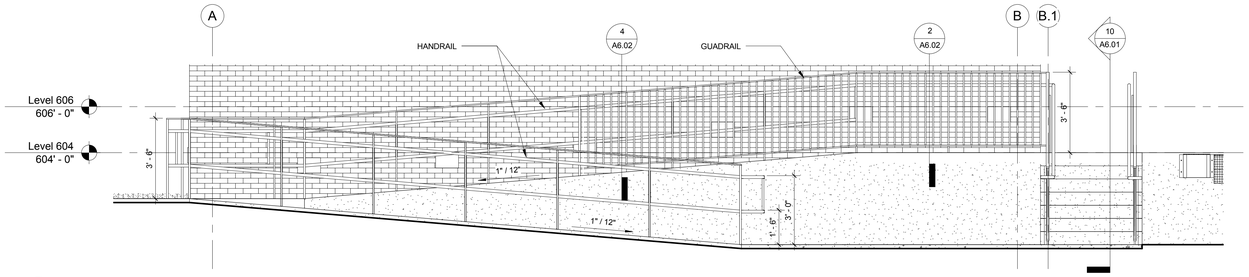
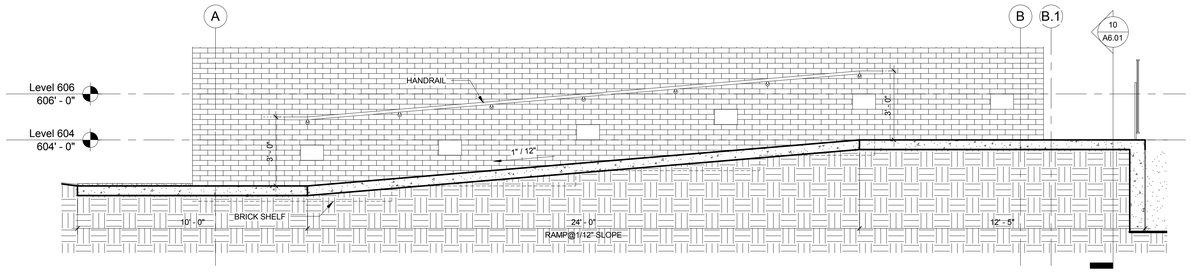


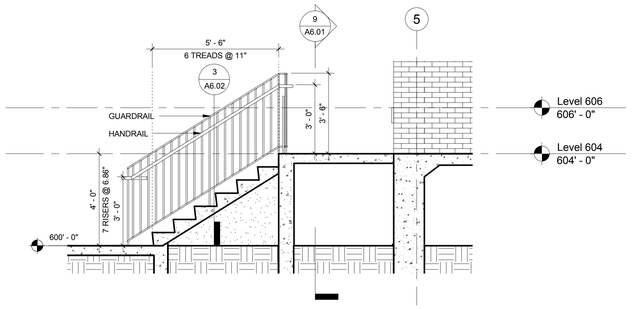
7 STAIR 2 & RAMP PLAN
3/8" = 1'-0"



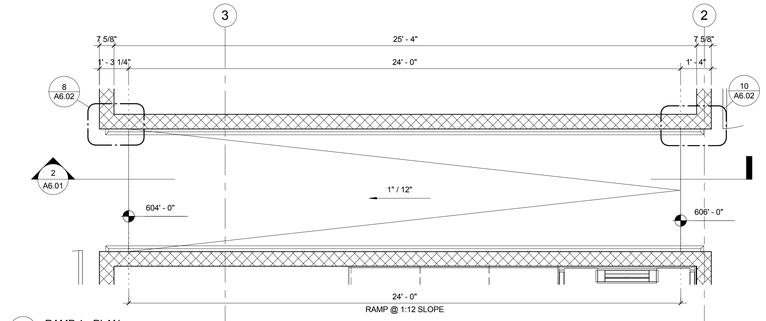
8 STAIR 2 ELEVATION
3/8" = 1'-0"



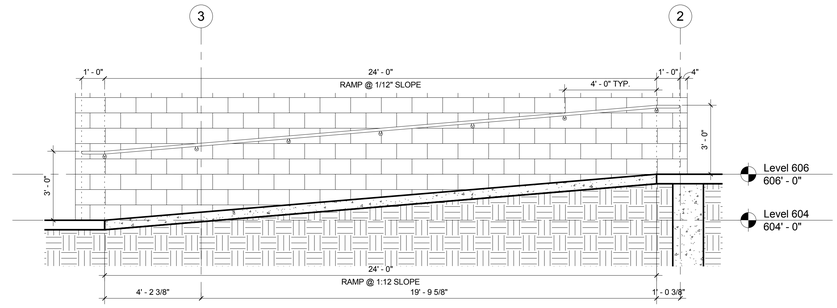
9 SECTION @ RAMP2
3/8" = 1'-0"



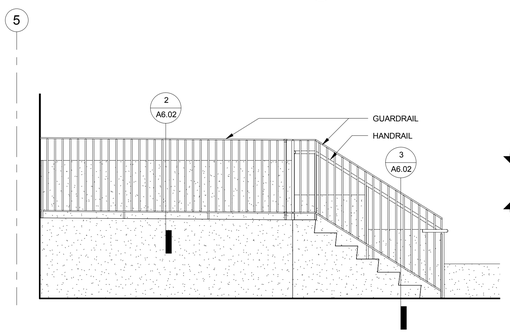
10 SECTION @ STAIR 2
3/8" = 1'-0"



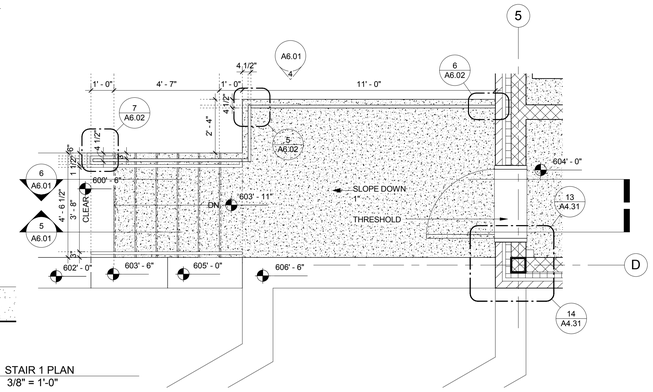
1 RAMP 1 - PLAN
3/8" = 1'-0"



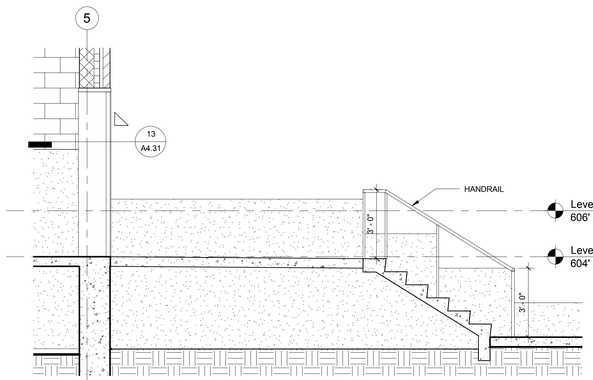
2 RAMP 1 - SECTION
3/8" = 1'-0"



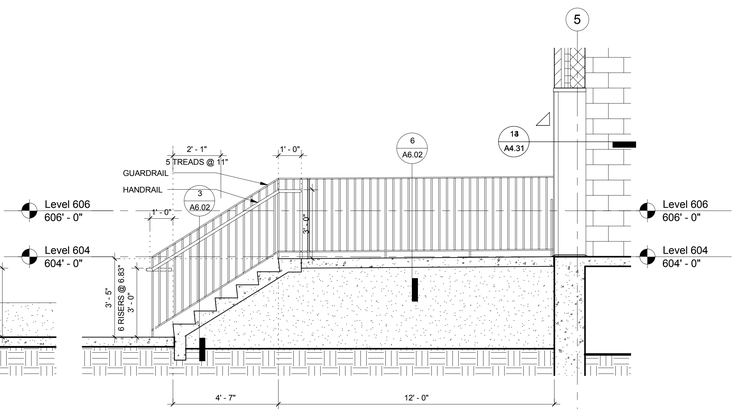
4 STAIR 1 ELEVATION
3/8" = 1'-0"



3 STAIR 1 PLAN
3/8" = 1'-0"



6 STAIR 1 - SECTION2
3/8" = 1'-0"



5 STAIR 1 - SECTION1
3/8" = 1'-0"

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE

STAIR PLANS & SECTIONS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\oct\Documents\140202 UCONN_MAA - Central - CD - 2014_oct.rvt

DATE: 9/10/2014
SCALE: 3/8" = 1'-0"
DRAWN BY: OCT
CHECKED BY: BH

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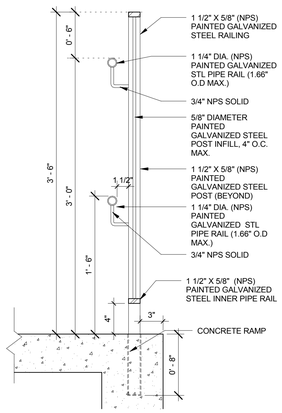
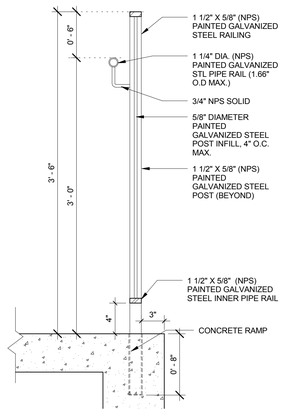
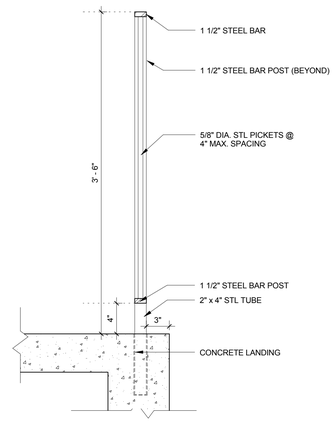


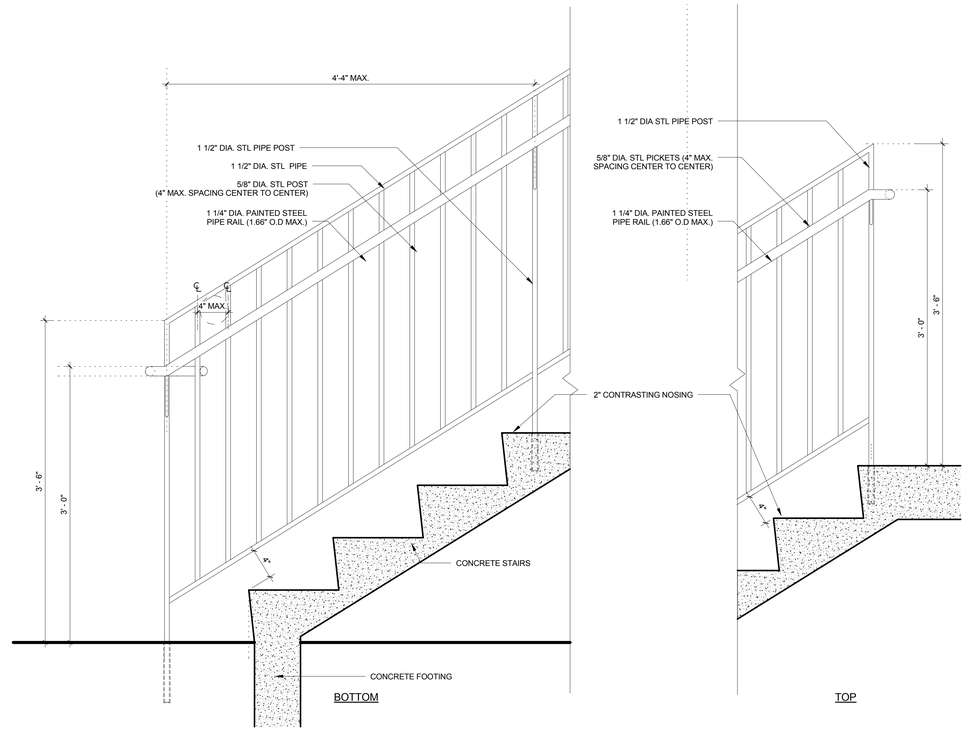
4 GUARDRAIL DETAIL @ EXTERIOR RAMP
1 1/2" = 1'-0"



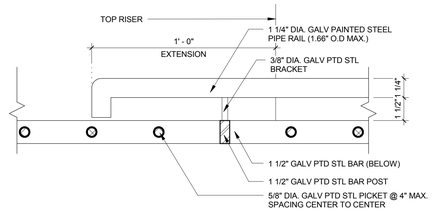
3 GUARDRAIL DETAIL @ STAIR
1 1/2" = 1'-0"



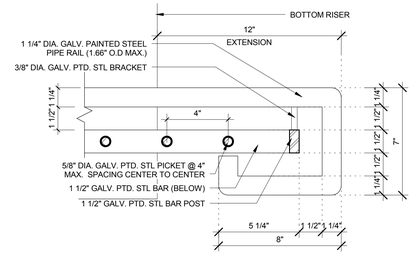
2 GUARDRAIL DETAIL @ LANDINGS
1 1/2" = 1'-0"



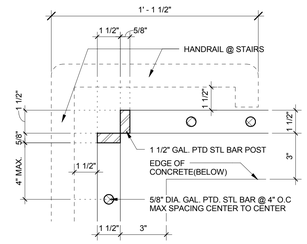
1 STAIR DETAIL
1 1/2" = 1'-0"



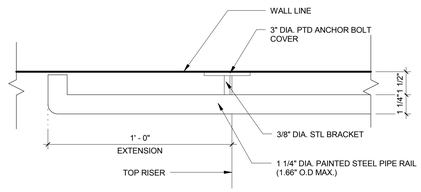
9 EXTENSION @ TOP OF STAIR - DETAIL 1
3" = 1'-0"



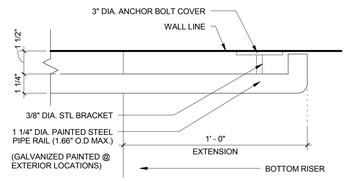
7 EXTENSION @ BOTTOM OF STAIR - DETAIL1
3" = 1'-0"



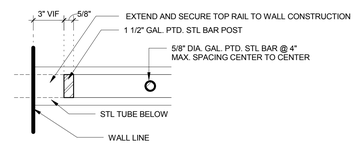
5 GUARDRAIL DETAIL 1
3" = 1'-0"



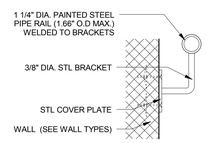
10 EXTENSION @ TOP OF STAIR/RAMP - DETAIL 2
3" = 1'-0"



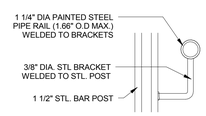
8 EXTENSION @ BOTTOM OF STAIR / RAMP- DETAIL 2
3" = 1'-0"



6 GUARDRAIL DETAIL 2
3" = 1'-0"



12 TYP STL HANDRAIL @ WALL1
3" = 1'-0"



11 TYP STL HANDRAIL @ STEEL POST1
3" = 1'-0"

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
STAIR DETAILS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA
UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\cc\Documents\140202 UCONN_MAA - Central - CD - 2014_cc.rvt

DATE: 9/10/2014
SCALE: As indicated
DRAWN BY: Author
CHECKED BY: Checker

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4/6/2015 12:01:06 PM
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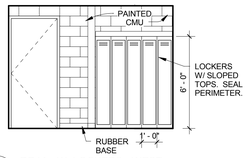
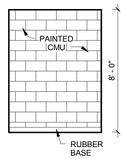
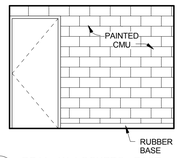


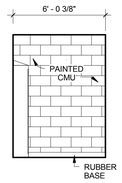
5 RR1A - W. LOCKERS - WEST
1/4" = 1'-0"



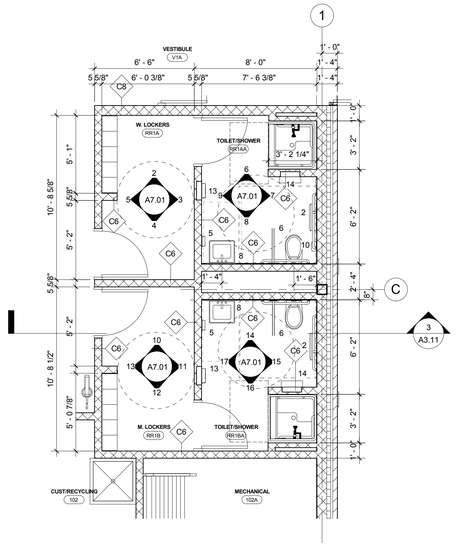
4 RR1A - W. LOCKERS - SOUTH
1/4" = 1'-0"



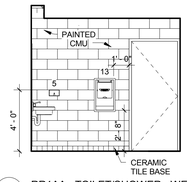
3 RR1A - W. LOCKERS - EAST
1/4" = 1'-0"



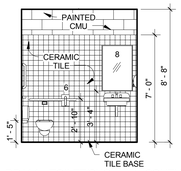
2 RR1A - W. LOCKERS - NORTH
1/4" = 1'-0"



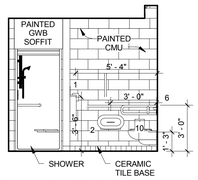
1 TOILET & LOCKERS PLANS-RR1A&RR1B
1/4" = 1'-0"



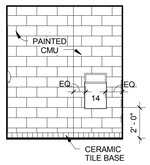
9 RR1AA - TOILET/SHOWER - WEST
1/4" = 1'-0"



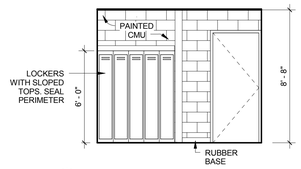
8 RR1AA - TOILET/SHOWER - SOUTH
1/4" = 1'-0"



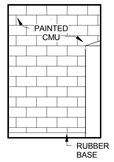
7 RR1AA - TOILET/SHOWER - EAST
1/4" = 1'-0"



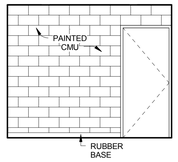
6 RR1AA - TOILET/SHOWER - NORTH
1/4" = 1'-0"



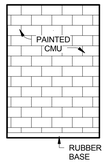
13 RR1B - M. LOCKERS - WEST
1/4" = 1'-0"



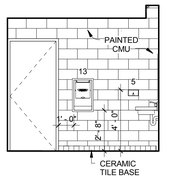
12 RR1B - M. LOCKERS - SOUTH
1/4" = 1'-0"



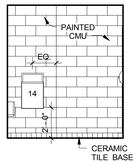
11 RR1B - M. LOCKERS - EAST
1/4" = 1'-0"



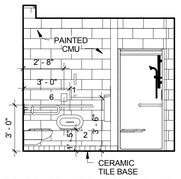
10 RR1B - M. LOCKER - NORTH
1/4" = 1'-0"



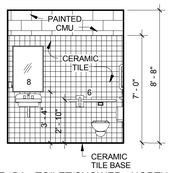
17 RR1BA - TOILET/SHOWER - WEST
1/4" = 1'-0"



16 RR1BA - TOILET/SHOWER - SOUTH
1/4" = 1'-0"



15 RR1BA - TOILET/SHOWER - EAST
1/4" = 1'-0"



14 RR1BA - TOILET/SHOWER - NORTH
1/4" = 1'-0"

TOILET ACCESSORIES KEY

1	CALL FOR AID
2	TOILET PAPER DISPENSER
3	GRAB BARS
4	PAPER TOWEL DISPENSER
5	SOAP DISPENSER
6	SWING UP GRAB BAR
7	GRAB BAR SHOWER
8	24" X 36" MIRROR (WITH FRAME)
9	NOT USED
10	SANITARY NAPKIN DISPOSAL
11	TOWEL HOOK
12	SHOWER CURTAIN AND ROD
13	SEMI-RECESSED HAND DRYER
14	RECESSED WASTE RECEPTACLE
15	VITREOUS CHINA SOAP DISH

NOTE: REFER TO GENERAL INFORMATION SHEET A0.01 FOR FIXTURE LOCATION AND HEIGHT.

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
TOILET PLANS & ELEVATIONS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202

FILE PATH: C:\Users\cct\Documents\140202 UCONN_MAA - Central - CD - 2014_cct.rvt

DATE: 9/10/2014
SCALE: 1/4" = 1'-0"
DRAWN BY: CCT
CHECKED BY: BH

A7.01

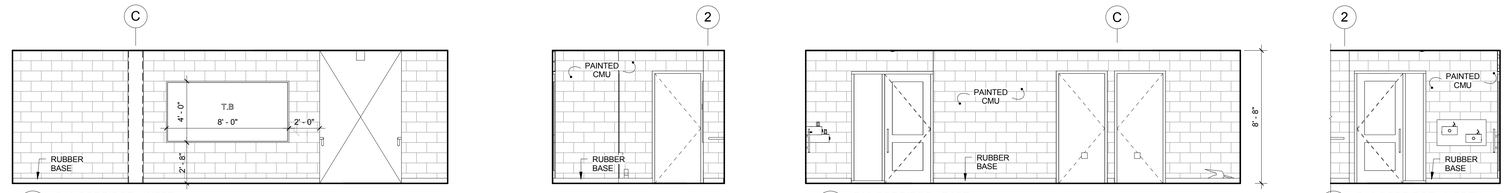
4/9/2015 12:01:11 PM
CAD FILE: C:\Users\cct\Documents\140202 UCONN_MAA - Central - CD - 2014_cct.rvt

4 V1A VESTIBULE - WEST
1/4" = 1'-0"

3 V1A VESTIBULE - SOUTH
1/4" = 1'-0"

2 V1A VESTIBULE - EAST
1/4" = 1'-0"

1 V1A VESTIBULE - NORTH
1/4" = 1'-0"

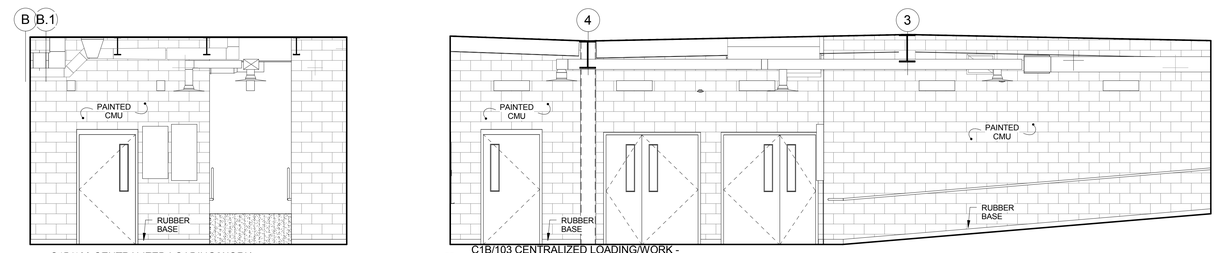


8 C1A CORRIDOR - WEST
1/4" = 1'-0"

7 C1A CORRIDOR - SOUTH
1/4" = 1'-0"

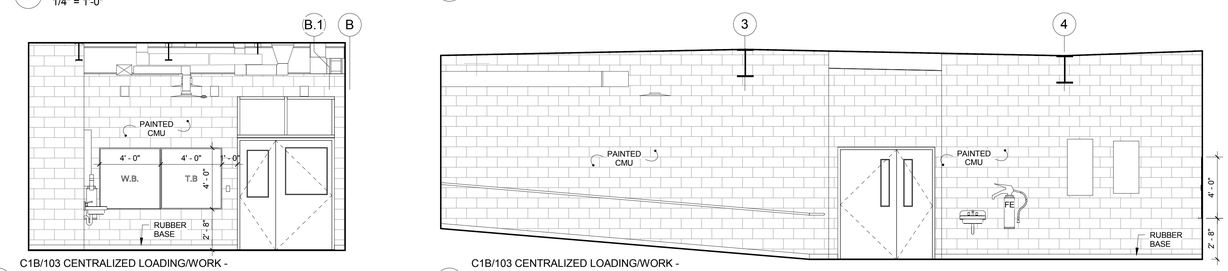
6 C1A CORRIDOR - EAST
1/4" = 1'-0"

5 C1A CORRIDOR - NORTH
1/4" = 1'-0"



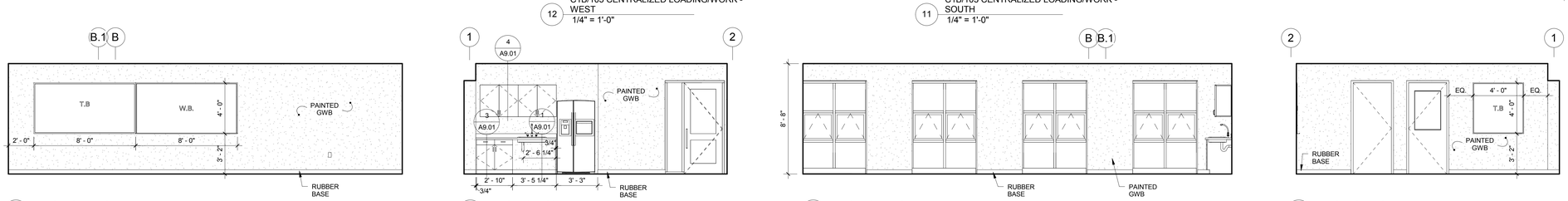
10 C1B/103 CENTRALIZED LOADING/WORK - EAST
1/4" = 1'-0"

9 C1B/103 CENTRALIZED LOADING/WORK - NORTH
1/4" = 1'-0"



12 C1B/103 CENTRALIZED LOADING/WORK - WEST
1/4" = 1'-0"

11 C1B/103 CENTRALIZED LOADING/WORK - SOUTH
1/4" = 1'-0"

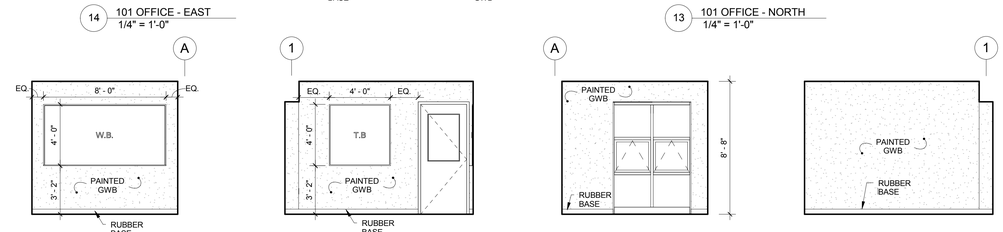


16 101 OFFICE - WEST
1/4" = 1'-0"

15 101 OFFICE - SOUTH
1/4" = 1'-0"

14 101 OFFICE - EAST
1/4" = 1'-0"

13 101 OFFICE - NORTH
1/4" = 1'-0"



20 101A CONFERENCE - WEST
1/4" = 1'-0"

19 101A CONFERENCE - SOUTH
1/4" = 1'-0"

18 101A CONFERENCE - EAST
1/4" = 1'-0"

17 101A CONFERENCE - NORTH
1/4" = 1'-0"

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PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\cc\Documents\140202 UCONN_MAA - Central - CD - 2014_cc.rvt

DATE: 9/10/2014
SCALE: 1/4" = 1'-0"
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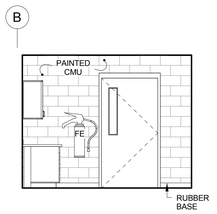
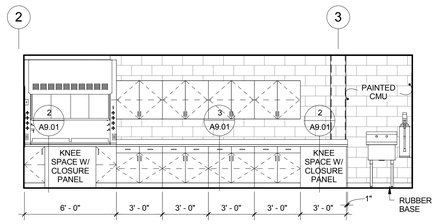
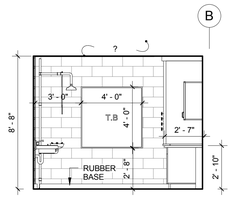


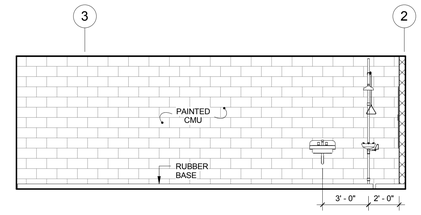
4 106A RADIATION LAB. - WEST
1/4" = 1'-0"



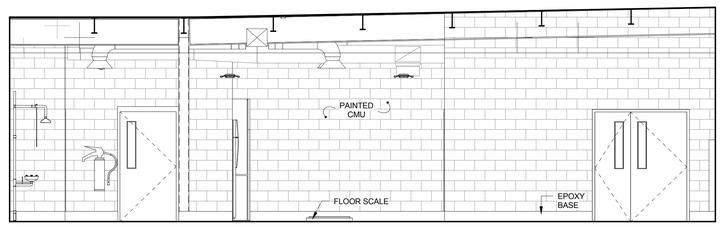
3 106A RADIATION LAB. - SOUTH
1/4" = 1'-0"



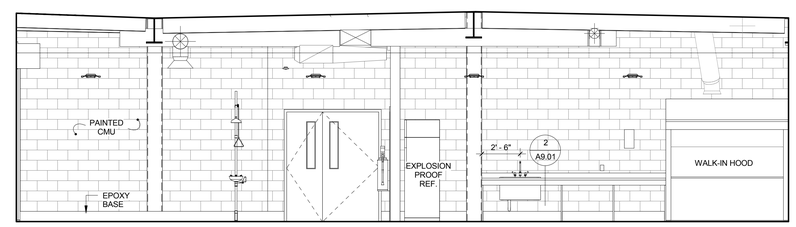
2 106A RADIATION LAB - EAST
1/4" = 1'-0"



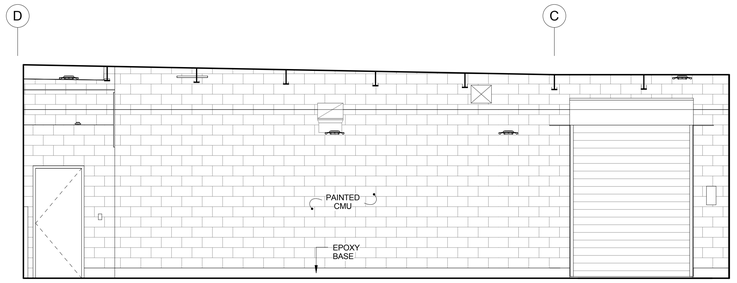
1 106A RADIATION LAB. - NORTH
1/4" = 1'-0"



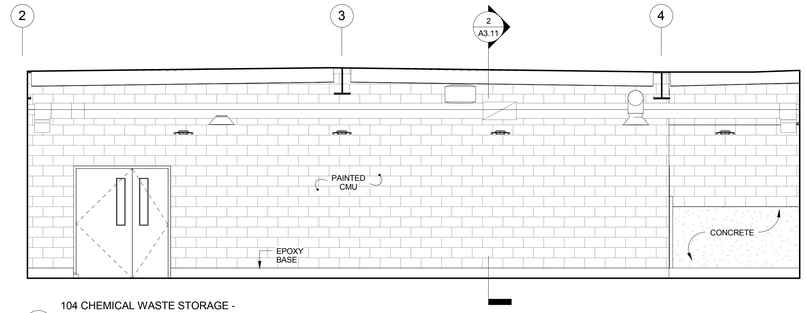
6 104 CHEMICAL WASTE STORAGE - EAST
1/4" = 1'-0"



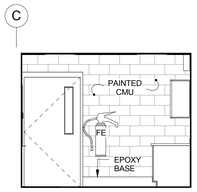
5 104 CHEMICAL WASTE STORAGE - NORTH
1/4" = 1'-0"



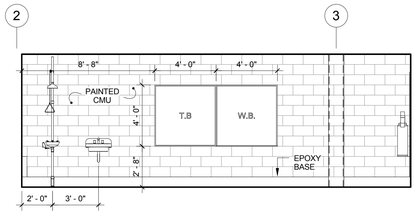
8 104 CHEMICAL WASTE STORAGE - WEST
1/4" = 1'-0"



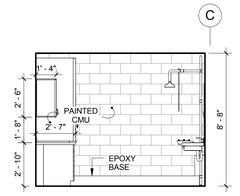
7 104 CHEMICAL WASTE STORAGE - SOUTH
1/4" = 1'-0"



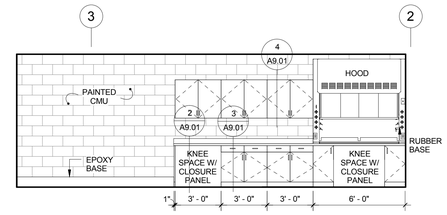
12 104A CHEMICAL LAB. - WEST
1/4" = 1'-0"



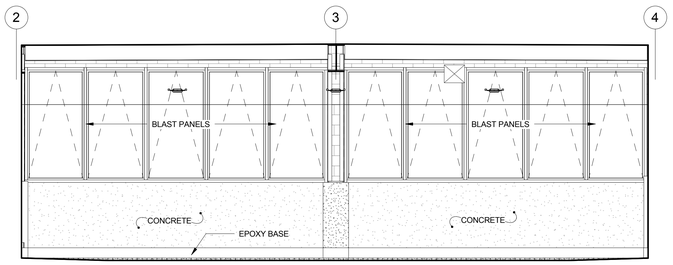
11 104A CHEMICAL LAB. - SOUTH
1/4" = 1'-0"



10 104A CHEMICAL LAB - EAST
1/4" = 1'-0"



9 104A CHEMICAL LAB. - NORTH
1/4" = 1'-0"



13 104B CHEMICAL STORAGE - SOUTH
1/4" = 1'-0"

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PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\oct\Documents\140202 UCONN_MAA - Central - CD - 2014_oct.rvt

DATE: 9/10/2014
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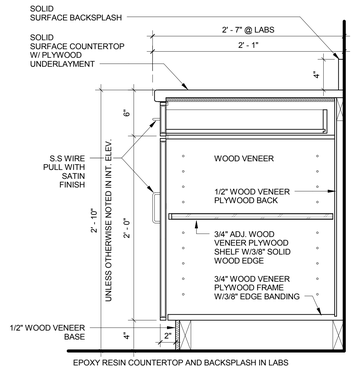
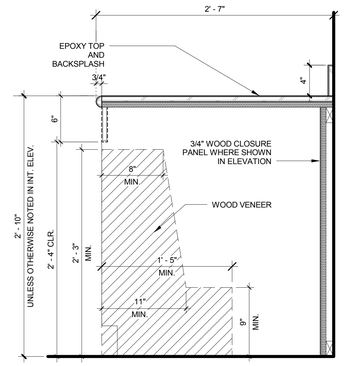
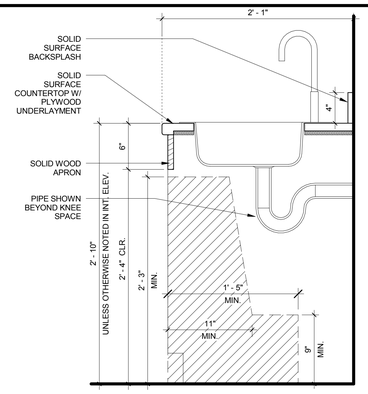


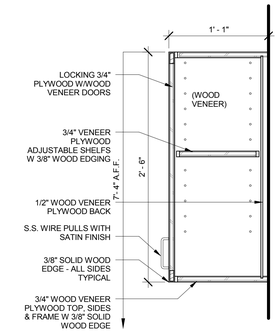
3 CW-BASE CABINET DRAWER (TYP)
1 1/2" = 1'-0"



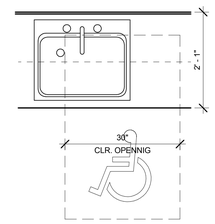
2 CW-COUNTER SECTION TYP. @ LABS AND CHEM. STORAGE
1 1/2" = 1'-0"



1 CW-ADA SINK SECT.
1 1/2" = 1'-0"



4 CW-TYP. OVERHEAD CAB. SECT.
1 1/2" = 1'-0"



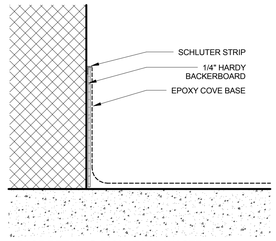
5 TYP. ADA SINK PLAN
3/4" = 1'-0"

ROOM FINISH SCHEDULE

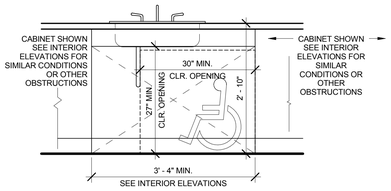
RM. NO	ROOM NAME	FLOOR	BASE NORTH	BASE EAST	BASE SOUTH	BASE WEST	NORTH MAT	NORTH FIN	EAST MAT	EAST FIN	SOUTH MAT	SOUTH FIN	WEST MAT	WEST FIN	CEILING MAT	CEILING ACT TYPE	CEILING HGT	REMARKS
101	OFFICE	CPT	RB	RB	RB	RB	GWB	PTD	GWB	PTD	GWB	PTD	GWB	PTD	ACT	1	8'-8"	
101A	CONFERENCE ROOM	CPT	RB	RB	RB	RB	GWB	PTD	GWB	PTD	GWB	PTD	GWB	PTD	ACT	1	8'-8"	
101B	DATA ROOM	VCT	RB	RB	RB	RB	CMU	PTD	GWB	PTD	GWB	PTD	CMU	PTD	-		-	PAINTED EXPOSED STRUCTURE
102	CUST/RECYCLING	CT	CT	CT	CT	CT	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	-		-	PAINTED EXPOSED STRUCTURE
102A	MECHANICAL	SC	RB	RB	RB	RB	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	-		-	PAINTED EXPOSED STRUCTURE
103	CENTRALIZED LOADING /WORK AREA	EPOXY-TYPE 3 / WOM	RB	RB	RB	RB	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	-		-	PAINTED EXPOSED STRUCTURE, WALK OFF MAT
104	CHEMICAL WASTE STORAGE	EPOXY-TYPE 2	EPOXY	EPOXY	EPOXY	EPOXY	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	-		-	PAINTED EXPOSED STRUCTURE, EPOXY TYPE 4 @ DETENTION BASINS
104A	CHEMICAL LAB	EPOXY-TYPE 2	EPOXY	EPOXY	EPOXY	EPOXY	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	ACT	2	8'-8"	
104B	CHEMICAL STORAGE	EPOXY-TYPE 2	EPOXY	EPOXY	EPOXY	EPOXY	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	-		-	PAINTED EXPOSED STRUCTURE, EPOXY TYPE 4 @ DETENTION BASINS
105	GENERAL STORAGE	EPOXY-TYPE 3	RB	RB	RB	RB	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	-		-	PAINTED EXPOSED STRUCTURE
106	RADIATION WASTE ST.	EPOXY-TYPE 3	RB	RB	RB	RB	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	-		-	PAINTED EXPOSED STRUCTURE, EPOXY TYPE 4 @ DETENTION BASINS
106A	RADIATION LAB.	EPOXY-TYPE 3	RB	RB	RB	RB	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	ACT	2	8'-8"	
107	CENTRAL SUPPLY STORAGE	EPOXY-TYPE 3	RB	RB	RB	RB	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	-		-	PAINTED EXPOSED STRUCTURE
108	UNIVERSAL STORAGE	EPOXY-TYPE 3	RB	RB	RB	RB	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	-		-	PAINTED EXPOSED STRUCTURE
109	LOADING DOCK																	SYNTHETIC STUCCO FINISHED OVERHANG
110	BIOHAZARD WASTE STORAGE	EPOXY-TYPE 1	EPOXY	EPOXY	EPOXY	EPOXY												
C1A	CORRIDOR	VCT	RB	RB	RB	RB	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	ACT	1	8'-8"	
C1B	CORRIDOR	VCT	RB	RB	RB	RB	CMU	PTD	CMU	PTD	CMU	PTD	CMU	PTD	-		-	PAINTED EXPOSED STRUCTURE
RR1A	W. LOCKERS	VCT	RB	RB	RB	RB	CMU	PTD	CMU	PTD	CMU	PTD	GWB	PTD	PTD GWB		8'-8"	
RR1AA	TOILET/SHOWER	CT	CT	CT	CT	CT	CMU	PTD	CMU	PTD	CMU/CT	PTD	CMU	PTD	PTD GWB		8'-8"	
RR1B	M. LOCKERS	VCT	RB	RB	RB	RB	GWB	PTD	CMU	PTD	CMU	PTD	CMU	PTD	PTD GWB		8'-8"	
RR1BA	TOILET/SHOWER	CT	CT	CT	CT	CT	CMU/CT	PTD	CMU	PTD	CMU	PTD	CMU	PTD	PTD GWB		8'-8"	
V1A	VESTIBULE	WOM	RB	-	RB	-	CMU	PTD			CMU	PTD			ACT	1	8'-8"	

FINISH SCHEDULE LEGEND

ACT - ACOUSTIC TILE	EPOXY - EPOXY	RB - RUBBER
CONC - CONCRETE	GL - GLASS	VCT - VINYL TILE
CMU - CONCRETE MASONRY UNIT	GWB - GYPSUM WALL BOARD	SVT - SOLID VINYL TILE
CPT - CARPET TILE	PTD - PAINTED	WOM - WALK OFF MAT
CT - CERAMIC TILE	RM - SLIP RESISTANT RUBBER MAT	SC - SEALED CONCRETE



7 BASE DETAIL @ BIOHAZARD WASTE STORAGE
3" = 1'-0"



6 TYP. ADA SINK ELEVATION
3/4" = 1'-0"

TAI SOO KIM PARTNERS ARCHITECTS
146 WYLLYS STREET
HARTFORD, CONNECTICUT
TEL: (860) 547-1970
FAX: (860) 249-0695

UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE

MILLWORK DETAILS & ROOM FINISH SCHEDULE

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202

FILE PATH
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DATE: 9/10/2014
SCALE: As indicated
DRAWN BY: OCT
CHECKED BY: BH

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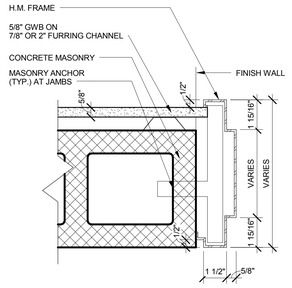
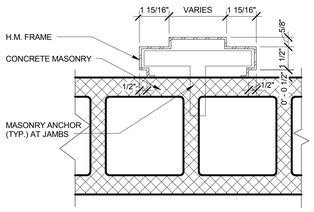
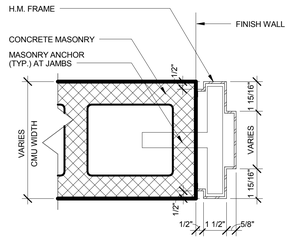


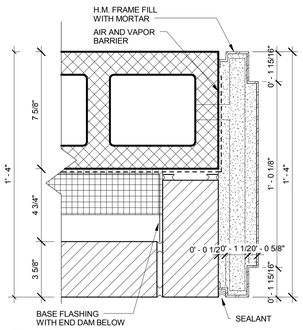
J3 H3 **NOTE: SEE PARTITION TYPES. SEE STRUCTURAL DRAWINGS FOR LINTEL REQUIREMENTS.**



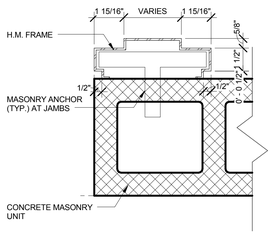
J2 **NOTE: SEE PARTITION TYPES**



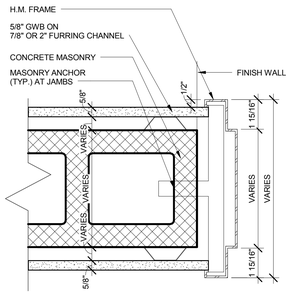
J1 H1 **NOTE: SEE PARTITION TYPES. SEE STRUCTURAL DRAWINGS FOR LINTEL REQUIREMENTS.**



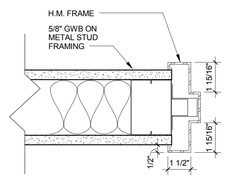
J6 H6 **NOTE: SEE PARTITION TYPES. SEE STRUCTURAL DRAWINGS FOR LINTEL REQUIREMENTS.**



J5 **NOTE: SEE PARTITION TYPES**



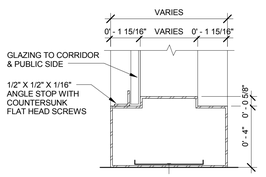
J4 H4 **NOTE: SEE PARTITION TYPES. SEE STRUCTURAL DRAWINGS FOR LINTEL REQUIREMENTS.**



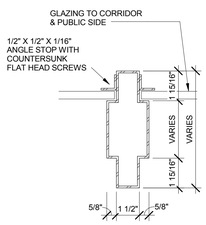
J7 H7 **NOTE: SEE PARTITION TYPES**

DOOR AND FRAME SCHEDULE

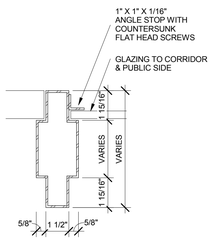
NUMBER	DETAIL DRAWING SHEET #	DOOR: DOUBLE LEAF DOOR	DOOR: SIZE: WIDTH	DOOR: SIZE: HEIGHT	DOOR: TYPE / MATERIAL: MATERIAL	DOOR: TYPE / MATERIAL: TYPE	FRAME: TYPE / MATERIAL: MATERIAL	FRAME: TYPE / MATERIAL: TYPE	FRAME: HEAD DETAIL	FRAME: JAMB DETAIL	FRAME: SADDLE DETAIL	FIRE RATING (MINUTES)	HARDWARE - SEE SPECIFICATIONS: FIRECODE: PANIC RELEASE LATCH	FIRECODE: POSITIVE LATCHING	FIRECODE: AUTOMATIC CLOSER	FIRECODE: E-M. HOLD OPEN	DISABLED: LEVER U-HANDLE	DISABLED: ACCESSIBLE THRESHOLD	PUSH/PULL	SIGNAGE: INTER. SYMBOL OF ACCESSIBILITY	SIGNAGE: SIGNAGE REQUIRED	SIGNAGE: TEXT	HARDWARE SET NUMBER	SECURITY DEVICE	REMARKS
101	A1.11		3' - 0"	7' - 2"	HM	D2	HM	F2	H3	J3/M1	T2	45	-	•	•		•	•			•	OFFICE	9		SIGNAGE BY OWNER
101A	A1.11		3' - 0"	7' - 2"	HM	D2	HM	F1	H7	J7	-	-	-	•	-		•	-			•	CONFERENCE ROOM	10		SIGNAGE BY OWNER
101B	A1.11		3' - 0"	7' - 2"	HM	D1	HM	F1	H7	J7	T2	-	-	•	•		•	•			•	DATA ROOM	10		SIGNAGE BY OWNER
102	A1.11		3' - 0"	7' - 2"	HM	D1	HM	F1	H1	J1/J2	T3	45	-	•	•		•	•			•	CUSTODIAL/MECHANICAL	9		SIGNAGE BY OWNER
102A.1	A1.11		3' - 0"	7' - 2"	HM	D1	HM	F1	H1	J1/J2	T3	45	-	•	•		•	•			-	-	14		-
102A.2	A1.11		3' - 0"	7' - 2"	HM	D1	HM	F1	H6	J6	T4	-	•	•	•		•	•			-	-	4		EXTERIOR DOOR
103	A1.11	•	6' - 0"	7' - 2"	HM	D3	HM	F1	H6	J6	T4	-	•	•	•		•	•			-	-	2	•	EXTERIOR DOOR - UNEQUAL LEAVES - 28" AND 44"
104.1	A1.11	•	6' - 0"	7' - 2"	HM	D3	HM	F1	H1	J1	T7	90	•	•	•		•	•			•	CHEMICAL WASTE STORAGE	5		UNEQUAL LEAVES - 28" AND 44". SIGNAGE BY OWNER.
104.2	A1.11		3' - 0"	7' - 2"	HM	D1	HM	F1	H6	J6	T4	-	•	•	•		•	•			-	-	3		-
104.3	A1.11		8' - 0"	10' - 0"	-	-	-	-	10/A4.21	9/A4.31	T7	-	-	-	-		-	•			-	-	-		OVERHEAD COILING DOOR
104A	A1.11		3' - 8"	7' - 2"	HM	D3	HM	F1	H1	J1/J5	-	90	-	•	•		-	-			•	CHEMICAL LABORATORY	11		SIGNAGE BY OWNER
104B1	A1.11	•	6' - 0"	7' - 2"	HM	D1	HM	F1	H1	J1	T1	90	•	•	•		•	•			•	CHEMICAL STORAGE	5		UNEQUAL LEAVES - 28" AND 44". SIGNAGE BY OWNER.
104B2	A1.11	•	6' - 0"	7' - 2"	HM	D1	HM	F1	H1	J1	T1	90	•	•	•		•	•			•	CHEMICAL STORAGE	5		UNEQUAL LEAVES - 28" AND 44". SIGNAGE BY OWNER.
105	A1.11		3' - 8"	7' - 2"	HM	D3	HM	F1	H1	J1	T1	45	-	•	•		•	•			•	GENERAL STORAGE	15		SIGNAGE BY OWNER
106.1	A1.11	•	6' - 0"	7' - 2"	HM	D3	HM	F1	H1	J1	T1	45	-	•	•		•	•			•	RADIATION WASTE STORAGE	13		SIGNAGE BY OWNER
106.2	A1.11		3' - 0"	7' - 2"	HM	D1	HM	F1	H6	J6	T4	-	•	•	•		•	•			-	-	3		EXTERIOR DOOR
106A	A1.11		3' - 8"	7' - 2"	HM	D3	HM	F1	H1	J1	-	45	-	•	•		•	-			•	RADIATION LABORATORY	12		SIGNAGE BY OWNER
107	A1.11	•	6' - 0"	7' - 2"	HM	D3	HM	F1	H1	J1	-	45	-	•	•		•	•			•	CENTRAL SUPPLY STORAGE	13		UNEQUAL LEAVES - 28" AND 44". SIGNAGE BY OWNER.
108	A1.11		3' - 8"	7' - 2"	HM	D3	HM	F1	H1	J1	-	45	-	•	•		•	•			•	UNIVERSAL STORAGE	14		SIGNAGE BY OWNER
110	A1.11		3' - 6"	7' - 0"	-	-	-	-	-	-	-	-	-	-	-		-	-			-	-	-		WALK-IN COOLER DOOR, ALL HARDWARE BY COOLER MANUFACTURER
C1A	A1.11		3' - 0"	7' - 1 1/2"	HM	D4	HM	F3	H7	J1/J5	T6	-	-	-	•		•	•	•		-	-	6		-
RR1A	A1.11		3' - 0"	7' - 2"	HM	D1	HM	F1	H1	J1/J5	-	45	-	•	•		•	-		•	•	WOMEN'S LOCKER/TOILET ROOM	7		SIGNAGE BY OWNER
RR1AA	A1.11		3' - 0"	7' - 2"	HM	D1	HM	F1	H1	J1/J2	T3	-	-	•	-		•	•			-	-	8		-
RR1B	A1.11		3' - 0"	7' - 2"	HM	D1	HM	F1	H1	J1/J5	-	45	-	•	•		•	-		•	•	MEN'S LOCKER/TOILET ROOM	7		SIGNAGE BY OWNER
RR1BA	A1.11		3' - 0"	7' - 2"	HM	D1	HM	F1	H1	J1/J2	T3	-	-	•	-		•	•			-	-	8		-
V1A	A1.11		3' - 0"	7' - 1 1/2"	AL	D4	AL		5/A5.01	8/A5.01	T5	-	•	•	•		•	•			-	-	1	•	EXTERIOR DOOR



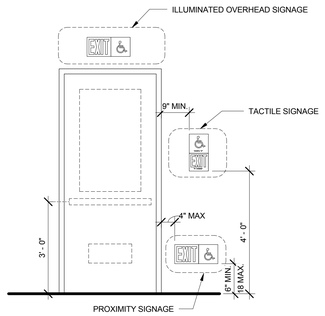
M3 **STANDARD HOLLOW METAL DOOR FRAME SILL**



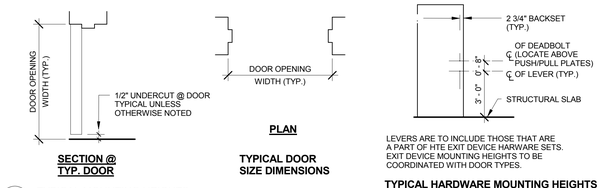
M2 **STANDARD HOLLOW METAL INTERMEDIATE MULLION (WHERE APPLICABLE)**



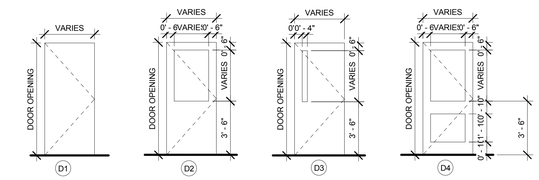
M1 **STANDARD HOLLOW METAL INTERMEDIATE MULLION/DOOR JAMB (WHERE APPLICABLE)**



3 TYPICAL SIGNAL CONFIGURATION
1/2" = 1'-0"

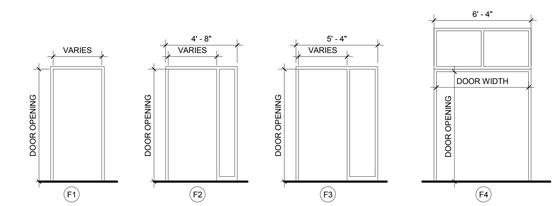


1 TYPICAL MOUNTING HEIGHTS
1/4" = 1'-0"

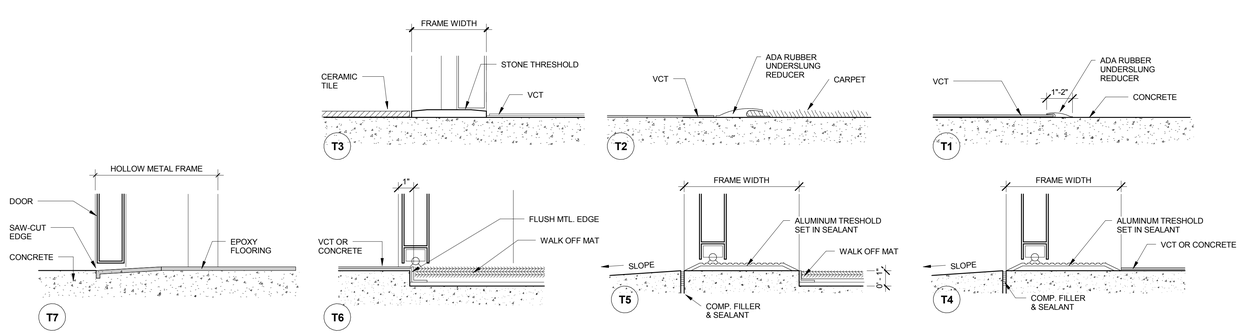


NOTE:
1. PROVIDE LAMINATED GLASS TYPE L1 (1/2" NOM. THICKNESS) AT ALL EXTERIOR DOORS.
2. PROVIDE LAMINATED GLASS TYPE L2 (1/4" NOM. THICKNESS) AT ALL NON-RATED INTERIOR DOORS AND FRAMES.
3. PROVIDE FIRE PROTECTION RATED SAFETY GLAZING AT ALL RATED INTERIOR DOORS AND FRAMES.

2 DOOR TYPES
1/4" = 1'-0"



4 FRAME TYPES
1/4" = 1'-0"



5 THRESHOLD TYPES
3" = 1'-0"

TAI SOO KIM PARTNERS ARCHITECTS
146 WYLLYS STREET
HARTFORD, CONNECTICUT
TEL: (860) 547-1970
FAX: (860) 249-0695

TITLE
DOOR SCHEDULE
DOOR TYPES & DETAILS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD

UNIVERSITY OF CONNECTICUT

STORRS, CT

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\cc\Documents\140202 UCONN_MAA - Central - CD - 2014_cc.rvt

DATE: 9/10/2014
SCALE: As indicated
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CHECKED BY: BH

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4/9/2015 12:01:39 PM
C:\Users\cc\Documents\140202 UCONN_MAA - Central - CD - 2014_cc.rvt
CAD FILE

GENERAL NOTES:

1. THE PLANS AND SPECIFICATIONS, TO THE BEST OF OUR KNOWLEDGE,COMPLY WITH THE APPLICABLE REQUIREMENTS OF THE INTERNATIONALBUILDING CODE, 2003 EDITION AS SUPPLEMENTED, AMENDED, AND ADOPTED BY THE STATE OF CONNECTICUT.

2. THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE INTERNATIONAL BUILDING CODE, 2003 EDITION AND ALL APPLICABLE FEDERAL AND STATE CODES, STANDARDS, REGULATIONS, AND LAWS.

3. ALL REFERENCED STANDARDS REFER TO THE EDITION IN FORCE AT THE TIME THESE PLANS AND SPECIFICATIONS ARE ISSUED FOR PERMIT.

4. WORK NOT INDICATED ON A PART OF THE DRAWINGS BUT REASONABLY IMPLIED TO BE SIMILAR TO THAT SHOWN AT CORRESPONDING PLACES SHALL BE REPEATED.

5. IN ANY CASE OF CONFLICT BETWEEN THE NOTES, DETAILS AND SPECIFICATIONS, THE MOST RIGID REQUIREMENTS SHALL GOVERN. CONTRACTOR SHALL MAKE NO DEVIATION FROM DESIGN DRAWINGS WITHOUT WRITTEN APPROVAL OF THE ARCHITECT.

6. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AND COORDINATE WITH ARCHITECTURAL DRAWINGS, DRAWINGS FROM OTHER CONSULTANTS, PROJECT SHOP DRAWINGS AND FIELD CONDITIONS.

7. THE CONTRACTOR SHALL PROTECT EXISTING FACILITIES, STRUCTURES, AND UTILITY LINES FROM ALL DAMAGE.

8. JOB SAFETY AND CONSTRUCTION PROCEDURES ARE THE RESPONSIBILITY OF THE CONTRACTOR.

9. THE BUILDING IS DESIGNED FOR THE FOLLOWING UNIFORMLY DISTRIBUTED LIVE LOADS:

(A) SNOW LOAD - BASIC GROUND SNOW LOAD IS 35 PSF WITH APPLICABLE SNOW SHADOWING FACTORS.

(B) WIND LOADS - DESIGN WIND SPEED: 100 MPH, EXPOSURE "B", CATEGORY III - IMPORTANCE FACTOR: 1.15

(C) SEISMIC LOADS - BASED ON PARAMETERS AS DEFINED IN SECTION 1615 OF THE CONNECTICUT STATE BUILDING CODE.

(1) Ss = .268
(2) S1 = .084
(3) SEISMIC HAZARD EXPOSURE GROUP - GROUP II
(4) SEISMIC DESIGN CATEGORY - B
(5) SOIL PROFILE SITE CLASS C
(6) LATERAL LOAD BRACING SYSTEM FOR MAIN BUILDING ARE MOMENT RESISTANT FRAMES.
(7) R = 3

(D) DESIGN LOADS:
ROOF LIVE LOAD - 35 PSF

REINFORCED CONCRETE NOTES:

1. STRUCTURAL CONCRETE AND CONCRETING PRACTICES SHALL CONFORM WITH ACI-318- 02, "AMERICAN CONCRETE INSTITUTE, BUILDING CODE FOR REINFORCED CONCRETE." DETAILS SHALL BE IN ACCORDANCE WITH ACI-135, "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES" UNLESS OTHERWISE NOTED ON THE DRAWINGS.

2. ALL STRUCTURAL CONCRETE SHALL BE NORMAL WEIGHT STONE CONCRETE. CONCRETE FOR FOOTINGS, PIERS, GRADE BEAMS, FOUNDATION WALLS, PILE CAPS, SLABS ON GRADE, AND RETAINING WALLS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS UNLESS OTHERWISE NOTED ON THE DRAWINGS.

3. ALL EXPOSED CONCRETE SHALL HAVE AN AIR ENTRAINING AGENT.

4. ALL REINFORCING BARS SHALL CONFORM TO ASTM A615, GRADE 60.

5. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185. CHAIR OR LIFT WIRE FABRIC DURING CONCRETE PLACEMENT TO INSURE PROPER POSITION IN SLAB.

6. ALL REINFORCEMENT SHALL BE SECURELY HELD IN PLACE WHILE PLACING CONCRETE. IF REQUIRED ADDITIONAL BARS OR STIRRUPS SHALL BE PROVIDED BY THE CONTRACTOR TO FURNISH SUPPORT OR ALL BARS.

7. ALL REINFORCING BARS, SHALL BE LAPPED AS SPECIFICALLY DETAILED ON DRAWINGS. WHERE NOT SPECIFICALLY INDICATED ON THE DRAWINGS, ALL REINFORCING BARS SHALL BE LAPPED USING THE TENSION SPLICE LENGTHS IN THE SCHEDULE ON DRAWINGS. LAP WALL TOP HORIZONTAL REINFORCEMENT AT CENTER OF SPAN. LAP WALL BOTTOM HORIZONTAL REINFORCEMENT AT SUPPORT. LAP INSIDE FACE WALL VERTICAL REINFORCEMENT AT SUPPORT. LAP OUTSIDE FACE VERTICAL WALL REINFORCEMENT AT MID-HEIGHT OF WALL. UNLESS OTHERWISE NOTED TERMINATE CONTINUOUS BARS AT DISCONTINUOUS ENDS WITH STANDARD HOOKS.

8. MINIMUM CONCRETE COVER SHALL BE 3/4 INCH FOR SLABS, 1 INCH FOR WALLS AND 1-1/2 INCHES FOR COLUMNS. MINIMUM CONCRETE COVER FOR REINFORCING STEEL SHALL BE 1 INCH FOR SLABS ON GRADE AND WALLS. ALL CONCRETE EXPOSED TO WEATHER OR EARTH SHALL HAVE MINIMUM CONCRETE COVER OF 2 INCHES FOR BARS LARGER THAN #5, 1-1/2 INCHES FOR #5 BARS OR SMALLER. FOR ALL CONCRETE CAST AGAINST EARTH PROVIDE 3 INCHES COVER. ALL CONCRETE PLACED AGAINST PERMANENT SHEETING SHALL HAVE 4 INCHES COVER.

9. PROVIDE CONSTRUCTION JOINTS IN ACCORDANCE WITH ACI-318, CHAPTER 6.4. SUBMIT SHOP DRAWINGS SHOWING CONSTRUCTION JOINT LOCATIONS ALONG WITH THE SEQUENCE OF POURS FOR THE STRUCTURAL ENGINEER'S REVIEW. WALL (CONTINUOUS FOOTING) CONSTRUCTION JOINTS SHALL BE PLACED SO AS TO PROVIDE A 60 FOOT MAXIMUM LENGTH OF CONCRETE PLACEMENT.

10. NO CONCRETE TEST WILL BE ACCEPTED IF CONCRETE IS TAMPERED WITH IN ANY WAY AFTER SAID TEST IS PERFORMED. REPEAT TEST IF WATER IS ADDED AFTER INITIAL SAMPLING.

11. VERTICAL CONSTRUCTION JOINTS IN WALLS SHALL BE USED ONLY WITH PRIOR APPROVAL OF THE ENGINEER AND SHALL BE LOCATED AT LEAST EIGHT FEET FROM ANY WALL OPENING FOR FOUNDATION WALLS.

12. NO HORIZONTAL CONSTRUCTION JOINTS WILL BE PERMITTED IN BEAMS, WALLS AND SLABS UNLESS SPECIFICALLY SHOWN ON THE DRAWINGS OR APPROVED IN WRITING BY THE ENGINEER.

13. THE GENERAL CONTRACTOR SHALL PROVIDE REINFORCING STEEL ERECTOR WITH A SET OF STRUCTURAL PLANS FOR FIELD USE.

14. ALL ADJOINING SURFACES NOT CAST MONOLITHICALLY SHALL BE ROUGHENED TO 1/4 INCH AMPLITUDE FOR THE ENTIRE INTERSECTING SURFACE ACCORDING TO ACI RECOMMENDATIONS.

15. CONTRACTOR SHALL VERIFY DIMENSIONS AND LOCATIONS OF ALL OPENINGS, PIPE SLEEVES, CURBS ETC. AS REQUIRED BY OTHER TRADES BEFORE CONCRETE IS PLACED.

16. FOR LOCATION OF FLOOR DRAINS, CURBS, CONCRETE PADS AND FLOOR DEPRESSIONS SEE ARCHITECTURAL AND MECHANICAL DRAWINGS.

17. COORDINATE LOCATION OF SLOTTED INSERTS, WELDED PLATES, AND OTHER ITEMS TO BE EMBEDDED IN CONCRETE WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.

18. CONTRACTOR SHALL USE RIGID TEMPLATES TO INSTALL ANCHOR BOLTS.

19. PIPES OR CONDUITS ARE NOT PERMITTED TO BE PLACED IN SLAB.

20. TYPICAL SLAB ON-GRADE REINFORCING SHALL BE AS FOLLOWS: TEMPERATURE REINFORCING 6 X 6 - W2.9 X W2.9 WELDED WIRE FABRIC.

FOUNDATION NOTES:

1. DOWELS FROM FOOTINGS INTO PIERS AND WALLS ABOVE, SHALL BE THE SAME SIZE AND NUMBER AS VERTICAL REINFORCEMENT IN PIERS AND WALLS, AND SHALL BE EXTENDED LTE INTO FOOTINGS AND LTS INTO PIERS AND WALLS UNLESS OTHERWISE SHOWN.

2. DROP BOTTOM OF WALLS AND PIERS TO TOP OF FOOTINGS, TO OBTAIN FULL EXTENT OF CONTACT, UNLESS OTHERWISE SHOWN.

3. CENTERLINE OF FOOTINGS AND CENTERLINE OF WALLS, PIERS, COLUMNS, AND BEAMS SHALL BE THE SAME UNLESS OTHERWISE NOTED.

4. NO BACK FILLING SHALL BE DONE AGAINST FOUNDATION AND RETAINING WALLS UNTIL CONCRETE HAS ATTAINED AT LEAST 75% OF ITS 28 DAY STRENGTH. BEFORE BACK FILLING, PROVIDE BRACING FOR WALLS SUSTAINING MORE THAN 3 FEET OF EARTH PRESSURE. THIS BRACING SHALL REMAIN IN PLACE UNTIL ALL SLABS AND BEAMS FRAMING INTO WALL (INCLUDING SLAB ON GRADE) HAVE BEEN PLACED AND SET.

6. CONTRACTOR SHALL BE RESPONSIBLE TO ADEQUATELY PROTECT ALL EXCAVATION SLOPES. WHERE NECESSARY SHEETING AND SHORING OF EXCAVATION SHALL BE PROVIDED WITH ALL REQUIRED TIE BACKS AND BRACING.

7. THE MAXIMUM SLOPE BETWEEN TWO ADJACENT FOOTINGS SHALL NOT EXCEED 2 HORIZONTAL TO 1 VERTICAL.

8. COMPACTION SHALL BE CONTROLLED BY A QUALIFIED TESTING LABORATORY OR GEO-TECHNICAL ENGINEER. TAKE A MINIMUM OF ONE FIELD DENSITY TEST (ASTM D-1557 OR D-2922) FOR EACH LAYER. LOCATION OF TEST SHALL BE RANDOMLY SELECTED BY TESTING AGENCY.

9. FOOTINGS ADJACENT TO EXISTING BUILDING FOUNDATIONS SHALL BE DROPPED TO MATCH BOTTOM OF NEW FOOTING TO BOTTOM OF EXISTING.

STRUCTURAL STEEL NOTES:

1. FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL CONFORM WITH THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, "MANUAL OF STEEL CONSTRUCTION" (LATEST EDITION) OR THE "MANUAL FOR STEEL CONSTRUCTION, LOAD AND RESISTANCE FACTOR DESIGN" (LATEST EDITION).

2. ALL STEEL DETAILS AND CONNECTIONS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE AISC "SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS, ALLOWABLE STRESS DESIGN AND PLASTIC DESIGN", (LATEST EDITION) OR THE "MANUAL FOR STEEL CONSTRUCTION, LOAD AND RESISTANCE FACTOR DESIGN", (LATEST EDITION). BRACED FRAME CONNECTIONS SHALL BE DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AISC "SEISMIC PROVISIONS FOR STRUCTURAL BUILDINGS" 2002 EDITION.

3. ALL ROLLED SHAPES SHALL CONFORM TO ASTM STANDARD A572, GRADE 50 UNLESS SPECIFICALLY INDICATED ELSEWHERE ON OTHER DRAWINGS.

4. STEEL FOR TUBE SECTIONS SHALL COMPLY WITH ASTM A500 GRADE B, FY = 46 KSI. PIPE STEEL SHALL COMPLY WITH ASTM A 500 GR B, FY = 42 KSI.

5. ALL CONNECTION MATERIAL, BASE PLATES, ANGLES AND MISCELLANEOUS FRAMING SHALL CONFORM TO ASTM STANDARD A-36 UNLESS OTHERWISE NOTED.

6. SHOP AND FIELD CONNECTIONS NOT SPECIFICALLY DETAILED ON THE DRAWINGS MAY BE BOLTED OR WELDED.

7. WHEN NOT SPECIFICALLY DETAILED ELSEWHERE ON THE DRAWINGS, ALL BEAM TO BEAM AND BEAM TO COLUMN CONNECTIONS SHALL BE TWO SIDED WEB ANGLE CONNECTIONS.

8. ALTERNATE CONNECTIONS WILL BE ACCEPTED ONLY WITH THE 8 WRITTEN APPROVAL OF THE ENGINEER. HOWEVER, THE ENGINEER SHALL BE THE SOLE JUDGE OF ACCEPTABILITY AND THE CONTRACTOR'S BID SHALL ANTICIPATE THE USE OF THOSE SPECIFIC DETAILS SHOWN ON THE DRAWINGS. IN ANY EVENT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF SUCH ALTERNATE DETAILS WHICH HE PROPOSES.

9. WHEN INDICATED AS BOLTED ON THE DRAWINGS, ALL SHOP OR FIELD BOLTED BEAM TO BEAM CONNECTIONS SHALL BE BOLTED CONNECTIONS USING 3/4 INCH DIAMETER A325 BEARING BOLTS IN STANDARD HOLES UNLESS SPECIFICALLY NOTED OTHERWISE.

10. ALL BEAMS AND GIRDERS SHALL BE CONNECTED FOR 115% OF REACTION DENOTED BY THE SYMBOL V ON PLAN. IF NO REACTION IS GIVEN PROVIDE CONNECTIONS PER NOTE 12 BELOW.

11. ALL BEAM AND GIRDER CONNECTIONS SHALL BE A LEAST CAPABLE OF DEVELOPING THE UNIFORMLY DISTRIBUTED LOAD CAPACITY OF THE MEMBER USING THE REACTION FROM THE ALLOWABLE LOAD OF BEAM AS TABULATED IN THE MANUAL OF STEEL CONSTRUCTION PART 2, (LATEST EDITION) UNLESS NOTED OTHERWISE.

12. WHEN INDICATED AS BOLTED ON THE DRAWINGS, ALL SHOP OR FIELD BOLTED COLUMN SPLICES, COLUMN TO BEAM CONNECTIONS AND BRACING CONNECTIONS SHALL BE BEARING TYPE CONNECTIONS USING 3/4 INCH DIAMETER A325 BOLTS IN STANDARD HOLES.

13. SPLICES SHALL BE ALLOWED ONLY AT LOCATIONS SPECIFICALLY INDICATED ON THE STRUCTURAL DRAWINGS UNLESS APPROVED OTHERWISE BY THE ENGINEER IN WRITING.

14. OVERSIZED OR SLOTTED HOLES SHALL NOT BE USED FOR ANY CONNECTIONS UNLESS SPECIFICALLY INDICATED ON THE DRAWINGS OR APPROVED IN WRITING BY THE ENGINEER.

15. ALL ANCHOR RODS SHALL CONFORM TO F1554 UNLESS OTHERWISE NOTED.

16. THE STRUCTURAL STEEL CONTRACTOR SHALL COORDINATE THE BOTTOM OF BASE PLATE ELEVATION WITH THE TOP OF CONCRETE ELEVATION. IN CASE OF CONFLICT, THE CONTRACTOR SHALL MAKE ALLOWANCE IN HIS BID FOR THE MOST STRINGENT REQUIREMENTS.

17. ALL WELDS INDICATED SHALL MEET THE MINIMUM WELD SIZE SPECIFIED BY THE CURRENT AISC MANUAL OF STEEL DESIGN.

18. ALL WELDING SHALL BE PERFORMED BY QUALIFIED WELDERS IN ACCORDANCE WITH A.W.S. SPECIFICATIONS, (LATEST EDITIONS). ALL WELDING ELECTRODES SHALL CONFORM TO A.W.S. A5.1 GRADE E-70. BARE ELECTRODES AND GRANULAR FLUX SHALL CONFORM TO A.W.S. A5.17, F7O A.W.S. FLUX CLASSIFICATION.

19. PROVIDE WELDED STIFFENER PLATES ON BOTH SIDES OF THE WEB OF BEAMS AT POINTS OF CONCENTRATED LOAD.

20. THE FILLER BEAMS SHOULD BE SPACED EQUALLY BETWEEN THE SUPPORTS IF NOT OTHERWISE NOTED ON THE DRAWINGS.

21. CUTS, HOLES, COPING, ETC. REQUIRED FOR WORK OF OTHER TRADES SHALL BE SHOWN ON THE SHOP DRAWINGS AND MADE IN THE SHOP. CUTS OR BURNING OF HOLES IN STRUCTURAL STEEL MEMBERS IN THE FIELD WILL NOT BE PERMITTED.

22. STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH ARCHITECTURAL AND MECHANICAL DRAWINGS AND DRAWINGS RELATED TO OTHER TRADES. THE GENERAL CONTRACTOR IS RESPONSIBLE TO CHECK AND COORDINATE DIMENSIONS, CLEARANCES, ETC., WITH THE WORK OF OTHER TRADES.

23. THE STRUCTURAL STEEL CONTRACTOR SHALL VERIFY AND COORDINATE THE LOCATIONS OF BEAMS AND GIRDERS AROUND ELEVATORS WITH THE ARCHITECTURAL AND MECHANICAL DRAWINGS.

24. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH SHOP DRAWINGS TO BE APPROVED PRIOR TO FABRICATING STEEL.

REINFORCED MASONRY NOTES:

1. CONCRETE BLOCK SHALL BE HOLLOW LOAD-BEARING CONCRETE MASONRY UNITS CONFORMING TO ASTM C90. CONCRETE MASONRY SHALL HAVE A PRISM STRENGTH FM' OF 1800 PSI. PRISM STRENGTHS SHALL BE DETERMINED BASED ON TESTS IN ACCORDANCE WITH ASTM E 447 METHOD B, EXCEPT THAT PRISMS SHALL BE CONSTRUCTED IN STACK BOND WITH A HEIGHT TO THICKNESS RATIO BETWEEN 1.33 AND 5.0 AND WITH A MINIMUM OF ONE JOINT.

2. MORTAR SHALL BE TYPE M MORTAR WITH MINIMUM 28 DAY COMPRESSIVE STRENGTH AS REQUIRED TO OBTAIN THE PRISM STRENGTH SPECIFIED ABOVE.

3. ALL CELLS CONTAINING REINFORCING SHALL BE FILLED SOLID WITH GROUT. GROUT SHALL SATISFY THE REQUIREMENTS OF ASTM C 476. GROUT COMPRESSIVE STRENGTH SHALL BE 1500 PSI, TESTED IN ACCORDANCE WITH ASTM C 1019. CONTRACTOR HAS THE OPTION OF GROUTING ALL CELLS.

4. DOWELS FROM FOUNDATIONS AND / OR SLABS SHALL BE PLACED TO ALIGN WITH CELLS IN CMU TO RECEIVE REINFORCING.

5. GROUT SHALL BE PLACED BY LOW-LIFT METHOD. MAXIMUM GROUT POUR HEIGHT SHALL BE FOUR (4) FEET.

6. HORIZONTAL REINFORCEMENT SHALL BE DUR-O-WAL TRUSS OR LADDER TYPE REINFORCEMENT, OR APPROVED EQUAL, WITH 2 - 9 GAGE CROSS WIRES AND 9 GAGE CROSS WIRES AT EVERY OTHER COURSE.

7. FOR NON-LOAD BEARING CONCRETE MASONRY, PROVIDE #5 AT 48" O.C. VERTICAL REINFORCEMENT IN THE CENTER OF THE BLOCKS AND GROUT ALL CELLS CONTAINING REINFORCING: THE FIRST CELL AT CORNERS AND ENDS OF WALLS SHALL BE REINFORCED WITH 1 - #5 AND GROUTED. 1 - #5 (EXTENDING 2'-0" BEYOND CORNERS) SHALL BE PLACED ON ALL SIDES OF WALL OPENINGS.

8. FOR LOCATION AND THICKNESS OF MASONRY WALLS, SEE ARCHITECTURAL DRAWINGS.

METAL DECK NOTES:

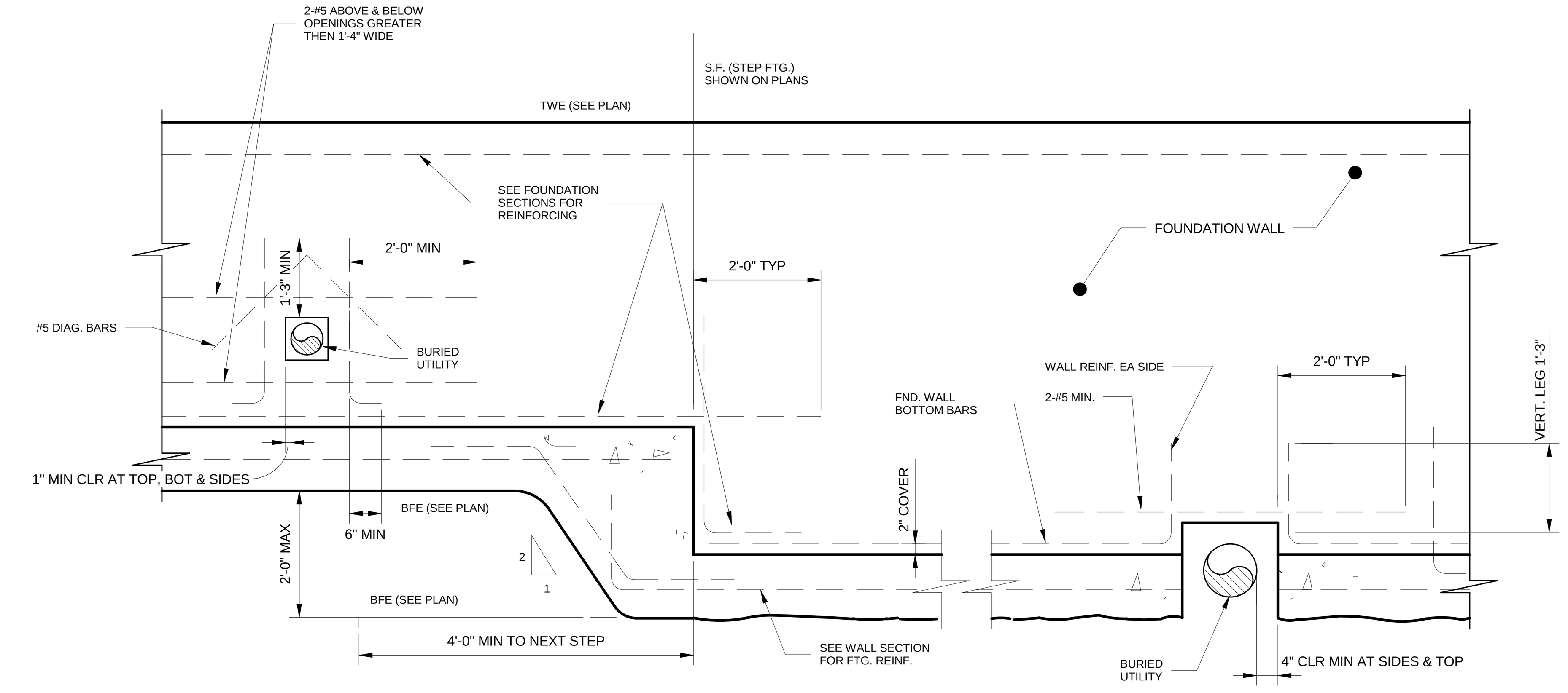
1. SEE PLANS FOR SIZE, TYPE, AND EXTENT OF METAL DECKING.

2. ALL METAL DECK SHALL BE FABRICATED AND INSTALLED FOR A MINIMUM THREE SPAN CONDITION. ONE SPAN CONDITIONS ARE PROHIBITED, UNLESS SPECIFICALLY INDICATED ON DWGS.

3. ALL METAL DECK UNITS SHALL BE FASTENED TO THE STEEL FRAMEWORK AT ENDS OF UNITS AND AT ALL INTERMEDIATE SUPPORTS BY WELDS NOT LESS THAN 3/4 IN. DIAMETER SPACED AT A MAXIMUM OF 12 INCHES ON CENTER (EVERY OTHER RIB) IN THE FIELD OF THE ROOF AND 6 INCHES ON CENTER (EVERY RIB) AT ALL SUPPORTS IN THE ROOF CONERS AND PERIMETER. THE WIDTH OF THE ROOF PERIMETER STRIP WAS CALCULATED AT 18 FEET. SIDE LAPS OF ADJACENT UNITS MAY BE FASTENED BETWEEN SUPPORTS BY SIDE SEAM WELDING OR BUTTON PUNCHING AT INTERVALS NOT EXCEEDING 24 INCHES ON CENTER. SEAM WELDS SHALL BE A MINIMUM OF 1 1/2 INCH BY 1/2 INCH.

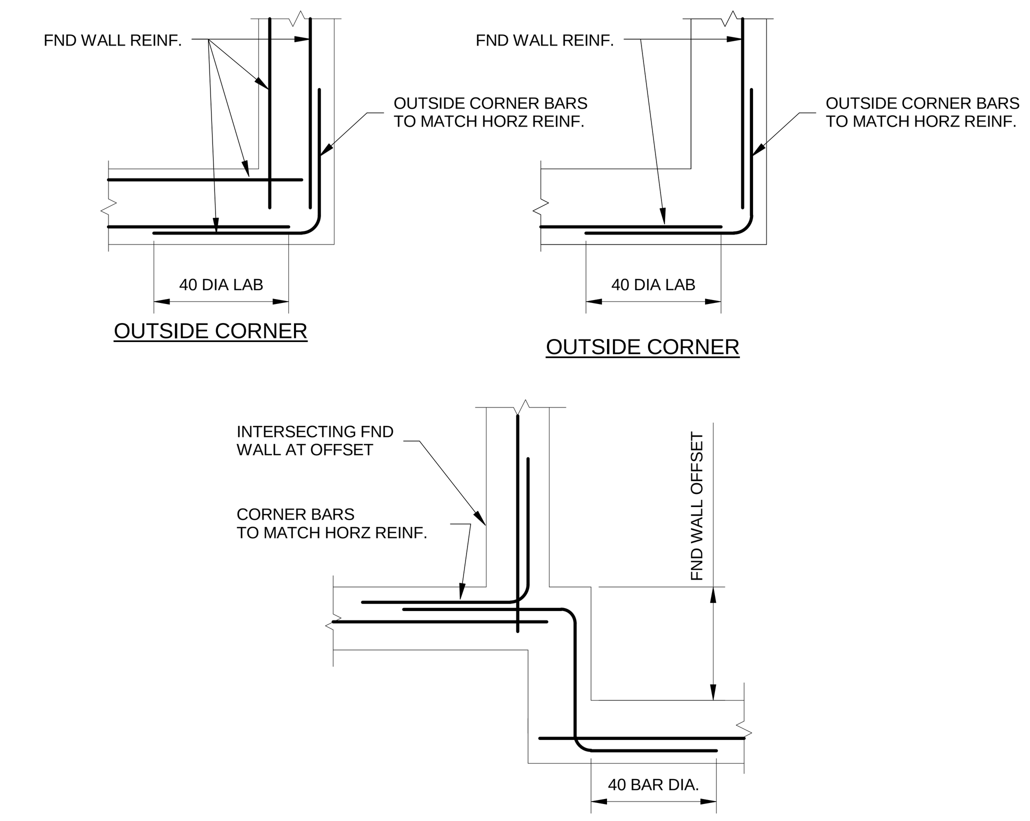
4. LOADS HUNG FROM COMPOSITE METAL FLOOR DECK HANGER TABS SHALL NOT EXCEED 60 LBS. / HANGER TAB. IN ADDITION LOADS ON HANGERS SHALL BE DISTRIBUTED IN SUCH A MANNER THAT THE TRIBUTARY LOADS FOR EACH HANGER SHALL NOT EXCEED 5 POUNDS PER SQUARE FOOT. MECHANICAL EQUIPMENT SHALL NOT BE HUNG DIRECTLY FROM METAL DECK.

5. DECKING CONTRACTOR SHALL COORDINATE DECK OPENING SIZES AND LOCATIONS FROM ARCHITECTURAL AND MECHANICAL DRAWINGS. HE SHALL PROVIDE HEADER MEMBERS OR REINFORCEMENT AS REQUIRED.

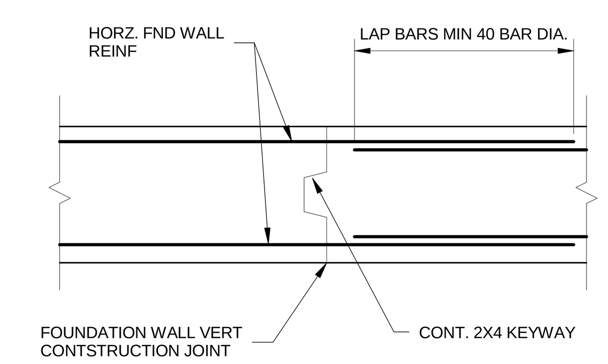


TYP. FOUNDATION WALL / FOOTING DETAILS

N.T.S



NOTE: VERT WALL REINF NOT SHOWN SEE FOUNDATION SECTIONS



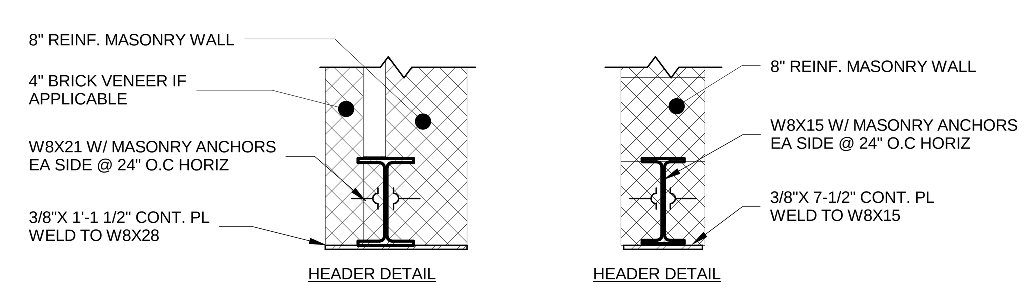
FND WALL CONST. JOINT DETAIL

N.T.S

DETAIL - TYPICAL FND WALL CORNER REINF.

N.T.S

LOOSE LINTEL SCHEDULE	
LOOSE LINTLE SHALL CONSIST OF ONE ANGLE FOR EACH 4" OF MASONRY AS FOLLOWS	
SIZE OF MASONRY OPENING	SIZE OF ANGLE
UP TO 4'-0"	L3 1/2" X 3 1/2" X 5/16"
UP TO 5'-6"	L5" X 3 1/2" X 5/16" LLV
UP TO 7'-6"	L6" X 3 1/2" X 5/16" LLV
UP TO 8'-6"	W8X15 + 3/8" PL W8X28 + 3/8" PL
UP TO 12'-6"	W8X31 + 3/8" PL



2 TYPICAL LOOSE LINTEL SCHEDULE
1" = 1'-0"

SCHEDULE OF EMBEDMENT + SPLICE LENGTH (IN INCHES)

BAR SIZE	COMPRESSION		TENSION (f'c = 4,000 psi)								TENSION (f'c = 5,000 psi)								TENSION (f'c = 6,000 psi)							
	EMBEDMENT LENGTH	LAP SPLICE LENGTH	EMBEDMENT LENGTH				LAP SPLICE LENGTH				EMBEDMENT LENGTH				LAP SPLICE LENGTH				EMBEDMENT LENGTH				LAP SPLICE LENGTH			
			TOP BARS		OTHER BARS		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS	
			CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1	
			I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
#3	8	12	19	28	14	21	24	36	19	28	17	25	13	19	22	32	17	25	16	23	12	17	20	29	16	23
#4	11	15	25	37	19	28	36	48	25	37	22	33	17	25	29	43	22	33	20	30	15	23	26	39	20	30
#5	14	19	31	46	24	36	40	60	31	46	28	41	21	32	36	54	28	41	25	38	19	29	33	49	25	38
#6	17	23	37	55	28	43	48	72	37	55	33	50	25	38	43	65	33	50	30	45	23	35	39	59	30	45
#7	19	27	54	81	42	62	70	105	54	81	48	72	37	56	63	94	48	72	44	66	34	51	57	86	44	66
#8	22	30	62	92	47	71	80	120	62	92	55	83	42	64	72	108	55	83	50	76	39	58	65	98	50	76
#9	25	34	70	104	54	80	90	136	70	104	62	93	48	72	81	121	62	93	57	85	44	66	74	111	57	85
#10	28	39	78	117	60	90	102	153	78	117	70	105	54	81	91	137	70	105	64	96	49	74	83	125	64	96
#11	31	43	87	130	67	100	113	170	87	130	78	117	60	90	101	152	78	117	71	106	54	82	92	138	71	106
NOTATION USED ON DWG	LCE	LCS	LTE				LTS				LTE				LTS				LTE				LTS			

1 SCHEDULE OF EMBEDMENT AND SPLICE LENGTH
SCALE: NOT TO SCALE

NOTES FOR SCHEDULES OF SPLICE LENGTH:

1. THE SCHEDULES BELOW INCLUDES SPLICE LENGTHS WHICH SATISFY THE PROJECT REQUIREMENTS AND THE FOLLOWING CRITERIA.

fy=60,000psi
CONCRETE WEIGHT = 150lb/cu.ft.

TENSION SPLICE LENGTHS ARE DIVIDED INTO TWO CATEGORIES WHICH SHALL BE APPLIED AS FOLLOWS:

2. CATEGORY I; CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN db, CLEAR COVER NOT LESS THAN db, AND BEAM STIRRUPS OF COLUMN TIES THROUGHOUT Ld NOT LESS THAN THE CODE MINIMUM OR CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN 2db & CLEAR COVER NOT LESS THAN db.

CATEGORY II; BARS NOT COVERED BY CATEGORY I.

3. USE COMPRESSION LAP SPLICE LENGTH (LCS) AT ALL COLUMN SPLICE LOCATIONS NOT SPECIFICALLY DETAILED AND UNLESS INDICATED OTHERWISE ON PLANS OR DETAIL. USE TENSION SPLICE FOR ALL OTHER SPLICES (UNLESS OTHERWISE SHOWN ON DRAWINGS).

4. THE STANDARD LAP SPLICE (0.0005 x fy x D) IS USED FOR COMPRESSION IN SPLICES AND CLASS "B" SPLICE IS USED FOR TENSION SPLICES. THE CONTRACTOR MAY SUBMIT LESSER SPLICE LENGTHS FOR REVIEW AND APPROVAL AT THE SAME TIME PROVIDING THE FOLLOWING INFORMATION:

A. DETAILS PREPARE AND SUBMITTED BY THE CONTRACTOR INDICATING LOCATION AND PROPOSED LAYOUT OF REBARS AND LENGTHS OF SPLICES.

B. WHERE THE SIZE AND NUMBER OF TIES OR SPIRALS PERMITS THE REDUCTION OF LAP LENGTH, THOSE BARS SHALL BE INDICATED ON THE DETAILS.

C. WHERE COMPUTED STRESS VALUES PERMIT THE REDUCTION OF LAP LENGTH, COMPUTATIONS SHALL BE SUBMITTED FOR REVIEW.

D. THE APPLICABLE SECTION OF THE ACI-95 CODE PERMITTING THE LESSER SPLICE LENGTH SHALL BE INDICATED IN THE SUBMITTED MATERIAL.

5. TOP BARS ARE HORIZONTAL BARS PLACED SO THAT MORE THAN 12 INCHES OF CONCRETE IS CAST IN THE MEMBER BELOW THE BAR.

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE

STRUCTURAL NOTES

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100% CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

DATE: 4/6/2015
SCALE: 1" = 1'-0"
DRAWN BY: JRO
CHECKED BY: EGS

STATE PROJECT NO:
OFFICE PROJECT NO: 83TS4.01

FILE PATH
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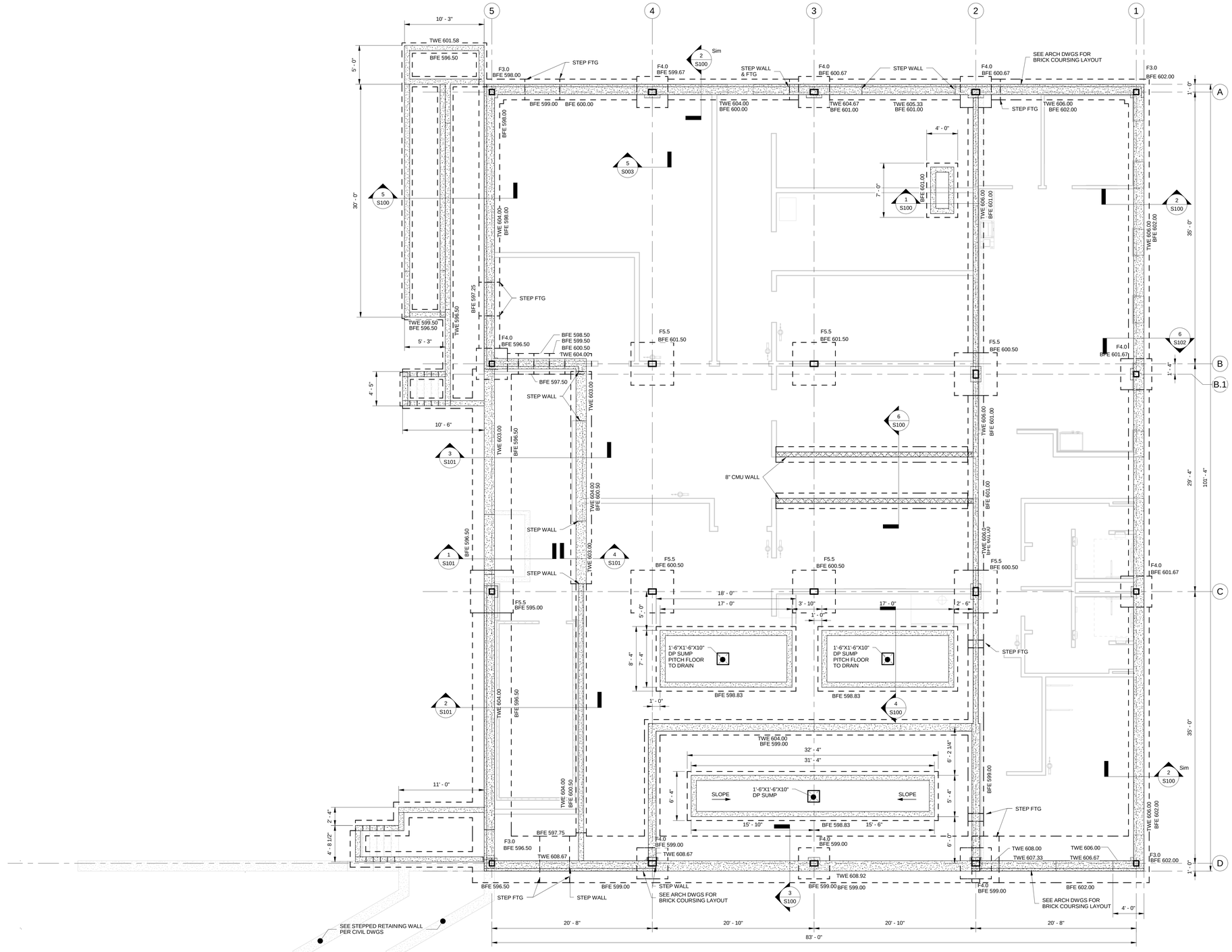

SPREAD FOOTING SCHEDULE		
MARK	SIZE	REINFORCING
F3.0	3'-0" X 3'-0" X 1'-0"	5-#5 EW (END BEND 90')
F4.0	4'-0" X 4'-0" X 1'-6"	6-#5 EW (END BEND 90')
F5.5	5'-6" X 5'-6" X 1'-6"	8-#5 EW (END BEND 90')

1 FOUNDATION PLAN
3/16" = 1'-0"

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
FOUNDATION PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100% CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO:
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DATE: 4/6/2015
SCALE: 3/16" = 1'-0"
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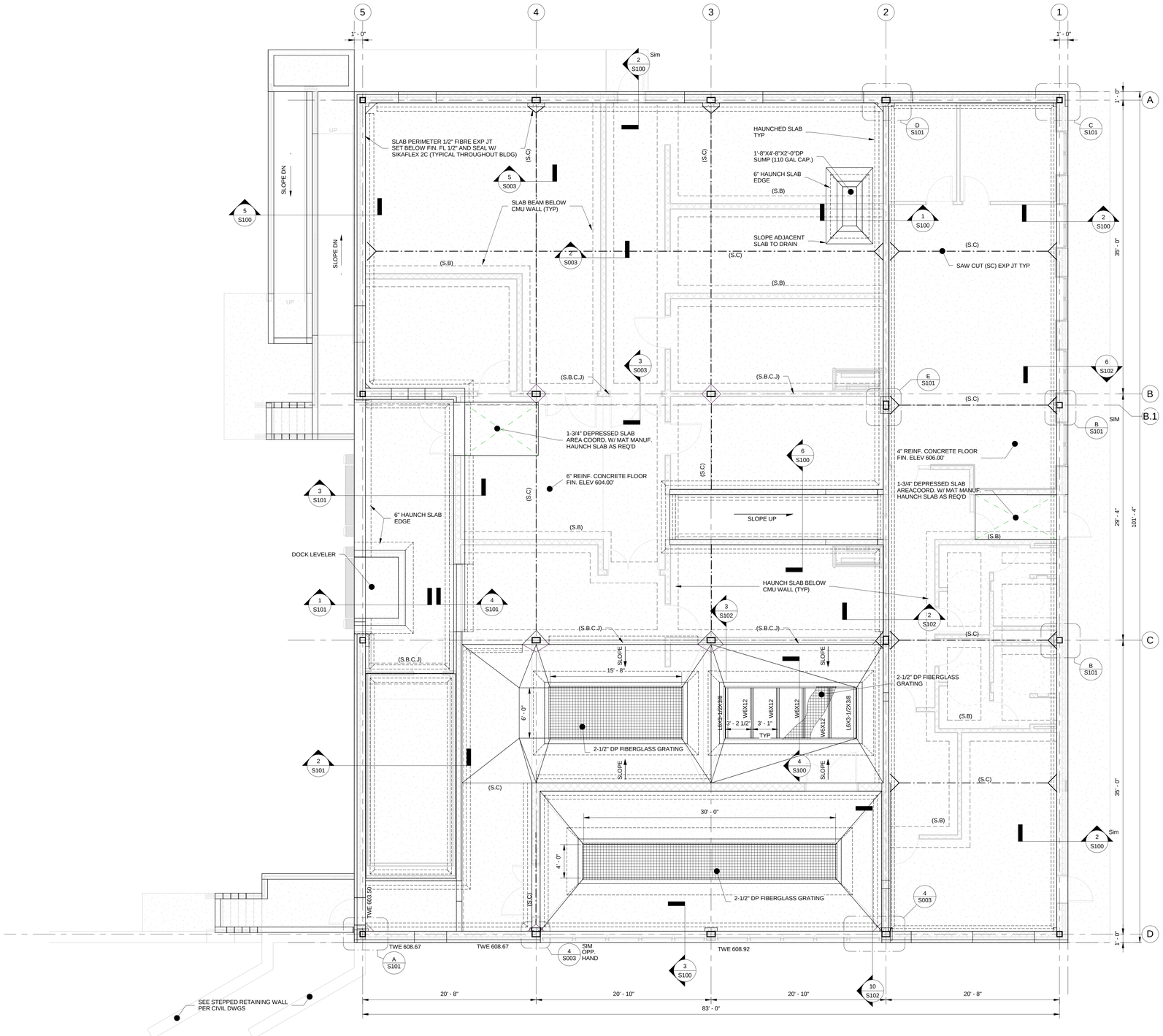

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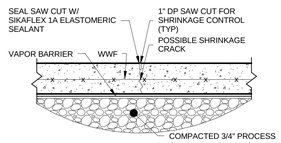
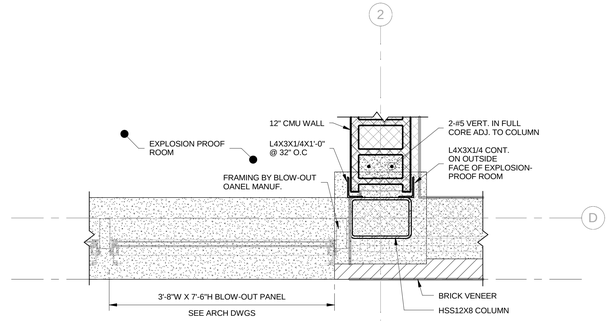
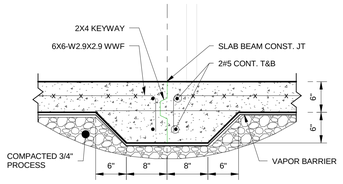
1 FIRST FLOOR PLAN
3/16" = 1'-0"



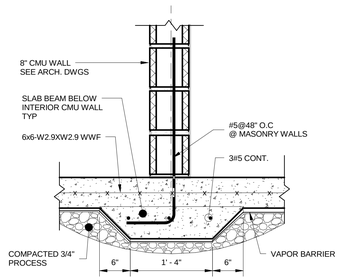
5 SLAB SAW CUT (S.C)
1" = 1'-0"



4 EXPLOSION-PROOF ROOM WALL/COLUMN DETAIL
1" = 1'-0"



3 SLAB BEAM CONST. JOINT (S.B.C.J)
1" = 1'-0"



2 SLAB BEAM (S.B)
1" = 1'-0"

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UNIVERSITY OF CONNECTICUT

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TITLE
FIRST FLOOR PLAN

ISSUE DATES

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2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100% CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
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S003

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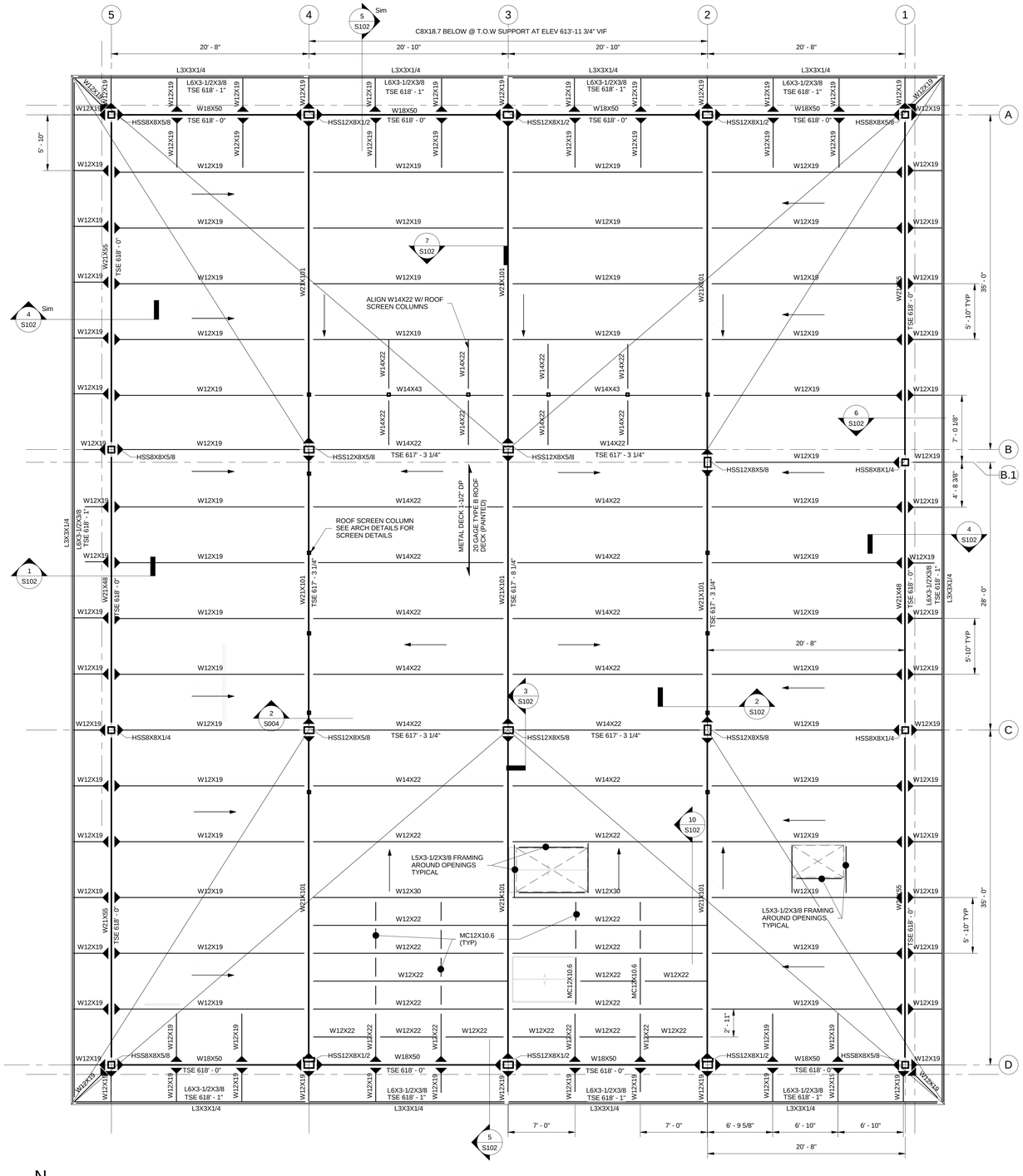
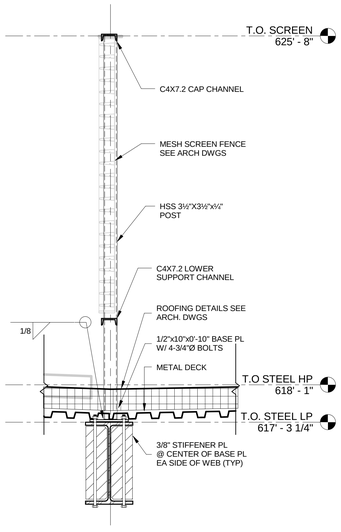


N

1 ROOF FRAMING PLAN
3/16" = 1'-0"



2 ROOF SCREEN FRAMING - DETAIL
3/4" = 1'-0"

COLUMN SCHEDULE

LOCATION	B-1-1 , C-1	A-1 , D-1	B-1-2 , C-2	A-2 , D-2	A-3 , D-3	B-3 , C-3	B-4 , C-4	A-4 , D-4	B-5 , C-5	A-5 , D-5
CAP PLATE	$\frac{1}{2}$"X8$\frac{1}{2}$"X0'-8$\frac{1}{2}$"	MOMENT CONN.	MOMENT CONN.	MOMENT CONN.	MOMENT CONN.	MOMENT CONN.	MOMENT CONN.	MOMENT CONN.	$\frac{1}{2}$"X8$\frac{1}{2}$"X0'-8$\frac{1}{2}$"	MOMENT CONN.
ROOF ELEVATION 618.00'			0'-8$\frac{1}{2}$"			0'-3$\frac{1}{2}$"	0'-8$\frac{1}{2}$"			
	HSS8 X 8 X 1/4	HSS 8 X 8 X 5/8	HSS 12 X 8 X 5/8	HSS 12 X 8 X 5/8	HSS 12 X 8 X 5/8	HSS 12 X 8 X 5/8	HSS 12 X 8 X 5/8	HSS 12 X 8 X 1/2	HSS 8 X 8 X 1/4	HSS 8 X 8 X 5/8
					0'-3$\frac{1}{2}$"(A-3)	4-1$\frac{1}{2}$" (D-3)	0'-3$\frac{1}{2}$"(B-2) 0'-3$\frac{1}{2}$"(C-3)	0'-3$\frac{1}{2}$"(B-4) 0'-3$\frac{1}{2}$"(C-4)		
FIN. FL ELEVATION 604.00'	1'-2$\frac{1}{2}$"	1'-2$\frac{1}{2}$"	1'-2$\frac{1}{2}$"	1'-2$\frac{1}{2}$"(A-2) 4-1$\frac{1}{2}$" (D-2)				0'-9$\frac{1}{2}$"(A-4) 3'-10$\frac{1}{2}$" (D-4) 0'-9$\frac{1}{2}$"	0'-9$\frac{1}{2}$"(A-6)	3'-10$\frac{1}{2}$" (D-6)
BASE PLATE	$\frac{3}{4}$"X10"X1'-2"	$\frac{3}{4}$"X14"X1'-2"	1"X10"X1'-6"	1"X10"X1'-6"	1"X10"X1'-6"	1"X10"X1'-6"	1"X10"X1'-6"	1"X10"X1'-6"	$\frac{3}{4}$"X10"X1'-2"	1"X14"X1'-2"
ANCHOR RODS	4 - $\frac{3}{4}$"øX1'-6"	4 - $\frac{3}{4}$"øX1'-6"	4 - $\frac{3}{4}$"øX1'-6"	4 - $\frac{3}{4}$"øX1'-6"	4 - $\frac{3}{4}$"øX1'-6"	4 - $\frac{3}{4}$"øX1'-6"	4 - $\frac{3}{4}$"øX1'-6"	4 - $\frac{3}{4}$"øX1'-6"	4 - $\frac{3}{4}$"øX1'-6"	4 - $\frac{3}{4}$"øX1'-6"

- ALL ANCHOR RODS SHALL COMPLY WITH ASTM F1554 GRADE 55
- ALL COLUMNS SURFACES IN CONTACT WITH MASONRY SHALL HAVE MASONRY ANCHORS AT 24" O.C VERTICAL

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ROOF FRAMING PLAN

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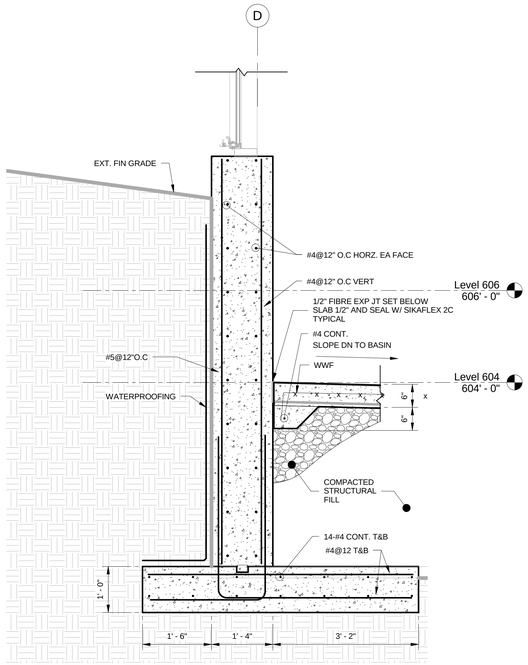
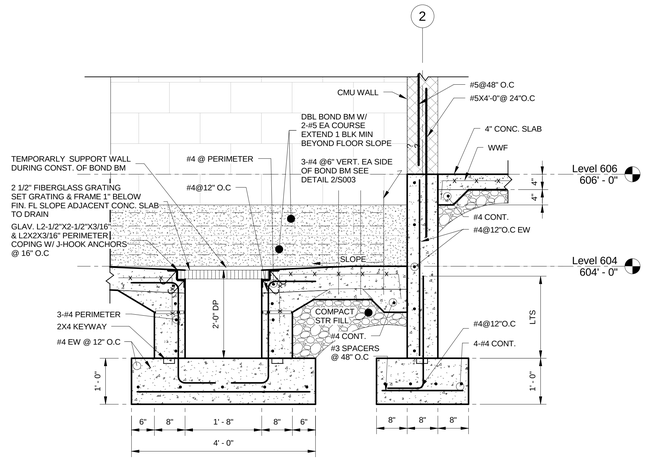
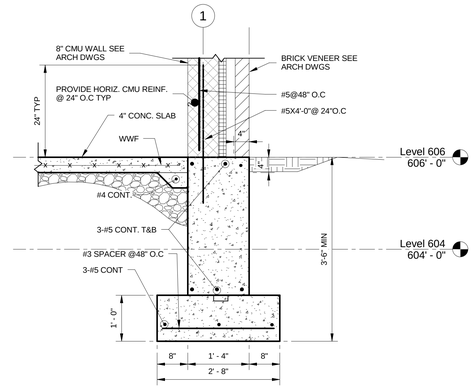


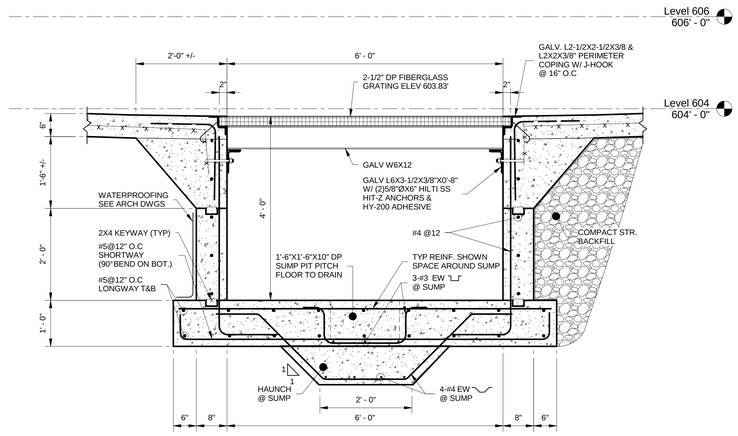
3 FOUNDATION WALL / RETAINING WALL - SECTION
3/4" = 1'-0"



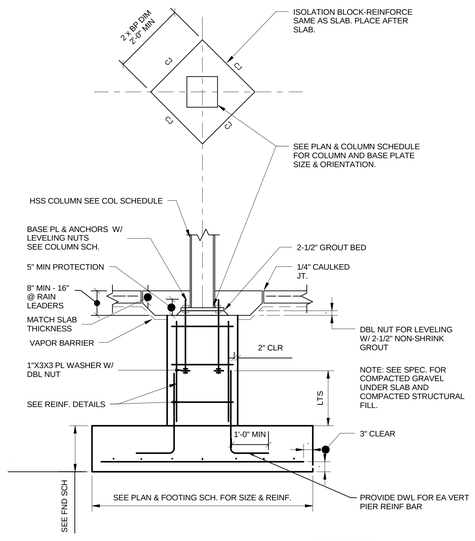
1 LAB SUMP AND FOUNDATION DETAIL
3/4" = 1'-0"

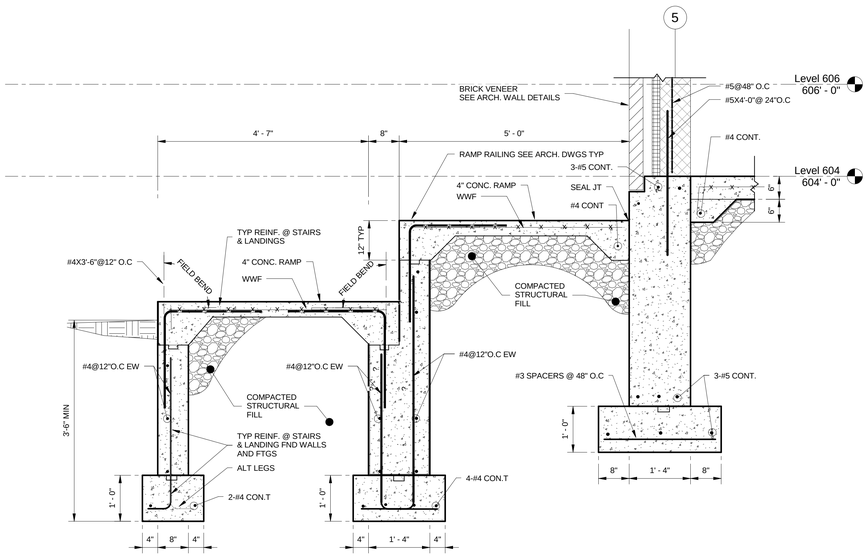


2 FOUNDATION WALL - SECTION
3/4" = 1'-0"

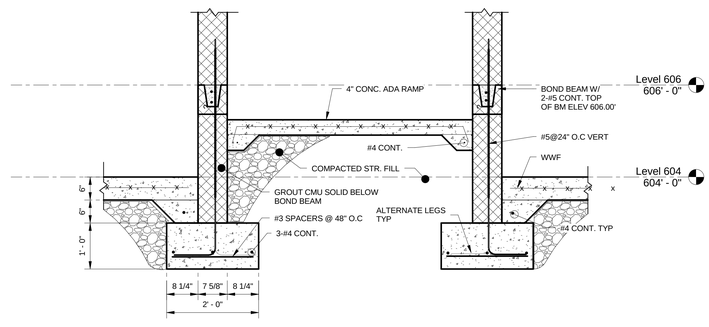


4 FIRE SUPPRESSANT STORAGE BASIN - SECTION
3/4" = 1'-0"





5 ADA RAMP FND DETAIL
3/4" = 1'-0"



6 ADA RAMP FOUNDATION SECTION
3/4" = 1'-0"

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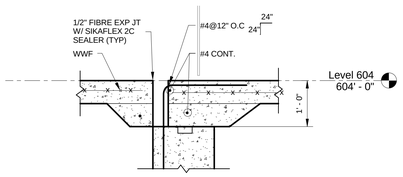
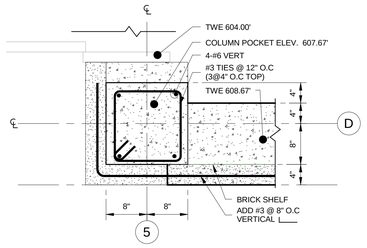
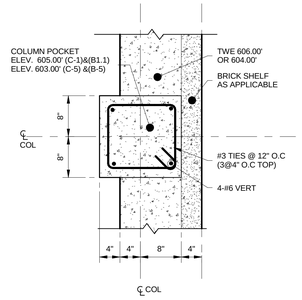


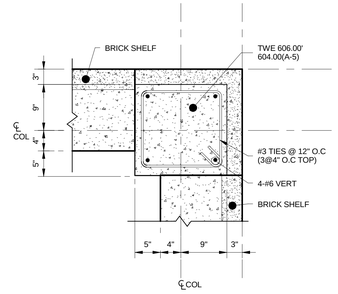
4 DETAIL AT DOORS - TYPICAL
3/4" = 1'-0"



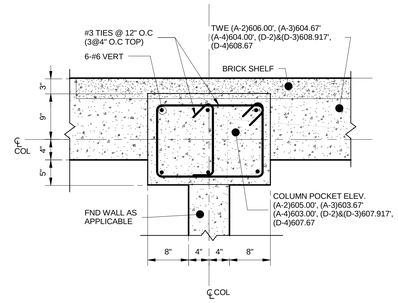
A COLUMN PILASTER DETAIL D-5
1" = 1'-0"



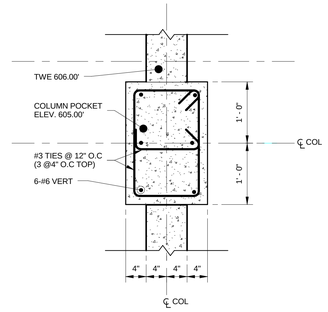
B COLUMN PILASTER DETAIL - B.1-1 & C-1 OPP.HAND B-5 & C-5
1" = 1'-0"



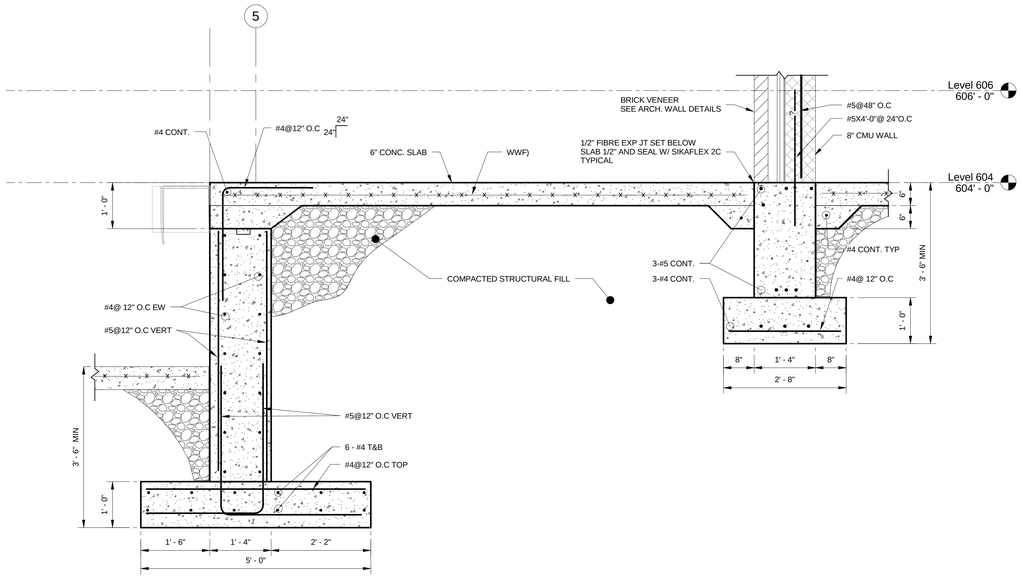
C COLUMN PILASTER DETAIL - A-1,OPP HAND A-5, D-1
1" = 1'-0"



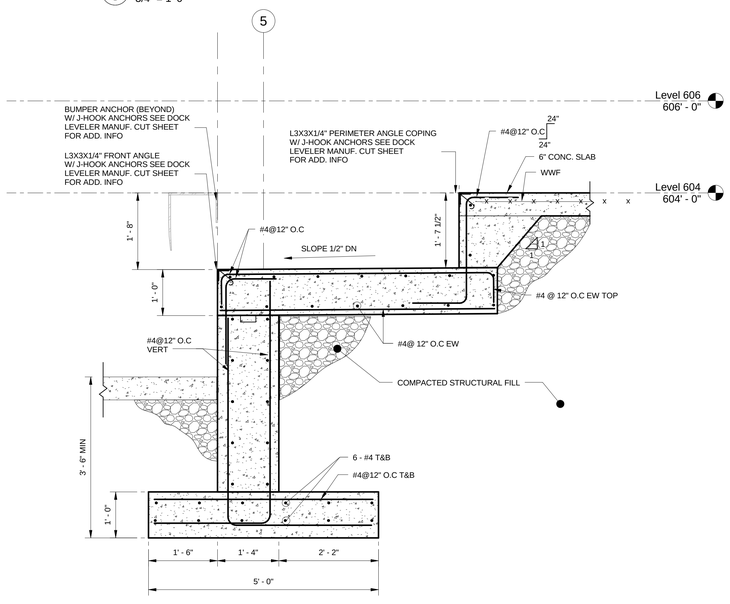
D COLUMN PILASTER DETAIL - A-2, A-3, A-4 OPP. HAND D-2, D-3, D-4
1" = 1'-0"



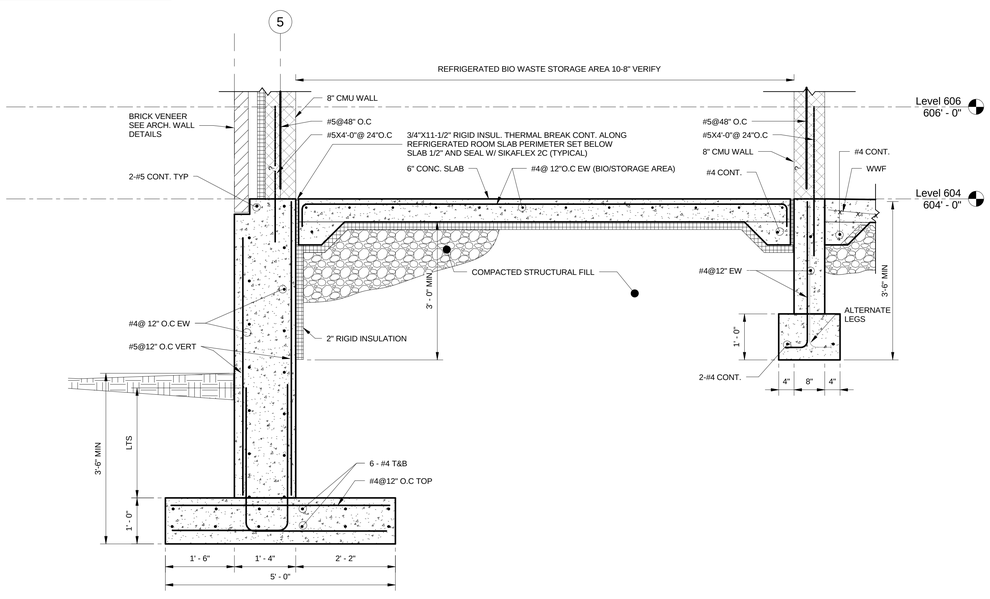
E COLUMN PILASTER DETAIL - B.1-2, C-2
1" = 1'-0"



3 LOADING DOCK FOUNDATION SECTION
3/4" = 1'-0"



1 DOCK LEVELER FOUNDATION SECTION
3/4" = 1'-0"



2 BIO/STORAGE AREA FOUNDATION SECTION
3/4" = 1'-0"

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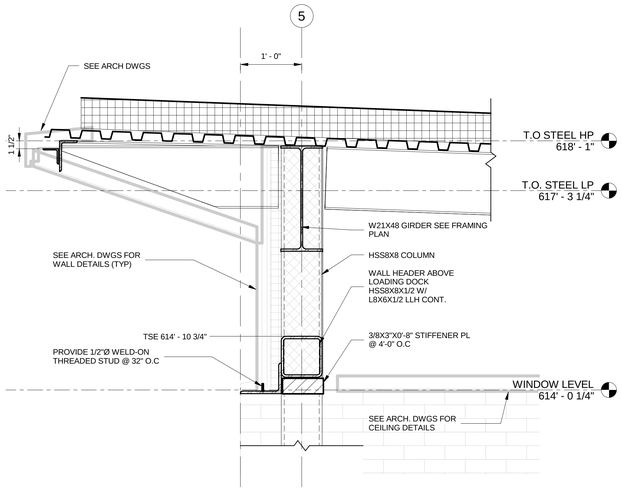
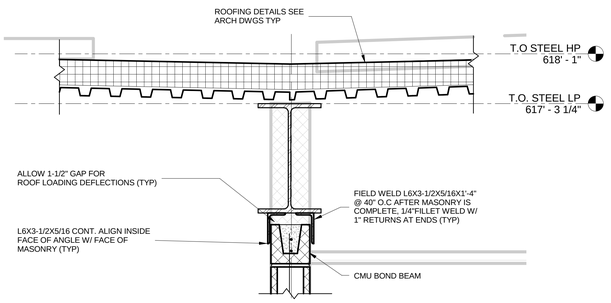
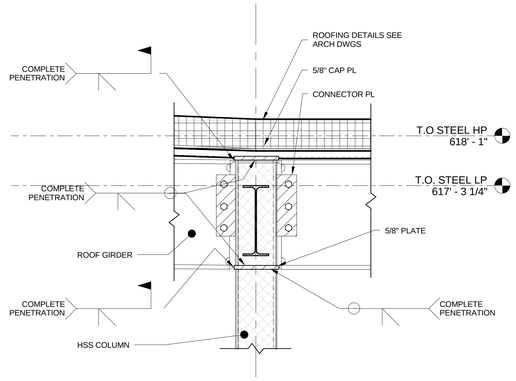


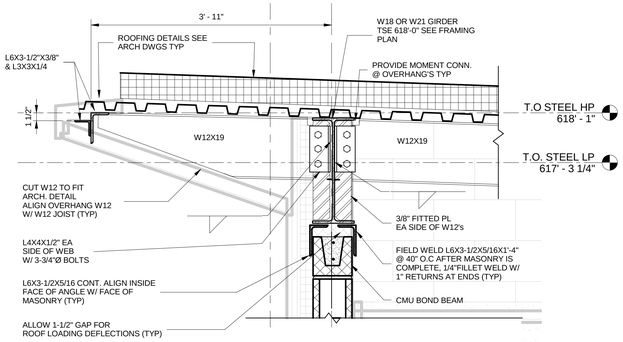
1 WALL HEADER FRAMING @ LOADING DOCK - SECTION
1" = 1'-0"



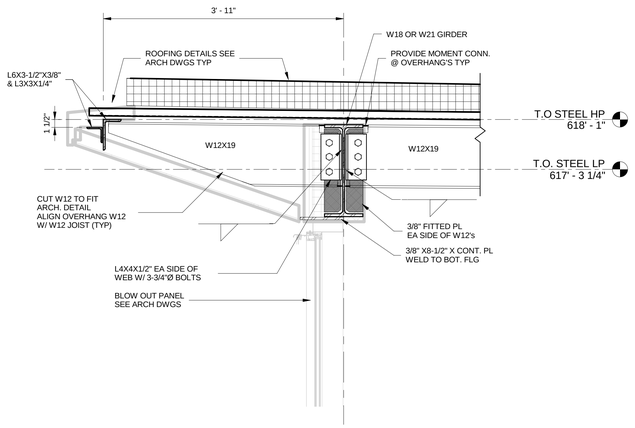
2 FRAMING & MASONRY WALL - SECTION
1" = 1'-0"



3 GIRDER FRAMING MOMENT CONNECTION - TYPICAL
1" = 1'-0"



4 ROOF OVERHANG FRAMING & MASONRY - SECTION
1" = 1'-0"



5 ROOF OVERHANG FRAMING - SECTION
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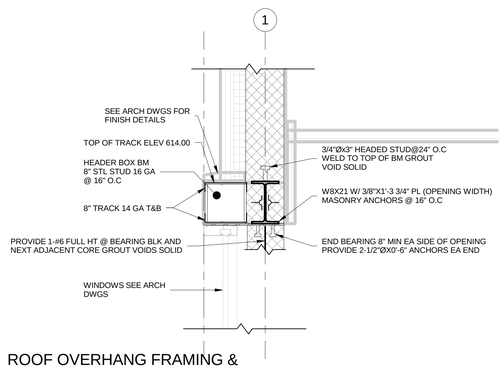
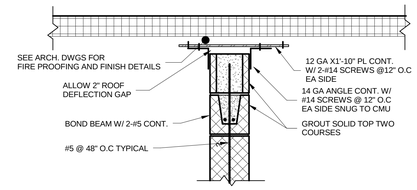
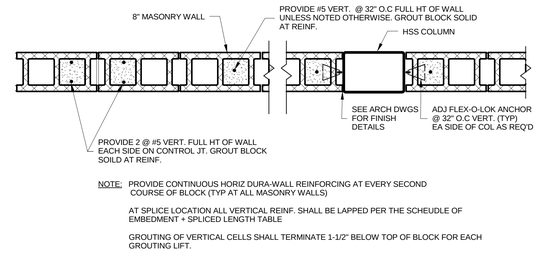


6 ROOF OVERHANG FRAMING & MASONRY - SECTION1
1" = 1'-0"



7 MASONRY WALL SUPPORT @ ROOF DECK - SECTION2
1" = 1'-0"

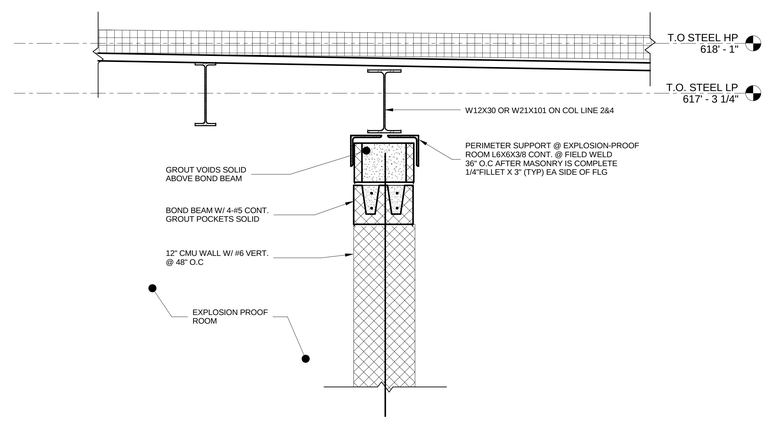


NOTE: PROVIDE CONTINUOUS HORIZ DURA-WALL REINFORCING AT EVERY SECOND COURSE OF BLOCK (TYP AT ALL MASONRY WALLS)

AT SPLICE LOCATION ALL VERTICAL REINF. SHALL BE LAPPED PER THE SCHEUDLE OF EMBEDMENT + SPLICED LENGTH TABLE

GROUTING OF VERTICAL CELLS SHALL TERMINATE 1-1/2" BELOW TOP OF BLOCK FOR EACH GROUTING LIFT.

8 TYPICAL REINFORCING AT MASONRY WALLS
1" = 1'-0"



10 CHEM-STORAGE BLAST ROOM - SECTION
1" = 1'-0"

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DATE: 4/6/2015

SCALE: 1" = 1' 0"

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MECHANICAL SYMBOL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
S/A	SUPPLY AIR		SUPPLY AIR OR OUTSIDE AIR FLOW	UD	UNDERCUT DOOR
R/A	RETURN AIR		RETURN AIR OR EXHAUST AIR FLOW	CUH	CABINET UNIT HEATER
O/A	OUTSIDE AIR		VOLUME DAMPER (VD)	ESP	EXTERNAL STATIC PRESSURE
EXH	EXHAUST AIR		REGISTER OR GRILLE		PIPE ELBOW TURNED UP
EF	EXHAUST FAN		DIFFUSER		PIPE ELBOW TURNED DOWN
AFF	ABOVE FINISHED FLOOR		R/A RECTANGULAR DUCT RISER		PIPE TEE UP
BOD	BOTTOM OF DUCT ELEVATION		S/A RECTANGULAR DUCT RISER		PIPE TEE DN
HX	HEAT EXCHANGER		EXH RECTANGULAR DUCT RISER		PIPE CAP
FD	FIRE DAMPER		R/A ROUND DUCT RISER		GATE VALVE
CFM	CUBIC FEET PER MINUTE		S/A ROUND DUCT RISER		BALL VALVE
C	COLD WATER (DOMESTIC)		EXH ROUND DUCT RISER		PRESSURE GAUGE W/SHUTOFF COCK
ACC	AIR-COOLED CONDENSER	T	THERMOSTAT		CHECK VALVE
RTU	PACKAGED ROOF TOP AC UNIT	M	MOTORIZED DAMPER		BLIND FLANGE
VD	VOLUME DAMPER	TS	TEMPERATURE SENSOR		CONTROL VALVE
UH	UNIT HEATER		FLEXIBLE CONNECTOR		SOLENOID VALVE
PF	PADDLE TYPE FAN		BALANCE VALVE		STRAINER
AC	AIR CONDITIONING		DRAIN VALVE		MANUAL AIR VENT
MAU	MAKE-UP AIR UNIT		PIPE UNION		PIPE REDUCER
CP	CONTROL PANEL		STRAINER WITH BLOWDOWN		DIRECTION OF FLOW
HWS&R	HOT WATER SUPPLY & RETURN		THERMOMETER		2-WAY CONTROL VALVE
P	PUMP	LD	LOUVERED DOOR		3-WAY CONTROL VALVE
UD	UNDERCUT DOOR				

ROOFTOP AIR CONDITIONING UNIT SCHEDULE

NUMBER	EVAPORATOR FAN				COMPRESSOR/CONDENSER					ELEC	DX COOLING COIL				HEATING (GAS-FIRED)					POWER EXHAUST			MIN EER	UNIT WEIGHT (lbs)	MIN. OUTSIDE AIR %	MANU/ MODEL	REMARKS
	CFM	TESP	RPM	HP	FAN NO.	FAN HP	FAN RPM	COMP MOTOR	COND EAT		EVAP EAT DB	EVAP EAT WB	COOLING CAPACITY TOTAL	COOLING CAPACITY SENSIBLE	EAT	LAT	CAPACITY INPUT	CAPACITY OUTPUT	STAGES	FAN CFM	FAN NO.	FAN HP					
RTU-1	1000	1.75"	1128	1.0	1	0.2	1075	2.62 KW	95°F	208/3PH	83.8°F	68.3°F	38.3 MBH	25.82 MBH	40°F	128.9°F	120 MBH	96 MBH	MODULATING	-	1	-	13	750	30	TRANE YHC036	PROVIDE WITH POWER EXHAUST
RTU-2	2400	1.75"	1192	5.0	1	0.75	1075	6.02 KW	95°F	208/3PH	84.2°F	68.5°F	90.27 MBH	65.29 MBH	40°F	96.5°F	150 MBH	120 MBH	MODULATING	-	SEE NOTES	-	11	1300	100	TRANE YHC092	PROVIDE WITH G SERIES 5 CORE ERV WITH POWER EXHAUST
RTU-3	3400	1.75"	1439	5.0	1	0.75	1075	7.60 KW	95°F	208/3PH	83.9°F	68.3°F	117.34 MBH	86.92 MBH	40°F	94.7°F	250 MBH	200 MBH	MODULATING	-	SEE NOTES	-	11	1700	100	TRANE YHC120	PROVIDE WITH D SERIES 6 CORE ERV WITH POWER EXHAUST

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE UNITS WITH THRU-THE-CURB POWER AND GAS, POWER EXHAUST, CONV OUTLET, COMPARATIVE ENTHALPY ECON, ROOF CURB, DISC SWITCH AND INTEGRATED CONTROLS.
3) PROVIDE UNITS WITH 4" DISPOSABLE, PLEATED, MERV13 PARTICULATE FILTERS.

SPLIT AIR CONDITIONING SYSTEM SCHEDULE (DATA CLOSET)

NUMBER	EVAPORATOR UNIT					COMPRESSOR/CONDENSER UNIT						DX COOLING				DX HEATING			ELEC HEATING COIL			MIN SEER	MANU/MODEL	REMARKS
	CFM	ESP	RPM	HP	ELEC	FAN NO.	FAN HP	FAN RPM	COMP MOTOR	COND EAT	ELEC	EVAP EAT DB	EVAP EAT WB	COOLING CAPACITY TOTAL	COOLING CAPACITY SENSIBLE	EVAP EAT DB	EVAP EAT WB	HEATING CAPACITY	KW	ELEC	STAGES			
AC-1	400	0" W.G.	-	-	208V/1PH	1	-	-	12 RLA	95°F	208V/1PH	80°F	67°F	18 .0 MBH	12.0 MBH	70°F	60°F	19.0 MBH @47F	-	-	-		15 MITSUBISHI PKA-A18HA4/PUZ-A18NHA4	SEE NOTES 2, 3 & 4

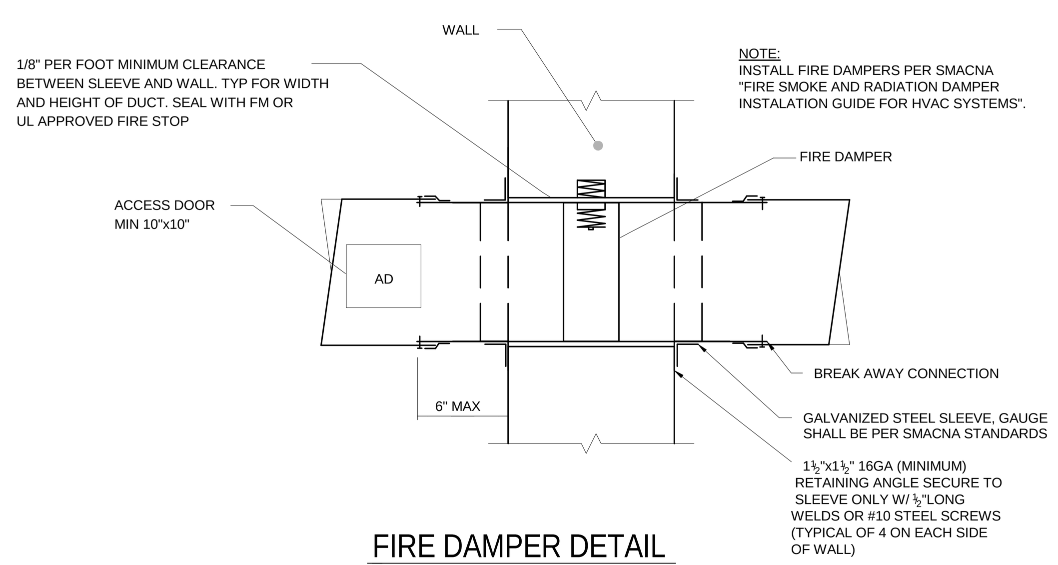
NOTES:

1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PERFORMANCE NOTED IS WITH FAN AT HIGH SPEED.
3) PROVIDE ALL UNITS WITH DISCONNECT SWITCHES AND CONDENSATE PUMPS.
4) INSIDE AC-X IS WIRED TO OUTSIDE ACC-X.

GAS FIRED UNIT HEATER SCHEDULE

UNIT NO.	TYPE	HEATING SECTION TOTAL INPUT/ OUTPUT	ENT. AIR (F)	TEMP. RISE (F)	FAN MOTOR DATA CFM	HP	VOLTS	PH	HZ	MANUFACTURER MODEL	REMARKS
GUH-1	NAT. GAS	100/80 MBH	60	50	1480	1/20	115	1	60	TRANE MODEL GAND	SEE NOTES 2 & 3

NOTE:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE ALL UH HEATERS WITH REMOTE LINE-VOLTAGE THERMOSTATS AND TAMPER PROOF CONSTRUCTION.
3) ONE STAGE, SEPARATED COMBUSTION UNIT, PROVIDE WITH CONCENTRIC ADAPTER.

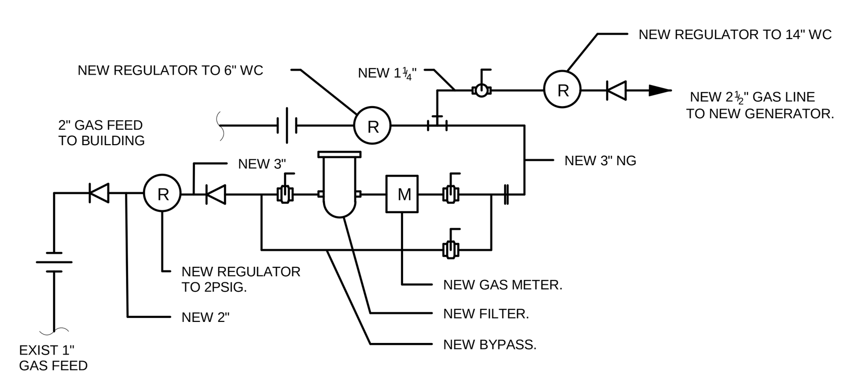


FIRE DAMPER DETAIL
SCALE: NONE

EXHAUST FAN SCHEDULE

NUMBER	AIR FLOW (CFM)	STATIC PRESSURE	MOTOR SPEED	FAN SPEED	HP	ELEC	AREA SERVING	TYPE	MAX dbA	MANU/MODEL	REMARKS
EF-1	1370	0.75"W.G.	1725 RPM	XXX RPM	X	208V/3PH	RAD LAB HOOD	ROOF UPBLAST	X	GREENHECK VEKTOR H-10	SEE NOTES 1, 2 & 3
EF-2	1370	0.75"W.G.	1725 RPM	XXX RPM	X	208V/3PH	CHEM LAB HOOD	ROOF UPBLAST	X	GREENHECK VEKTOR H-10	SEE NOTES 1, 2 & 3
EF-3	200	0.50"W.G.	1725 RPM	XXX RPM	X	120V/1PH	TOILET ROOM	ROOF CENTRIFUGAL	X	GREENHECK XX-XX	SEE NOTES 1 & 2
EF-4	5650	1.20"W.G.	1725 RPM	XXX RPM	X	208V/3PH	WALK IN HOOD	ROOF UPBLAST	X	GREENHECK VEKTOR H-16	SEE NOTES 1, 2 & 3
EF-5	75	0.30"W.G.	1725 RPM	XXX RPM	X	120V/1PH	JAN CLOSET	INLINE	X	GREENHECK XX-XX	SEE NOTES 1 & 2
EF-6	500	0.30"W.G.	1725 RPM	XXX RPM	X	208V/1PH	MECH ROOM	SIDEWALL	X	GREENHECK XX-XX	SEE NOTES 1 & 2

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE ALL FANS WITH DISCONNECT SWITCHES, AND BACKDRAFT DAMPERS.
3) EF-1, 2,&4 SHALL BE EXPLOSION PROOF MODELS.



GAS MAIN SCHEMATIC DIAGRAM
SCALE: NONE

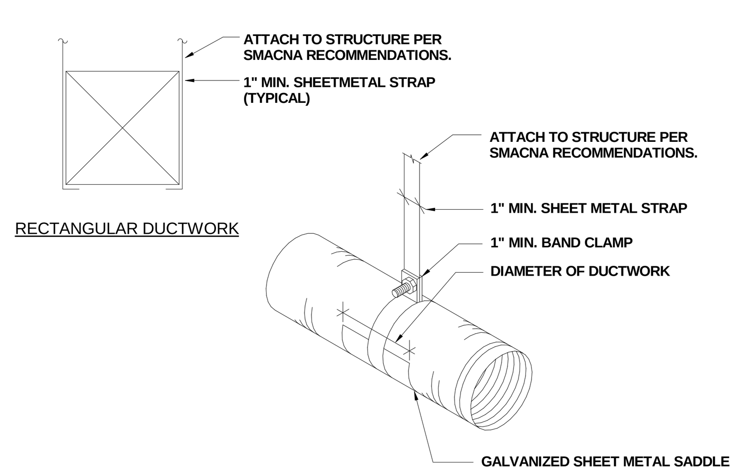
NOTES:
1. THIS CONTRACTOR TO PROVIDE ALL MATERIAL AND LABOR TO UPGRADE THE EXISTING GAS SERVICE AS REQUIRED, PER THE NATURAL GAS UTILITY.

2. ALL PIPING SHALL BE WELDED CARBON STEEL WITH FLANGED COMPONENTS. TEST PER NFPA S4.

ELECTRIC CABINET AND UNIT HEATER SCHEDULE

TYPE	KW	BTUH	ELEC	MANU/MODEL	REMARKS
CUH1	2.0/6.0	20,470	208V/3PH	TRANE FF-HB030	VERTICAL, RECESSED CABINET HEATER, PROVIDE WITH TWO-STAGE HEAT.
CUH2	2.0/6.0	20,470	208V/3PH	TRANE FF-FB030	VERTICAL, SURFACE MOUNTED HEATER, PROVIDE WITH TWO-STAGE HEAT.

NOTE:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE ALL UH HEATERS WITH BUILT-IN THERMOSTATS AND TAMPER PROOF CONSTRUCTION.



NOTES:

1. DO NOT USE POWDER POWERED FASTENING SYSTEMS TO ATTACH SUPPORTS TO STRUCTURE.
2. ALL CHANNEL SECTIONS SHALL BE HOT DIPPED GALVANIZED.
3. SUPPORT SYSTEM MUST NOT DAMAGE DUCT, INSULATION, OR CAUSE DUCT SHAPE DEFORMATION.
4. HANGER SIZES SHALL BE IN ACCORDANCE WITH SMACNA, LATEST EDITION.

DUCTWORK SUPPORT DETAIL
NTS

AIR OUTLET AND INLET SCHEDULE

TYPE	SIZE	MAX CFM	NECK	MAX NC	DESCRIPTION	MANU/MODEL	REMARKS
A	12x12	175	6"□	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
B	12x12	250	8"□	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
C	24x24	340	8"□	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
D	24x24	500	10"□	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
E	24x24	600	12"□	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
F	24x24	800	14"□	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
G	18x10	1000	-	35	4-WAY SUPPLY AIR DIFFUSER	TITUS 272RS	PROVIDE WITH OPPOSED BLADE DAMPER
H	24x18	1200	-	35	SIDEWALL SUPPLY AIR REGISTER	TITUS 272RS	PROVIDE WITH OPPOSED BLADE DAMPER
N	6x6	190	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
O	8x8	400	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
P	12x12	900	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
Q	18x12	1100	-	35		TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
R	18x18	1900	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
S	24x24	3300	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
T	30x12	2000	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) SUPPLY AIR DIFFUSERS SHALL BE 4-WAY THROW UNLESS NOTED OTHERWISE BY A SECOND DIGIT NOTATION (I.E. A3 INDICATES A THREE-WAY THROW TYPE A DIFFUSER). THE DIFFUSER AIR FLOW PATTERN SHALL BE AS NOTED ON THE PLAN DRAWING
3) PROVIDE WITH OPPOSED BLADE DAMPER AND FRAME COMPATIABLE WITH CEILING.

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UNIVERSITY OF CONNECTICUT
STORRS, CT

TITLE

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100%DD
2	1/16/2015	30%CD
3	3/23/2015	90%CD

PROJECT: MAIN ACCUMULATION AREA
UNIVERSITY OF CONNECTICUT
STORRS, CT

DATE: Issue Date
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OFFICE PROJECT NO: Project Number
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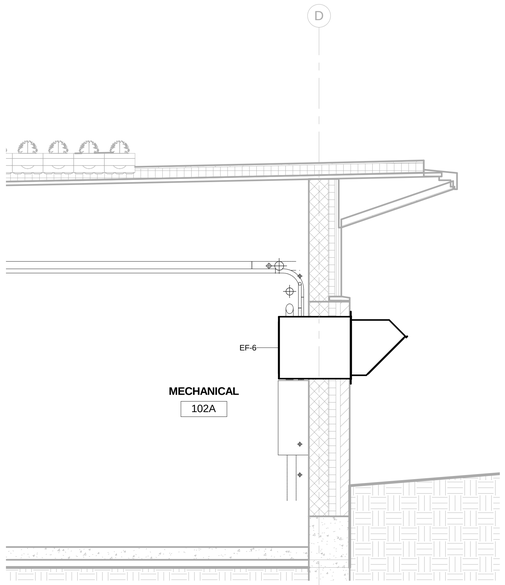

2 Section 2
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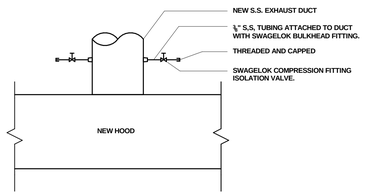
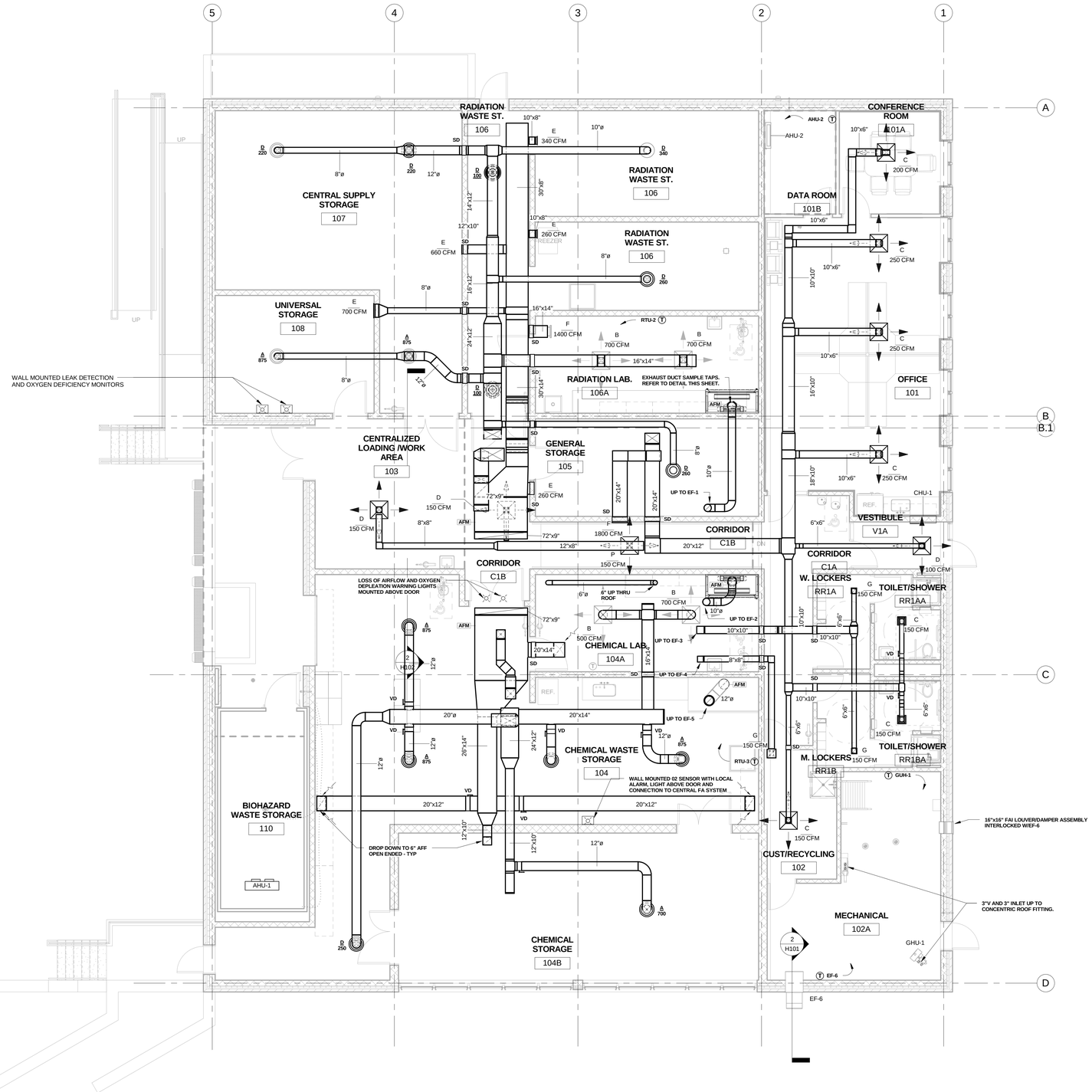


3 CHEM LAB EXHAUST DUCT SAMPLE POINTS
1" = 1'-0"



1 MECHANICAL PLAN
3/16" = 1'-0"

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MECHANICAL PLAN

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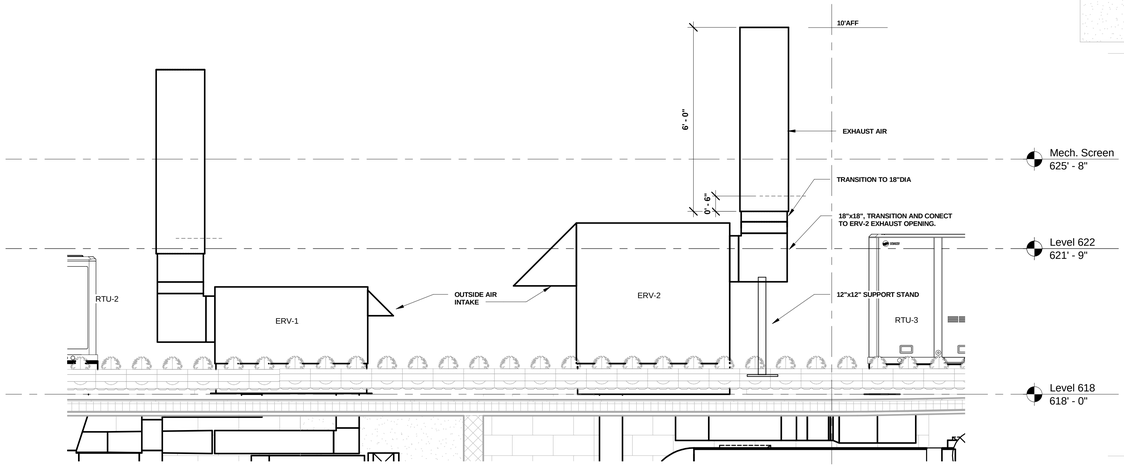

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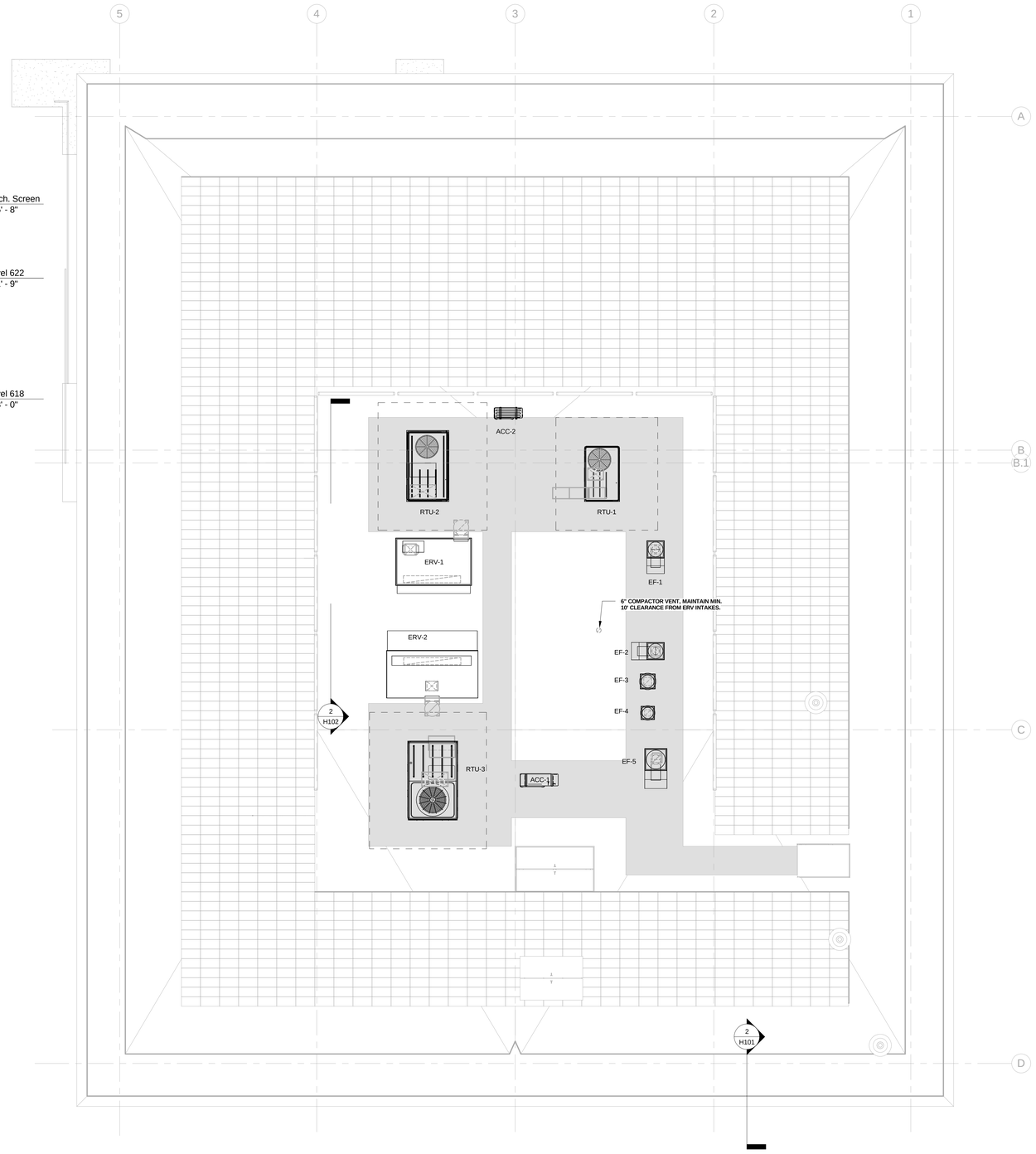

1 ROOF PLAN
3/16" = 1'-0"

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ROOF MECHANICAL PLAN

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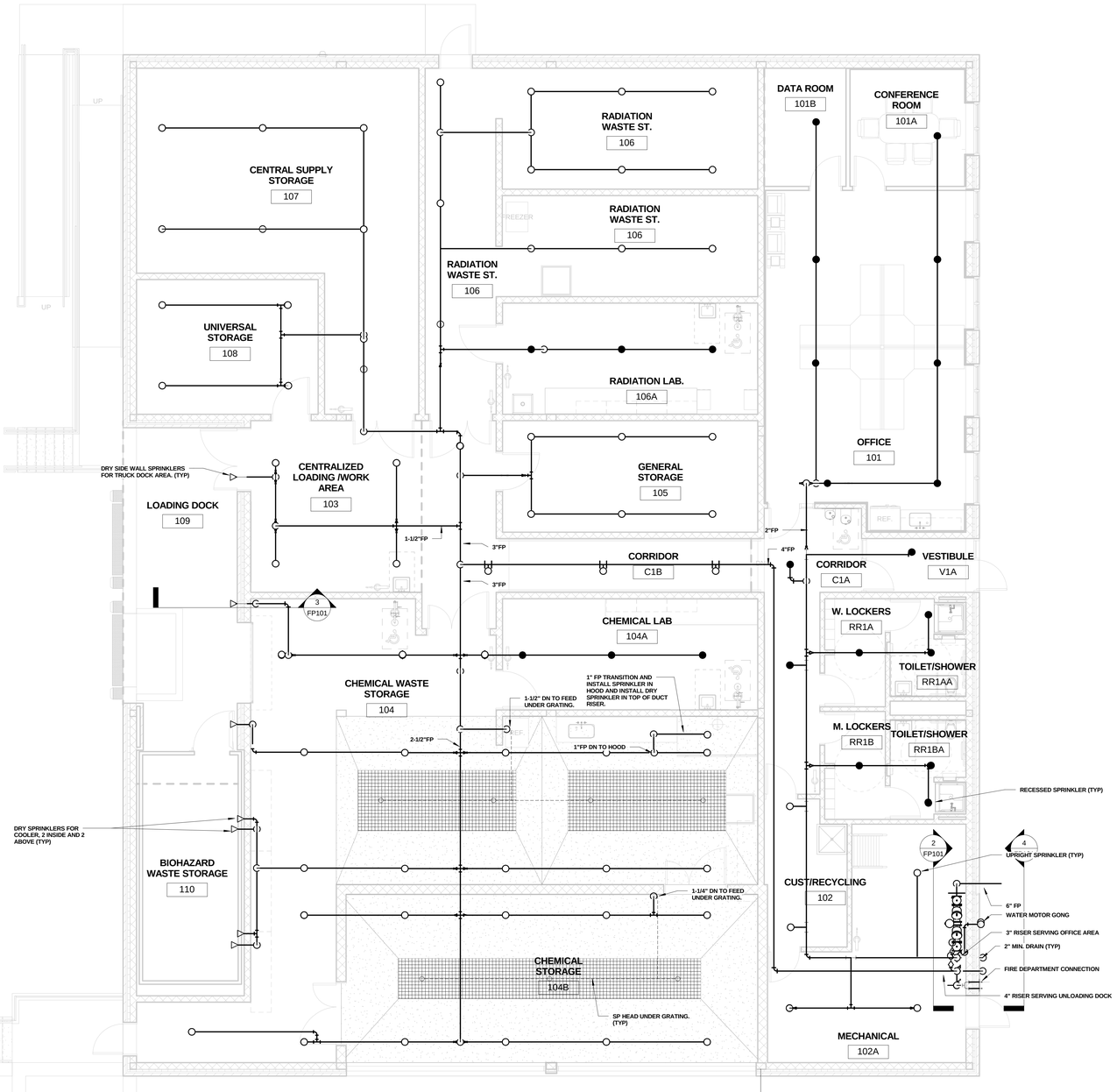
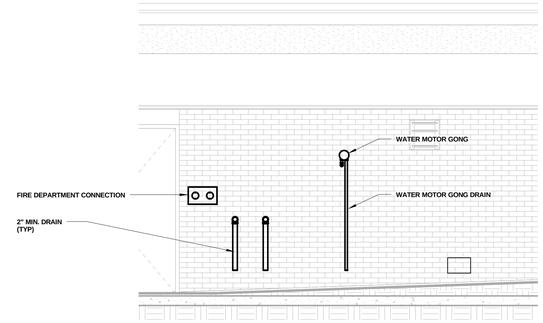
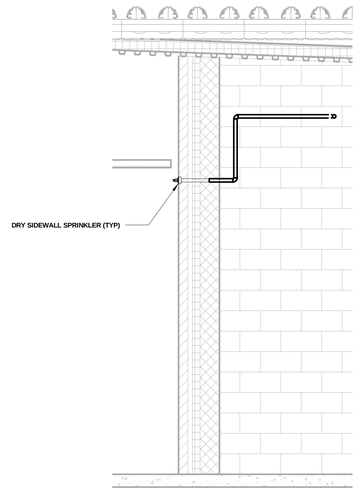


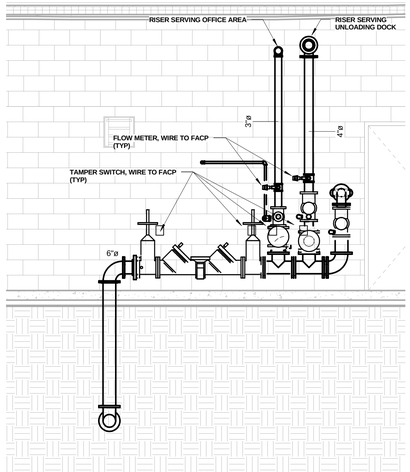
1 FIRE PROTECTION
3/16" = 1'-0"



4 Section 4
3/8" = 1'-0"



3 Section 3
1/2" = 1'-0"



2 Section 1
3/8" = 1'-0"

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TITLE
FIRE PROTECTION PLAN

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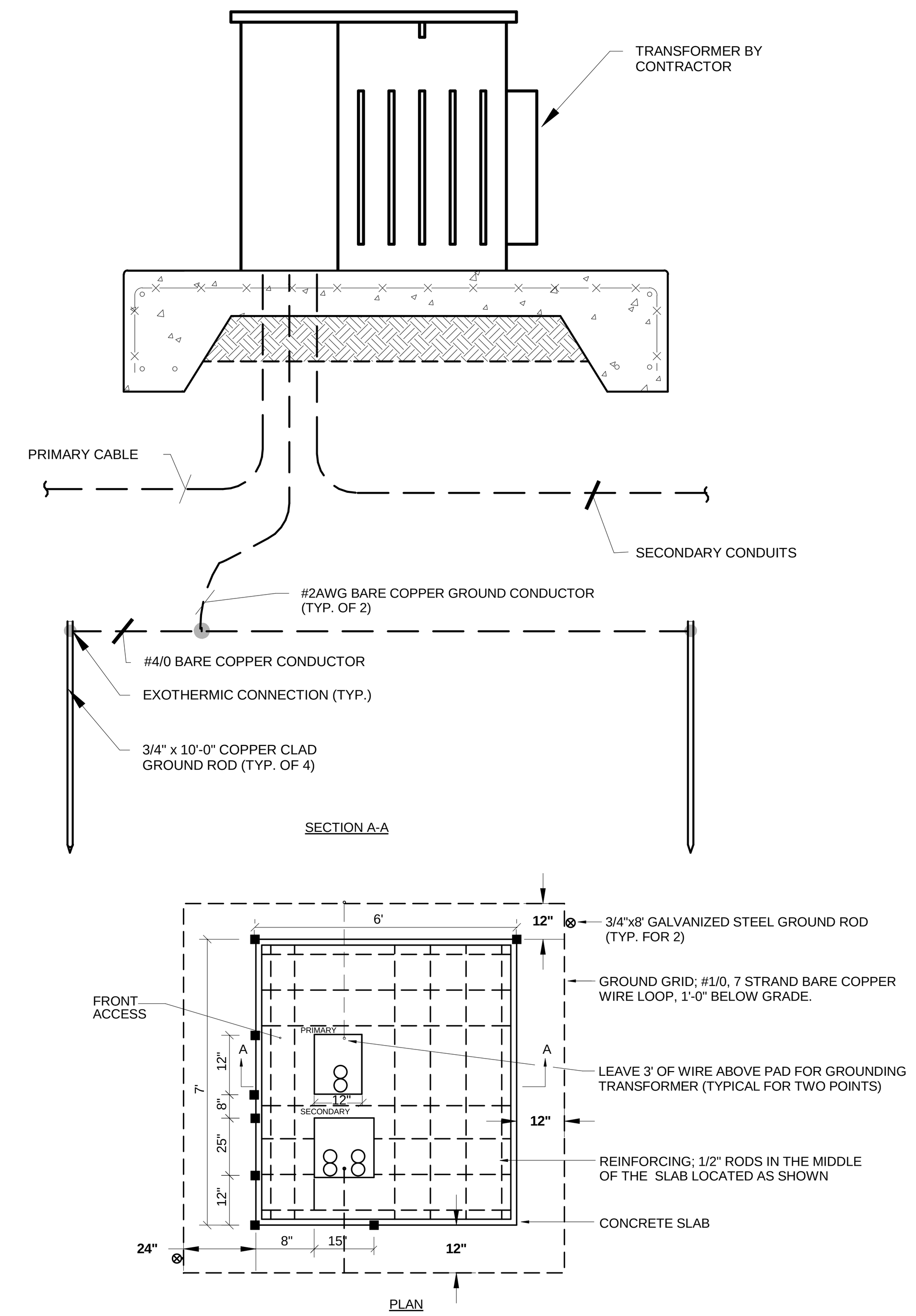
ELECTRICAL SYMBOL LEGEND

SYMBOL	DESCRIPTION
S	SINGLE POLE SWITCH
S_2	DOUBLE POLE SWITCH
S_3	THREE WAY SWITCH
S_4	FOUR WAY SWITCH
S_P	SINGLE POLE SWITCH WITH PILOT LIGHT
S_D	SINGLE POLE DIMMER SWITCH
S_K	SINGLE POLE KEY OPERATED SWITCH
S_a	SINGLE POLE SWITCH (a INDICATES SWITCH LEG)
S_T	SINGLE POLE TIMER SWITCH
S_{WP}	SINGLE POLE SWITCH WITH STAINLESS STEEL WEATHERPROOF COVER PLATE
S_F	FAN CONTROL SWITCH, MINIMUM 3 SPEED SOLID STATE, FLUSH MOUNTED
S_M	SINGLE POLE SWITCH WITH OCCUPANCY SWITCH
CA	CALL-FOR-AID PULLCORD
CA	CALL-FOR-AID COMBINATION LIGHT & BUZZER UNIT
O	CEILING MOUNTED OCCUPANCY SENSOR
	CEILING RECESSED FLUORESCENT, H.I.D. OR INCANDESCENT DOWNLIGHT LUMINAIRE
	WALL MOUNTED FLUORESCENT, H.I.D. OR INCANDESCENT DOWNLIGHT LUMINAIRE
	CEILING RECESSED FLUORESCENT, H.I.D. OR INCANDESCENT WALL WASH LUMINAIRE
	2x2 FLUORESCENT LUMINAIRE
	2x4 FLUORESCENT LUMINAIRE
	1x4 FLUORESCENT LUMINAIRE
	1x8 FLUORESCENT LUMINAIRE
	EMERGENCY/NIGHT LIGHT LUMINAIRE
	EMERGENCY/NIGHT LIGHT LUMINAIRE
	EMERGENCY/NIGHT LIGHT LUMINAIRE
	EMERGENCY/NIGHT LIGHT LUMINAIRE
	BATTERY POWERED EMERGENCY LUMINAIRE.
	REMOTE EMERGENCY LUMINAIRE
	CEILING EXIT SIGN LUMINAIRE SHADING INDICATES FACE AND ORIENTATION. ARROWS NOTE DIRECTION OF EGRESS.
	WALL EXIT SIGN LUMINAIRE SHADING INDICATES FACES AND ORIENTATION. ARROWS NOTE DIRECTION OF EGRESS.
	DUPLEX RECEPTACLE WITH UPPER HALF SWITCH CONTROLLED AND LOWER HALF CONSTANT POWER
a	DUPLEX RECEPTACLE MOUNTED ABOVE COUNTER OR IN CASEWORK. COORDINATE

SYMBOL	DESCRIPTION
	DUPLEX RECEPTACLE
GFI	GFI DUPLEX RECEPTACLE
	SINGLE RECEPTACLE
	DUPLEX RECEPTACLE, FLOOR MOUNTED
	SPECIAL RECEPTACLE, NEMA CONFIGURATION AS INDICATED
J	JUNCTION BOX
P B	PULL BOX
	MOTOR, HP AND VOLTAGE AS NOTED
T	TRANSFORMER, KVA AS NOTED
	208/120V CIRCUIT BREAKER PANEL
	480/277V CIRCUIT BREAKER PANEL
	CONTROL PANEL, FUNCTION AS NOTED
	NON-FUSED SWITCH, SIZE AS NOTED
	FUSED SWITCH, SIZE AS NOTED
	COMBINATION FUSED SWITCH AND MAGNETIC STARTER, SIZE AS NOTED
	MAGNETIC MOTOR STARTER
B B B	BUSWAY, SIZE AS NOTED
C C C	POWER CABLE TRAY, SIZE AS NOTED
P	PHOTOCELL
	CLOCK RECEPTACLE
DC	DROP CORD RECEPTACLE
DM	DAMPER MOTOR
VO	VALVE OPERATOR
	PUSHBUTTON OPERATORS STATION
	2 PUSHBUTTON OPERATORS STATION
	3 PUSHBUTTON OPERATORS STATION
	BELL
	GROUNDING ROD OR WIRE AS NOTED
	GROUND ROD
G	GROUNDING CONDUCTOR
T	THERMOSTAT
E	EMERGENCY SYSTEM BRANCH CIRCUIT
NL	NIGHT LIGHT BRANCH CIRCUIT
LV	LOW VOLTAGE BRANCH CIRCUIT
DC	DIRECT CURRENT CIRCUIT
	CONDUIT RUN UP
	CONDUIT RUN DOWN
	CONDUIT CAPPED OFF
	CONDUIT CONTINUED

SYMBOL	DESCRIPTION
FACP	FIRE ALARM CONTROL PANEL
FAAP	FIRE ALARM REMOTE ANNUNCIATOR PANEL
F	FIRE ALARM MANUAL PULL STATION
I	IONIZATION SENSOR OR DETECTOR
P	PHOTOELECTRIC SENSOR OR DETECTOR
H	HEAT SENSOR OR DETECTOR
P D	PHOTOELECTRIC SMOKE SENSOR, DUCT MOUNTED
L	REMOTE LIGHT/TEST STATION FOR DUCT MOUNTED SMOKE SENSOR
F XX	FIRE ALARM HORN/STROBE XX=STROBE INTENSITY
F XX	FIRE ALARM STROBE XX=STROBE INTENSITY
F	FIRE ALARM HORN
FS	WATER FLOW SWITCH
TS	VALVE TAMPER SWITCH
PS	PRESSURE SWITCH
DH	DOOR HOLDER
CM	ADDRESSABLE CONTROL MODULE
AI	ADDRESSABLE INTERFACE MODULE
EOL	END-OF-LINE DEVICE
S	SPEAKER HORN
S	RECESSED CEILING MOUNTED SPEAKER
M	MICROPHONE OUTLET
W	TELEPHONE OUTLET, W=WALL MOUNTED
X/Y	COMBINATION VOICE/DATA OUTLET X=VOICE Y=DATA
TV	CABLE TELEVISION OUTLET
MD	MAGNETIC DOOR SWITCH
ES	ELECTRIC STRIKE
CR	CARD READER
CK	CARD READER WITH KEYBOARD
IR	INFRA-RED DETECTOR
GT	GUARD TOUR
GB	WINDOW GLASS BREAK DETECTOR
R	REFLECTOR PLATE
UD	ULTRASONIC MOTION DETECTOR
PE	PHOTO EYE
TV	CCTV CAMERA
H	ALARM HORN
KR	KEY RESET SWITCH
KP	KEY PAD (WITHOUT CARD READER)
PB	PUSHBUTTTON, DEFINE PURPOSE

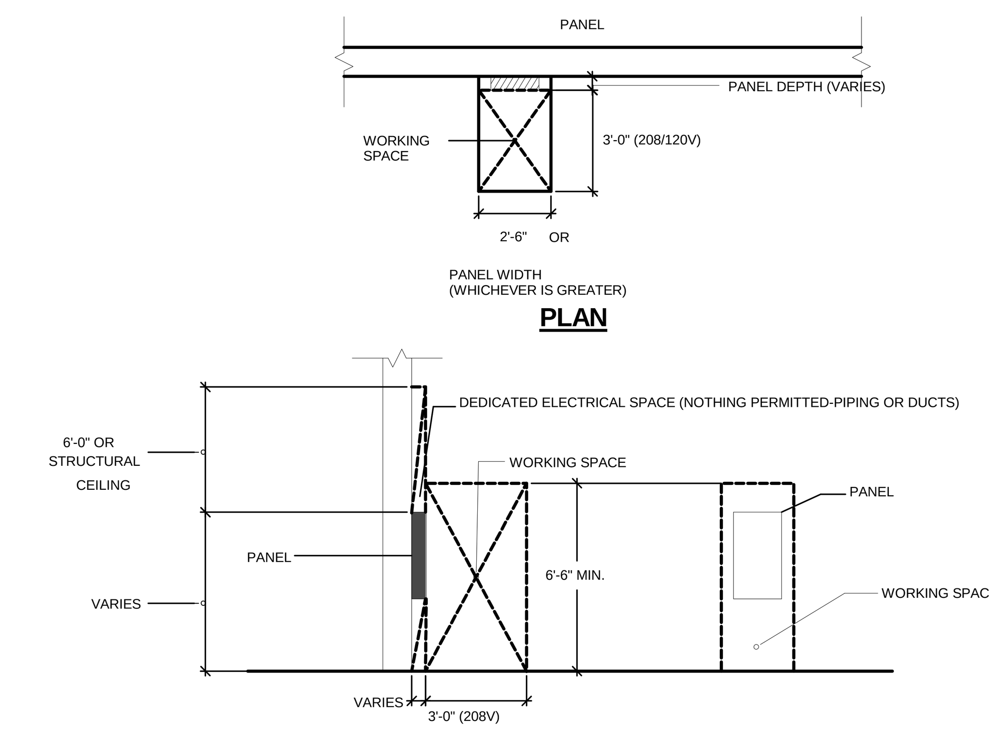
ABBREV.	DESCRIPTION
V	VOLTS OR VOLTAGE
A	AMPS OR AMPERAGE
W	WIRE
VA	VOLTAMPERES
KW	KILOWATTS
KVA	KILOVOLTAMPERES
AC	ALTERNATING CURRENT
DC	DIRECT CURRENT
CU	COPPER
AL	ALUMINUM
GND	GROUND
IG	ISOLATED GROUND
C/B	CIRCUIT BREAKER
GFI	GROUND FAULT CIRCUIT INTERRUPTER
PT	POTENTIAL TRANSFORMER
CT	CURRENT TRANSFORMER
VFD	VARIABLE FREQUENCY DRIVE
MCC	MOTOR CONTROL CENTER
PB	PUSHBUTTON
N.O.	NORMALLY OPEN
N.C.	NORMALLY CLOSED
WP	WEATHERPROOF
AFF	ABOVE FINISHED FLOOR
C	CONDUIT
RE	REMOVE EXISTING
ER	EXISTING TO REMAIN
RLE	RELOCATE EXISTING
EMT	ELECTRICAL METALLIC TUBING
RGS	RIGID GALVANIZED STEEL
IMC	INTERMEDIATE METAL CONDUIT
RNC	RIGID NONMETALLIC CONDUIT



NOTES:

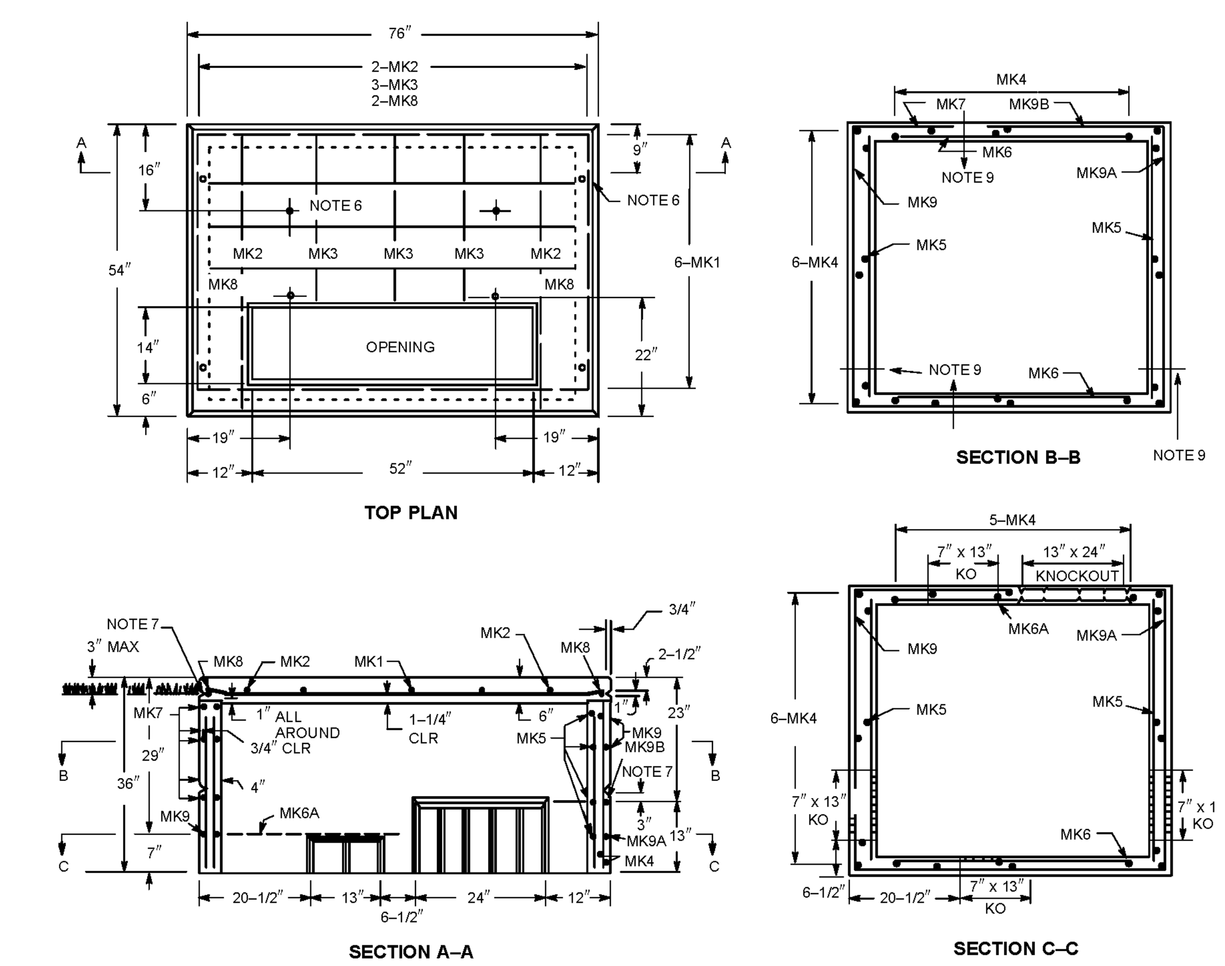
1. CONCRETE PAD SHALL BE IN ACCORDANCE WITH UNITED ILLUMINATING SPECIFICATIONS.
2. GROUND CONDUCTORS SHALL EXTEND 5'-0" ABOVE PAD.
3. GROUND RODS AND CONDUCTOR CONNECTING THE GROUND RODS SHALL BE A MINIMUM OF 2'-6" BELOW FINISHED GRADE.

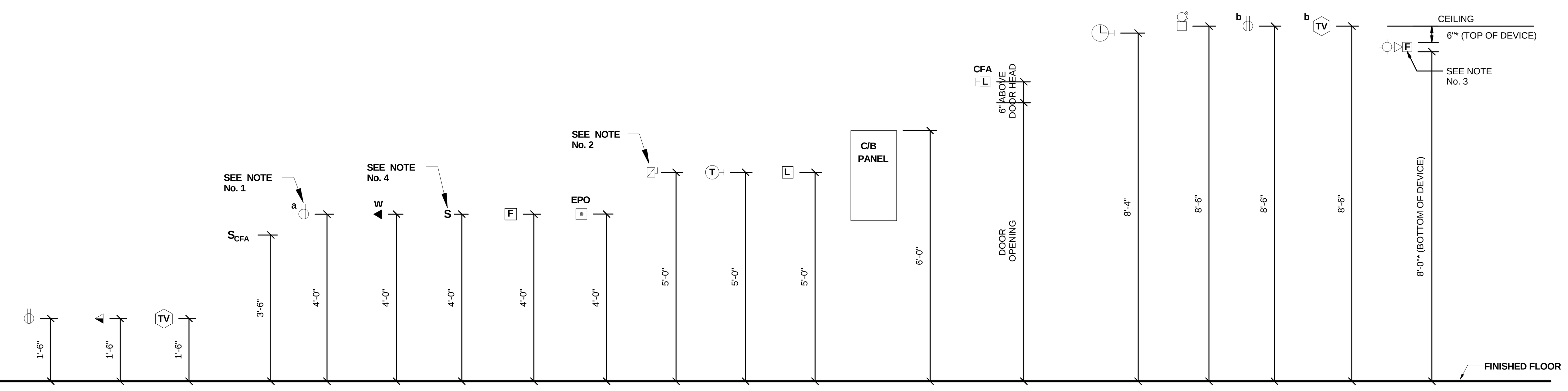
PAD MOUNTED TRANSFORMER FOUNDATION DETAIL
NTS



NOTE: ACCESS AND WORKING SPACE AS DETERMINED BY N.E.C. SECTION 110-26.

SPACES ABOUT ELECTRICAL EQUIPMENT
NTS

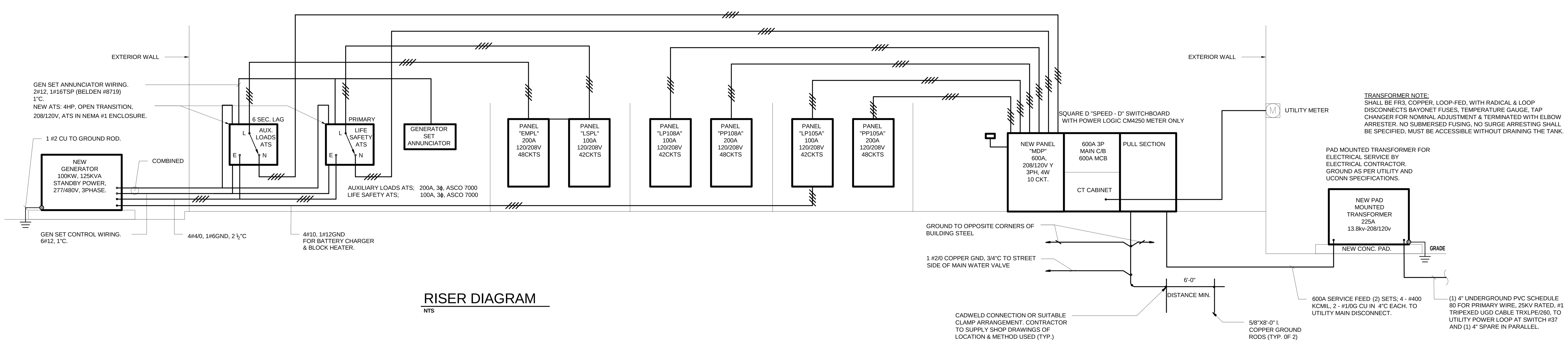




NOTES:

1. WHEN MOUNTED ABOVE A COUNTER, MOUNT 6" ABOVE BACK SPLASH.
2. MEASURED TO THE TOP OF THE OPERATING HANDLE IN THE "ON" POSITION. TYPICAL FOR NON-FUSED SWITCHES AND COMBINATION FUSED SWITCH/MAGNETIC STARTERS.
3. FIRE ALARM SPEAKERS, HORNS OR STROBE LIGHTS SHALL BE AT THE SAME HEIGHT.
4. INCLUDES ALL LIGHT SWITCHES, UNLESS OTHERWISE NOTED ON DRAWINGS.

DEVICE MOUNTING HEIGHTS
NTS



RISER DIAGRAM
NTS

Trench Details – Direct Buried Cables

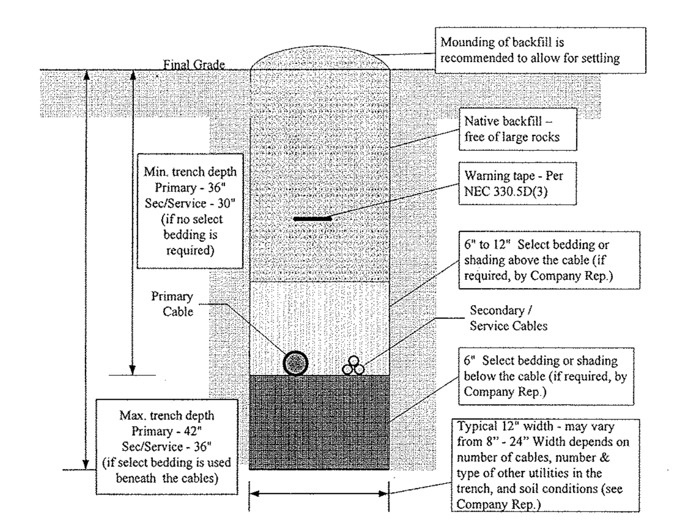


TABLE - MINIMUM COVER REQUIRED PER CODE (INCHES)

Owner / Code	Customer Installed Facilities / NEC [1]				Company / NESC
Voltage (Ø- Ø)	Direct Buried	Rigid Metallic Conduit (RMC)	Rigid Nonmetallic Conduit (RNC)	Street / Road Parking Lot [2]	Direct Buried
0 – 600 V	24	6	18	24	24
> 600 V– 22 kV	30	6	18	24	30

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UNIVERSITY OF CONNECTICUT

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TITLE

ELECTRICAL LEGENDS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100%DD
2	1/16/2015	30%CD
3	3/23/2015	90%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

DATE: 04/06/2015
SCALE:
DRAWN BY: Author
CHECKED BY: JKH

STATE PROJECT NO:
OFFICE PROJECT NO: Project Number
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PANEL: LP-105A

LOCATION: MECHANICAL ROOM 102A
MOUNTING: SURFACE

208/120V, 3 PHASE, 4 WIRE
100A BUS
100A MAIN CIRCUIT BREAKER
GROUND BUS, HINGED TRIM, KAIC

CIR	DESCRIPTION	KVA	C/B	A	B	C	C/B	KVA	DESCRIPTION	CIR
1	LIGHTS - MECHANICAL ROOM 103A	1.9	20A				20A	1.9	LIGHTS - SIDEWALK	2
3	LIGHTS - DOOR SCONCES	1.9	20A				20A	1.9	LIGHTS - LOCKER & RESTROOM RR1B & RR1BA	4
5	LIGHTS - LOCKER & RESTROOM RR1A & RR1AA	1.9	20A				20A	1.9	LIGHTS - VEST V1A & CORRIDORS C1A & C1B	6
7	LIGHTS - OFFICE 101	1.9	20A				20A	1.9	LIGHTS - OFFICE 101	8
9	LIGHTS - CONF ROOM 101A & DATA ROOM 101B	1.9	20A				20A	1.5	LIGHTS - NORTH EXTERIOR	10
11										12
13										14
15										16
17										18
19										20
21										22
23										24
25										26
27										28
29										30
31										32
33										34
35										36
37										38
39										40
41										42
	SUB-TOTALS	9.5						9.1		

TOTAL LOAD: 18.2KVA

PANEL: LP-108A

LOCATION: CENTRALIZED LOADING/WORK AREA 103
MOUNTING: SURFACE

208/120V, 3 PHASE, 4 WIRE
100A BUS
100A MAIN CIRCUIT BREAKER
GROUND BUS, HINGED TRIM, KAIC

CIR	DESCRIPTION	KVA	C/B	A	B	C	C/B	KVA	DESCRIPTION	CIR
1	LIGHTS - CHEMICAL WASTE STORAGE 104	1.9	20A				20A	1.9	LIGHTS - CHEMICAL LAB 104A	2
3	LIGHTS - GENERAL STORAGE 105	1.9	20A				20A	1.9	LIGHTS - RADIATION LAB 106A	4
5	LIGHTS - RAD WASTE STORAGE 106	1.9	20A				20A	1.9	LIGHTS - GENERAL STORAGE 105	6
7	LIGHTS - UNIVERSAL STORAGE 108	1.9	20A				20A	1.9	LIGHTS - CENTRALIZED LOADING/WORK AREA 103	8
9	LIGHTS - LOADING DOCK	1.9	20A							10
11										12
13										14
15										16
17										18
19										20
21										22
23										24
25										26
27										28
29										30
31										32
33										34
35										36
37										38
39										40
41										42
	SUB-TOTALS	9.5						7.6		

TOTAL LOAD: 17.1 KVA

PANEL: PP-105A

LOCATION: MECHANICAL ROOM 102A
MOUNTING: SURFACE

208/120V, 3 PHASE, 4 WIRE
200A BUS
200A MAIN CIRCUIT BREAKER
GROUND BUS, HINGED TRIM, KAIC

CIR	DESCRIPTION	KVA	C/B	A	B	C	C/B	KVA	DESCRIPTION	CIR
1	RECEPTACLES - MECHANICAL ROOMS 102 & 102A	0.9	20A				20A	0.8	RECEPTACLES - RESTROOMS & LOCKERS	2
3	FACP - VESTIBULE V1A	1.2	20A				20A	1.0	RECEPTACLES - OFFICE 101 EAST WALL	4
5	RECEPTACLES - CONFERENCE ROOM	1.0	20A				30A	2.9	RECEPTACLE #1 - DATA ROOM 101B	6
7	RECEPTACLE #2 - DATA ROOM 101B	2.9	30A				20A	1.0	RECEPTACLES - OFFICE 101 WEST WALL	8
9	RECEPTACLES - OFFICE 101 WORKSTATIONS #1 & #2	0.9	20A				20A	0.8	RECEPTACLES - OFFICE 101 WORKSTATIONS #3 & #4	10
11	HAND DRYER - TOILET/SHOWER ROOM RR1AA	2.0	20A				20A	2.0	HAND DRYER - TOILET/SHOWER ROOM RR1BA	12
13										14
15	RADIATION LAB HOOD - LIGHT & RECEPTACLE	1.0	20A				20A	1.0	CHEMICAL HOOD 1 - LIGHT & RECEPTACLE	16
17	CHEMICAL HOOD 2 - LIGHT & RECEPTACLE	1.0	20A				20A	0.5	M/E GUH-1 POWER	18
19	TELE/DATA RECEPTACLE	1.0	20A				20A	1.0	FIBER OPTIC RECEPTACLE	20
21	KITCHENETTE REFRIDGERATOR RECEPTACLE	1.0	20A				20A	1.0	CHEMICAL STORAGE ROOM 104B	22
23										24
25										26
27										28
29										30
31										32
33										34
35										36
37										38
39										40
41										42
	SUB-TOTALS	12.8						12.0		

TOTAL LOAD: 24.8KVA

PANEL: PP-108A

LOCATION: CENTRALIZED LOADING/WORK AREA 103
MOUNTING: SURFACE

208/120V, 3 PHASE, 4 WIRE
200A BUS
200A MAIN CIRCUIT BREAKER
GROUND BUS, HINGED TRIM, KAIC

CIR	DESCRIPTION	KVA	C/B	A	B	C	C/B	KVA	DESCRIPTION	CIR
1	RECEPTACLES - RADIATION LAB 106A	1.0	20A				20A	1.0	RECEPTACLES - RADIATION WASTE STORAGE 106	2
3	RECEPTACLES - LOADING DOCK, RM103 & RM105	0.8	20A				20A	0.8	RECEPTACLES - STORAGE ROOMS 107 & 108	4
5	RECEPTACLES - CHEMICAL LAB 104A	1.0	20A				20A	1.0	RECEPTACLES - CHEMICAL WASTE STORAGE 104	6
7										8
9	COMPACTOR - CHEMICAL LAB 104A	14.4	50A				20A	7.0	DOCK LEVELER	10
11										12
13										14
15	ACC-1 (ROOF)	1.0	20A				40A	8.6	RTU-1 (ROOF)	16
17										18
19	EF-3 & EF-4 (ROOF)	0.8	20A				20A	1.0	REFRIGERATOR - CHEMICAL LAB 104A	20
21	FREEZER - RADIATION WASTE STORAGE 107B	1.0	20A				20A	-	AC-1 - DATA ROOM 101B, ACC-2 (ROOF)	22
23										24
25	O.H. DOOR	6.0	20A							26
27										28
29										30
31										32
33										34
35										36
37										38
39										40
41										42
	SUB-TOTALS	24						-		

TOTAL LOAD: -KVA

PANEL: EMPL

LOCATION: CENTRALIZED LOADING/WORK AREA 103
MOUNTING: SURFACE

208/120V, 3 PHASE, 4 WIRE
200A BUS
200A MAIN CIRCUIT BREAKER
GROUND BUS, HINGED TRIM, KAIC

CIR	DESCRIPTION	KVA	C/B	A	B	C	C/B	KVA	DESCRIPTION	CIR
1	REFRIGERATOR - CHEMICAL WASTE STORAGE 104	0.8	20A				20A	0.8	FREEZER - RADIATION WASTE STORAGE 107B	2
3										4
5	RTU-2 (ROOF)	14.4	45A				70A	18.0	RTU-3 (ROOF)	6
7										8
9										10
11	ERV-3 (ROOF)	8.6	40A				25A	0.6	ERV-2 (ROOF)	12
13										14
15										16
17	EF-1 (ROOF)	0.8	20A				20A	0.8	EF-2 (ROOF)	18
19										20
21										22
23	EF-5 (ROOF)	6.1	30A							24
25										26
27										28
29										30
31										32
33										34
35										36
37										38
39										40
41										42
	SUB-TOTALS	30.7						32.8		

TOTAL LOAD; 62.8KVA

PANEL: LSPL

LOCATION: CENTRALIZED LOADING/WORK AREA 103
MOUNTING: SURFACE

208/120V, 3 PHASE, 4 WIRE
100A BUS
100A MAIN CIRCUIT BREAKER
GROUND BUS, HINGED TRIM, KAIC

CIR	DESCRIPTION	KVA	C/B	A	B	C	C/B	KVA	DESCRIPTION	CIR
1	EM LIGHTS - RESTROOMS & LOCKERS	1.9	20A				20A	1.9	EM LIGHTS - VEST V1A, OFFICE 101, CONF RM 101A	2
3	EM LIGHTS - RMS 105, 106, 106A, 107A, 107C	1.9	20A				20A	1.9	EM LIGHTS - LOADING DOCK, RMS 103, 107 & 108	4
5	EM LIGHTS - CHEMICAL LAB & STORAGE 104 & 104A	1.9	20A							6
7										8
9										10
11										12
13										14
15										16
17										18
19										20
21										22
23										24
25										26
27										28
29										30
31										32
33										34
35										36
37										38
39										40
41										42
	SUB-TOTALS	5.7						5.7		

TOTAL LOAD: 11.4KVA

PANEL: MDP

LOCATION: MECHANICAL ROOM 108
MOUNTING: SURFACE

208/120V, 3 PHASE, 4 WIRE
600A BUS
600A MAIN CIRCUIT BREAKER
GROUND BUS, HINGED TRIM, KAIC

CIR	DESCRIPTION	KVA	C/B	A	B	C	C/B	KVA	DESCRIPTION	CIR
1										2
3	LP-105A	18.2	100A				100A	17.1	LP-108A	4
5										6
7										8
9	PP-105A	23.8	200A				200A	38.4	PP-108A	10
11										12
13										14
15	EMPL	62.8	200A				100A	11.4	LSPL	16
17										18
19										20
21										22
23										24
25										26
27										28
29										30
31										32
33										34
35										36
37										38
39										40
41										42
	SUB-TOTALS	104.4						66.9		

TOTAL LOAD: 172KVA

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TITLE

ELECTRICAL SCHEDULES

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100%DD
2	1/16/2015	30%CD
3	3/23/2015	90%CD

DATE: 04/06/2015
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PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
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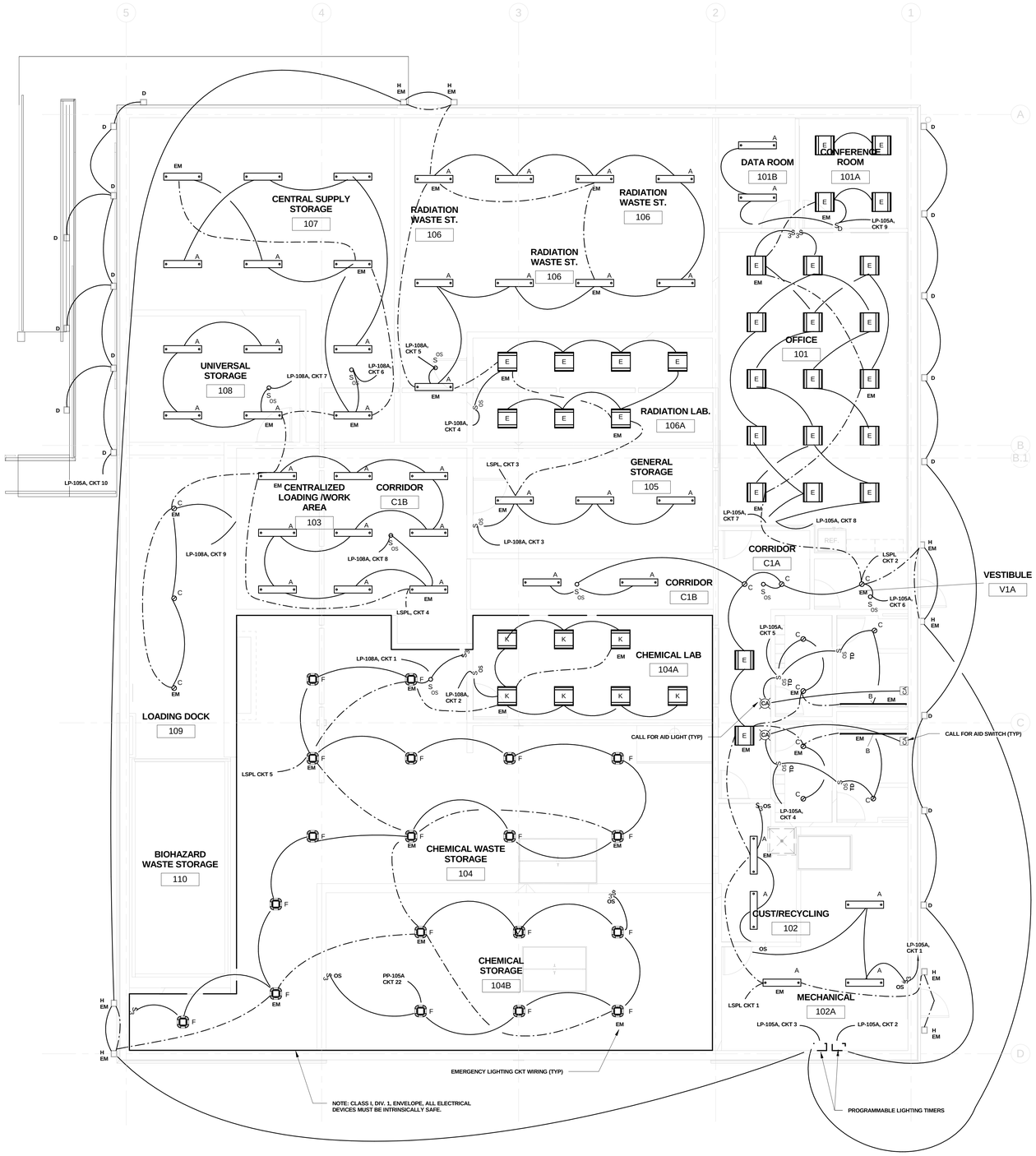
LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMPS
A	1'X4' LED SURFACE OR SUSPENDED LED LIGHT, 32W, 4000 LUMENS, 3500K. CREE MODEL# CR-LE-40L HE-35K- -S-	32W LED
B	4' LED SURFACE AMBIENT LUMINAIRE, LED LIGHT, 32W, 4000 LUMENS, 3500K. CREE MODEL# LS4- 40L-35K	44W LED
C	6" CALCULITE LED DOWNLIGHT MEDIUM BEAM, 39W, 2000 LUMENS, 3500K. LIGHTOLIER MODEL# C6L152DL-35K-M-CL-W, WITH FRAME IN KIT C6L20-N	39W LED
D	10"X4" LED OUTDOOR WALL MOUNTED WALK OR STEP LED LIGHT, 13W, 3000K. COLE MODEL# L609-HO	13W LED
E	2'X2' LED TROFFER LENS: FROSTED WHITE ACRYLIC, FINISH: WHITE. CREE MODEL# ZR22-32L-3500K-120/208VOLT-10V	1-35W, 3200 LUMENS LED
F	CLASS 1, DIV 2 SAFESITE LED AREA, POLYCARBONATE LENS, FINISH: GRAY. DIALIGHT MODEL# HZD5C2N-5000LUMEN 4000K-120/208VOLT-10V	48W, 5000 LUMENS LED
G	LED CANOPY LIGHTING, FLAT LENS, WHITE FINISH, 4000K, CREE CPY SERIES, MODEL# CPY250-(VERSION)-DM-F-A-UL-WH-40K.	82W LED
H	EXTERIOR WALL LUMINAIRE, LED, BRONZE FINISH,1000 LUMENS HUBBELL MODEL# LNC-5UL-4K-X	15.5W LED
I-3	EXTERIOR SITE LIGHTING, LED LIGHTING ON 18' POLE, BRONZE FINISH, 4000K, STERNER LIGHTING, MODEL# EXECUTIVE RT21-30L-4K-3-BC	42W LED
I-4	EXTERIOR SITE LIGHTING, LED LIGHTING ON 18' POLE, BRONZE FINISH, 4000K, STERNER LIGHTING, MODEL# EXECUTIVE RT21-60L-4K-5M	42W LED
I-6	EXTERIOR SITE LIGHTING, LED LIGHTING ON 18' POLE, BRONZE FINISH, 4000K, STERNER LIGHTING, MODEL# EXECUTIVE RT21-60L-4K-5W	42W LED
J	LED EXIT SIGN, RED ON WHITE BACKGROUND WITH BATTERY. HUBBELL DUAL LITE EVE SERIES MODEL# EVE-U-R-W- .- .	1-3.1W LED
K	2x2 LED TROFFER, KURIZON LIGHTING MODEL# G-5-2x2-3/LED35-UNV-LEX12	1-32W, 2200 LUMENS LED
L	LED EXIT SIGN, CLASS 1, DIV. 2. GROUSEHINDS MODEL# CCH UX60RHAZ	2.7W LED

LUMINAIRE SCHEDULE NOTES

1. ALL LED LAMPS SHALL HAVE A COLOR TEMPERATURE RATING OF 3500-4000 DEGREES KELVIN WITH A C.R.I. OF 75 OR BETTER.
2. ALL LUMINAIRES SHALL BE SUPPORTED FROM BUILDING STRUCTURE.
3. FINAL SELECTION OF ALL LUMINAIRE FINISHES SHALL BE BY THE ARCHITECT.
4. LED LAMPS ARE BASED ON MANUFACTURER.



1 LIGHTING PLAN
3/16" = 1'-0"

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TITLE
LIGHTING PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100%DD
2	1/16/2015	30%CD
3	3/23/2015	90%CD

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO:
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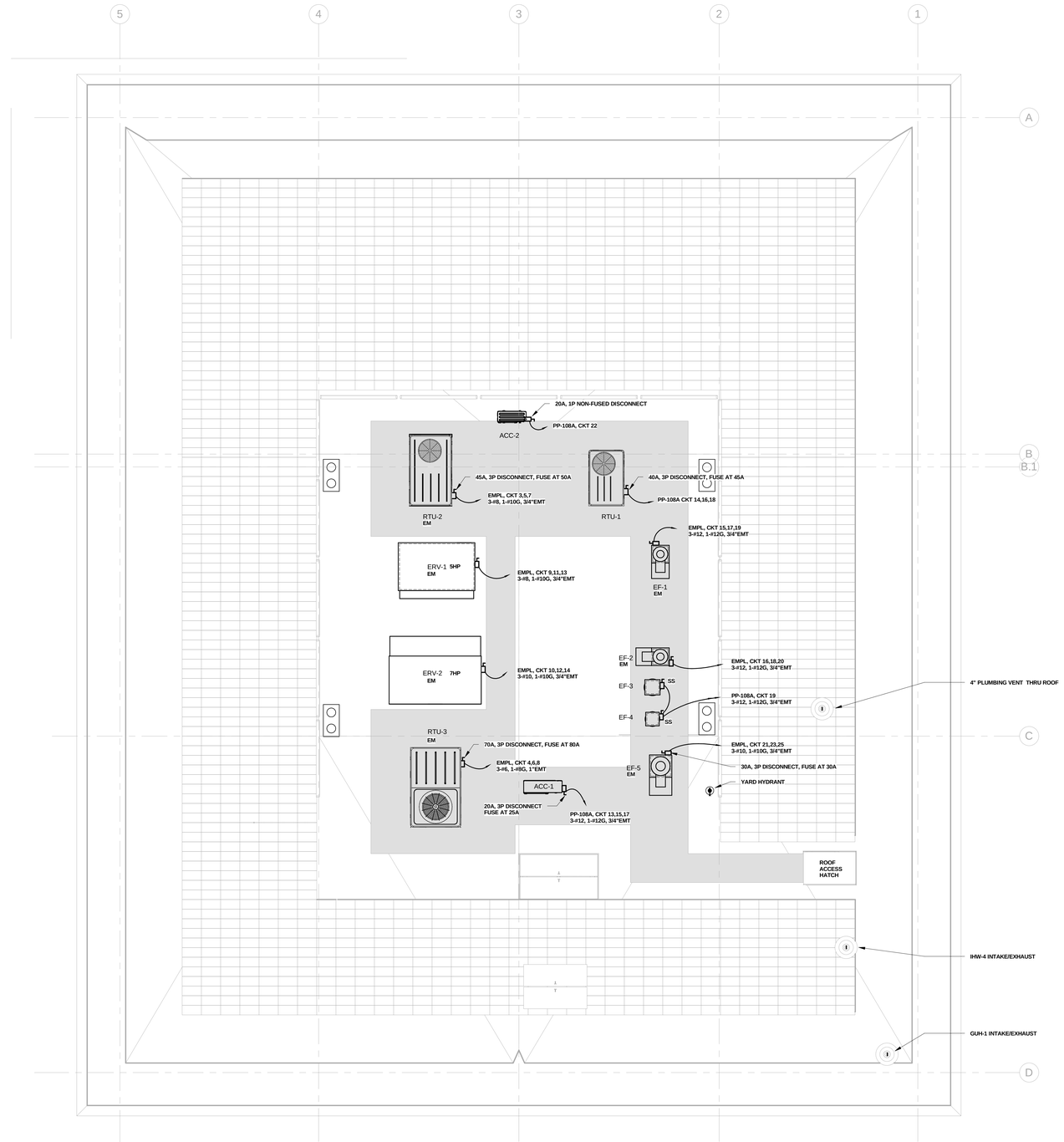

NOTE: PROVIDED IN ALL RTUs AND MECHANICAL SPEC. AS BUILT INTO UNIT & WITHIN CODE REQUIRED DISTANCE TO OTHER EQUIPMENT.

1 ROOF POWER PLAN
3/16" = 1'-0"

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TITLE
POWER PLAN ROOF EQUIP.

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100%DD
2	1/16/2015	30%CD
3	3/23/2015	90%CD

PROJECT: MAIN ACCUMULATION AREA

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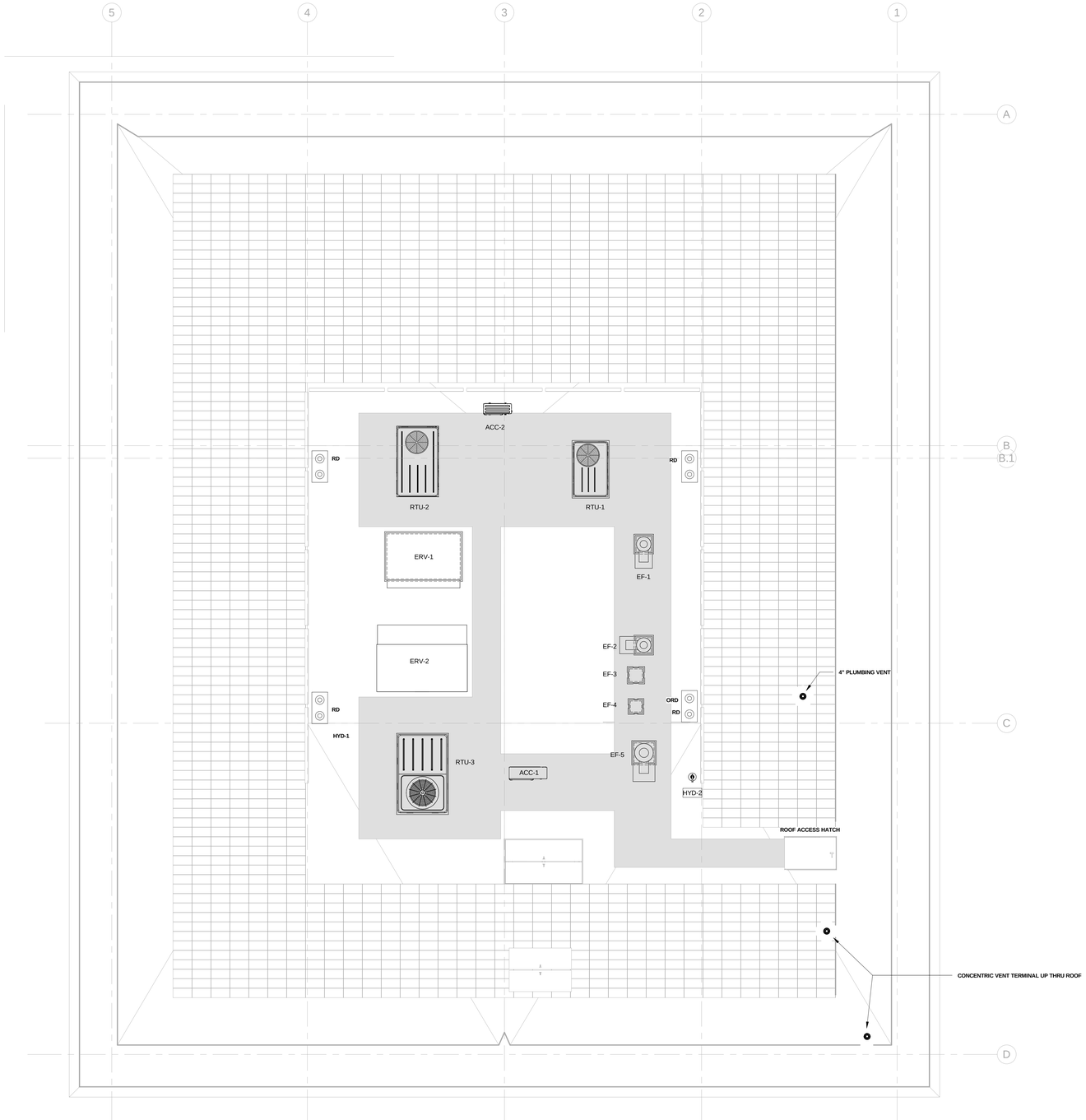

1 ROOF PLUMBING PLAN
3/16" = 1'-0"

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ISSUE DATES		
NO.	ISSUE DATE	PURPOSE

PROJECT: MAIN ACCUMULATION AREA

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OFFICE PROJECT NO: Project Number

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DATE: Issue Date
SCALE: 3/16" = 1'-0"
DRAWN BY: JTF
CHECKED BY: JTP

P102

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ADDENDUM NUMBER 1
June 4, 2015

The following clarifications are applicable to drawings and specifications for the project referenced above.

DRAWINGS

Item 1-1

DRAWING A0.01 – Drawing A0.01 is reissued as SK-A0.01 with changes clouded.

Item 1-2

DRAWING A0.02 – Drawing A0.02 is reissued as SK-A0.02 with changes clouded.

Item 1-3

CIVIL C-SERIES DRAWINGS

Add Sketch: SK-C-1A LOADING DOCK RAMP W/ RETAINING WALLS SITE PLAN, DATED 6-3-2015.
Add Sketch: SK-C-1B LOADING DOCK RAMP W/ RETAINING WALLS GRADING, DATED 6-3-2015.
Add Sketch: SK-C-2 RAMP ELEVATION CHANGE, DATED 6-3-2015.
Add Sketch: SK-C-3 VAN ACCESSIBLE HANDICAP PARKING, DATED 6-3-2015.
Add Sketch: SK-C-4 2 ½" GAS LINE TO GENERATOR, DATED 6-3-2015.

Item 1-4

DRAWING A1.11– Drawing A1.11 is reissued as SK- A1.11 with changes clouded.

Item 1-5

DRAWING A1.21– Drawing A1.21 is reissued as SK- A1.21 with changes clouded.

Item 1-6

DRAWING A2.11– Drawing A2.11 is reissued as SK- A2.11 with changes clouded.

Item 1-7

DRAWING A3.01– Drawing A3.01 is reissued as SK- A3.01 with changes clouded.

Item 1-8

DRAWING A4.01– Drawing A4.01 is reissued as SK- A4.01 with changes clouded.

Item 1-9

DRAWING A4.02– Drawing A4.02 is reissued as SK- A4.02 with changes clouded.

Item 1-10

DRAWING A6.01

I. Add Alternating Tread Stair Detail. See attached SKA-01 ALTERNATING TREAD STAIR DETAIL, DATED 6-4-2015.

Item 1-11

DRAWING A6.02

I. Change stair detail #1 so that the opening at the open side of the stairway will not allow a 6" sphere to pass. See attached SKA-02 REVISION OF 1/A6.02, DATED 6-4-2015.

Item 1-12

DRAWING A7.01

I. Change clearance at handicap accessible shower to 48" in length to 36" in depth. See attached SKA-03 TOILET & LOCKER PLANS RR1A & RR1B REVISED, DATED 6-4-2015.

II. Clarification: Provide closers at doors RR1BA and RR1AA per Specification Section 087100 – DOOR HARDWARE.

Item 1-13

DRAWING A8.02

I. Change elevation detail 13/A8.02 104B CHEMICAL STORAGE - SOUTH. See attached SKA-04 REVISED 104B CHEMICAL STORAGE SOUTH, DATED 6-4-2015.

Item 1-14

DRAWING A11.01

I. Add the following new door to the door schedule:

Door Number: 104B3
Width: 3'-4"
Height: 7'-4"
Material: Hollow Metal
Door Type: D1
Frame Type: F1
Head Detail: Special – See Blast Panel Head Detail
Jamb Detail: J1 Similar
Saddle Detail: T4 Similar - provide flashing per Blast Panel Details

Hardware: Note that this door is for firemen access only and all operable hardware is on the exterior.

Continuous Hinge
Continuous Weatherstripping
Threshold
Door Shoe
Cylinder Lock operable from exterior
Pull Handle

Item 1-15

STRUCTURAL S-SERIES DRAWINGS

DRAWING S001– Drawing S001 STRUCTURAL NOTES is reissued as SK- S001 with changes clouded.

DRAWING S003– Drawing S003 FIRST FLOOR PLAN is reissued as SK- S003 with changes clouded.

DRAWING S004– Drawing S004 ROOF FRAMING PLAN is reissued as SK- S004 with changes clouded.

Item 1-16

MECHANICAL H-SERIES DRAWINGS

DRAWING H001– Drawing H001 is reissued as SK- H001 with changes clouded.

DRAWING H101– Drawing H101 MECHANICAL PLAN is reissued as SK- H101 with changes clouded.

DRAWING H102– Drawing H102 ROOF MECHANICAL PLAN is reissued as SK- H102 with changes clouded.

Item 1-17

FIRE PROTECTION PLAN FP-SERIES DRAWINGS

DRAWING FP101– Drawing FP101 FIRE PROTECTION PLAN is reissued as SK- FP101 with changes clouded.

Item 1-18

PLUMBING P-SERIES DRAWINGS

DRAWING P001– Drawing P001 PLUMBING DETAILS is reissued as SK- P001 with changes clouded.

DRAWING P101– Drawing P101 PLUMBING PLAN is reissued as SK- P101 with changes clouded.

Item 1-19

ELECTRICAL E-SERIES DRAWINGS

DRAWING E001– Drawing E001 ELECTRICAL LEDGENDS is reissued as SK- E001 with changes clouded.

DRAWING E101– Drawing E101 POWER PLAN is reissued as SK- E101 with changes clouded.

DRAWING E102– Drawing E102 LIGHTING PLAN is reissued as SK- E102 with changes clouded.

DRAWING E103– Drawing E103 POWER PLAN ROOF EQUIP. is reissued as SK- E103 with changes clouded.

Item 1-20

FIRE ALARM FA-SERIES DRAWINGS

DRAWING FA101– Drawing FA101 FIRE ALARM is reissued as SK- FA101 with changes clouded.

SPECIFICATIONS

Item 1-21

Add new SPECIFICATION SECTION 101400 – SIGNAGE attached to this Addendum.

Item 1-22

SPECIFICATION SECTION 077200 – ROOF ACCESSORIES:

I. Delete "Automatic Heat and Smoke Vents". Automatic heat and smoke vents have been removed from the project. Add "Roof Mounted Explosion Relief Vents". A roof mounted explosion relief vent has been added in Chemical Storage Room 104B.

II. Change Paragraph 1.2 B 2 to read:

2. Roof Mounted Explosion Relief Vents.

III. Change Paragraph 2.3 B to read:

B. Insulated Core Aluminum Roof Mounted Explosion Relief Vent: Explosion relief vent with Factory Mutual approved explosion relief fasteners, insulated double-wall lid, and insulated double-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware. Provide restraint cable designed to prevent the unit from becoming a projectile.

1. Basis of Design Manufacturer: Drawings and Specification are based on C/S Group APC Daylighter Model XRV-IC. Subject to compliance with requirements, provide named product or equal product by another manufacturer.
2. Release Rating: 20-30 lb/ft.
3. Responsiveness to pressure shocks: Unit releases within 12-18 milliseconds.
3. Size: 48" x 72" inside curb dimension. Provide tandem units where venting area exceeds manufacturer's largest size.

4. Curb and Lid Material: Minimum .050 thick aluminum sheet, mill finish.
5. Curb Height: Minimum 12".
6. Insulation: Manufacturers' standard board.
7. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
8. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
9. Deflagration Vent Standard: Provide units that have been tested and listed to comply with NFPA 68 Design Guidelines for Deflagration Vents and Vents. Provide FM Listed and approved explosion release devices.

IV. Change Paragraph 3.2 G to read:

G. Explosion Relief Vent Installation:

1. Install explosion relief vent so top perimeter surfaces are level.
2. Install and test explosion relief vent and components for proper operation according to NFPA 68.

Item 1-23

SPECIFICATION SECTION 092900 – INTERIOR GYPSUM BOARD:

I. Add the following paragraph 2.3 D:

D. Lead Laminated Gypsum Board: Single un-pierced layer of sheet lead, 1/16" thick, laminated to back of gypsum board. Provide products by Santa Rosa Lead Products, Inc. or equal products of another manufacturer.

1. Core: 5/8" fire-resistant rated gypsum board Type X, ASTM C 1396.
2. Long edges tapered.
3. Location: East wall of Radiation Lab, floor to underside of structure. Provide installation details per manufacturer's written instructions.

Item 1-24

SPECIFICATION SECTION 104413 – FIRE PROTECTION SPECIALTIES:

I. Delete Paragraph 2.2 and replace with the following Paragraph 2.2:

2.2 PORTABLE FIRE EXTINGUISHERS

A. Manufacturers: Provide products by Badger Fire Protection.

B. General: Provide fire extinguishers of type, size, and capacity with mounting bracket for each location indicated.

1. Valves: Manufacturer's standard.
2. Handles and Levers: Manufacturer's standard.
3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

C. Types:

D. Fire Extinguisher Type 1: Badger class ABC Multipurpose Dry-Chemical Standard Stored Pressure Hand Portable Extinguisher, Model 5MB-6HB, UL-rated 3-A:40-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container. Provide MB-5 mounting bracket.

E. Fire Extinguisher Type 2: Badger class A Water Extra Stored Pressure Hand Portable Extinguisher, Model WP-61, UL-rated 2-A, 2.5 gallon capacity in stainless steel cylinder. Provide UB-20 mounting bracket.

F. Fire Extinguisher Type 3: Bagger class BC Carbon Dioxide Extra Self-Propelling Hand Portable, Model B20V-1, UL-rated 10-B:C, 20 lb. capacity in enameled steel container. Provide RB-4 mounting bracket.

G. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

   a. Orientation: Vertical.

H. Schedule:

Room C1A Corridor	1-Type 1
Room 102A Mechanical	1-Type 1
Room 103 Centralized Loading/Work	1-Type 1
Room 107 Central Supply Storage	1-Type 1
Room 108 Radiation Waste Storage	1-Type 1
Room 106A Radiation Lab	1-Type 1
Room 104 Chemical Waste Storage	2-Type 2 and 2-Type 3 (One each type mounted side by side in two locations)
Room 104A	1-Type 2 and 1-Type 3 (One each type mounted side by side)
Room 104B	1-Type 2 and 1-Type 3 (One each type mounted side by side)

Item 1-25

SPECIFICATION SECTION 108200 – EXTRUDED ALUMINUM SCREENS:

I. Delete Paragraphs 2.1 and 2.2 and replace with the following:

2.1 MANUFACTURERS

A. Basis of Design Product: Drawings and Specification are based on All-Lite Architectural Products HJ-445 equipment screen. Subject to compliance with requirements, provide the named product or a comparable product from another manufacturer.

2.2 EXTRUDED ALUMINUM SCREENS

A. Construction:

1. Material: 6063-T5 extruded aluminum.
2. Frame: 2" x 2" x 0.081" thick angle.
3. Blades: 0.081 thick 45 degree J style.
4. Mullion: Concealed.

B. Performance Data:

1. Based on testing 48 inch x 48 inch size unit in accordance with AMCA 500L.
2. Free Area: 50.6% nominal

ATTACHMENTS

SKETCHES

CIVIL

SK-C-1A LOADING DOCK RAMP W/ RETAINING WALLS SITE PLAN, DATED 6-3-2015.
SK-C-1B LOADING DOCK RAMP W/ RETAINING WALLS GRADING, DATED 6-3-2015.
SK-C-2 RAMP ELEVATION CHANGE, DATED 6-3-2015.
SK-C-3 VAN ACCESSIBLE HANDICAP PARKING, DATED 6-3-2015.
SK-C-4 2 ½" GAS LINE TO GENERATOR, DATED 6-3-2015.

ARCHITECTURAL

SK-A0.01
SK-A0.02
SK- A1.11
SK- A1.21
SK- A2.11
SK- A3.01
SK- A4.01
SK- A4.02
SKA-01 ALTERNATING TREAD STAIR DETAIL, DATED 6-4-2015.
SKA-02 REVISION OF 1/A6.02 STAIR DETAIL, DATED 6-4-2015.
SKA-03 DETAIL 1/A7.01 TOILET PLAN REVISIONS, DATED 6-4-2015.
SKA-04 104B CHEMICAL STORAGE-SOUTH REVISED ELEV., DATED 6-4-2015.

STRUCTURAL

SK-S001 STRUCTURAL NOTES, DATED 6-3-2015.
SK-S003 FIRST FLOOR PLAN, DATED 6-3-2015.
SK-S004 ROOF FRAMING PLAN, DATED 6-3-2015.

MECHANICAL

SK-H001 DATED 6-3-2015.
SK-H101 MECHANICAL PLAN, DATED 6-3-2015.
SK-H102 ROOF MECHANICAL PLAN, DATED 6-3-2015.

FIRE PROTECTION

SK-FP101 FIRE PROTECTION PLAN

PLUMBING

SK-P001 PLUMBING DETAILS, DATED 6-3-2015.
SK-P101 PLUMBING PLAN, DATED 6-3-2015.

ELECTRICAL

SK-E001 ELECTRICAL LEGENDS, DATED 6-3-2015.
SK-E101 POWER PLAN, DATED 6-3-2015.
SK-E102 LIGHTING PLAN, DATED 6-3-2015.
SK-E103 POWER PLAN ROOF EQUIP., DATED 6-3-2015.

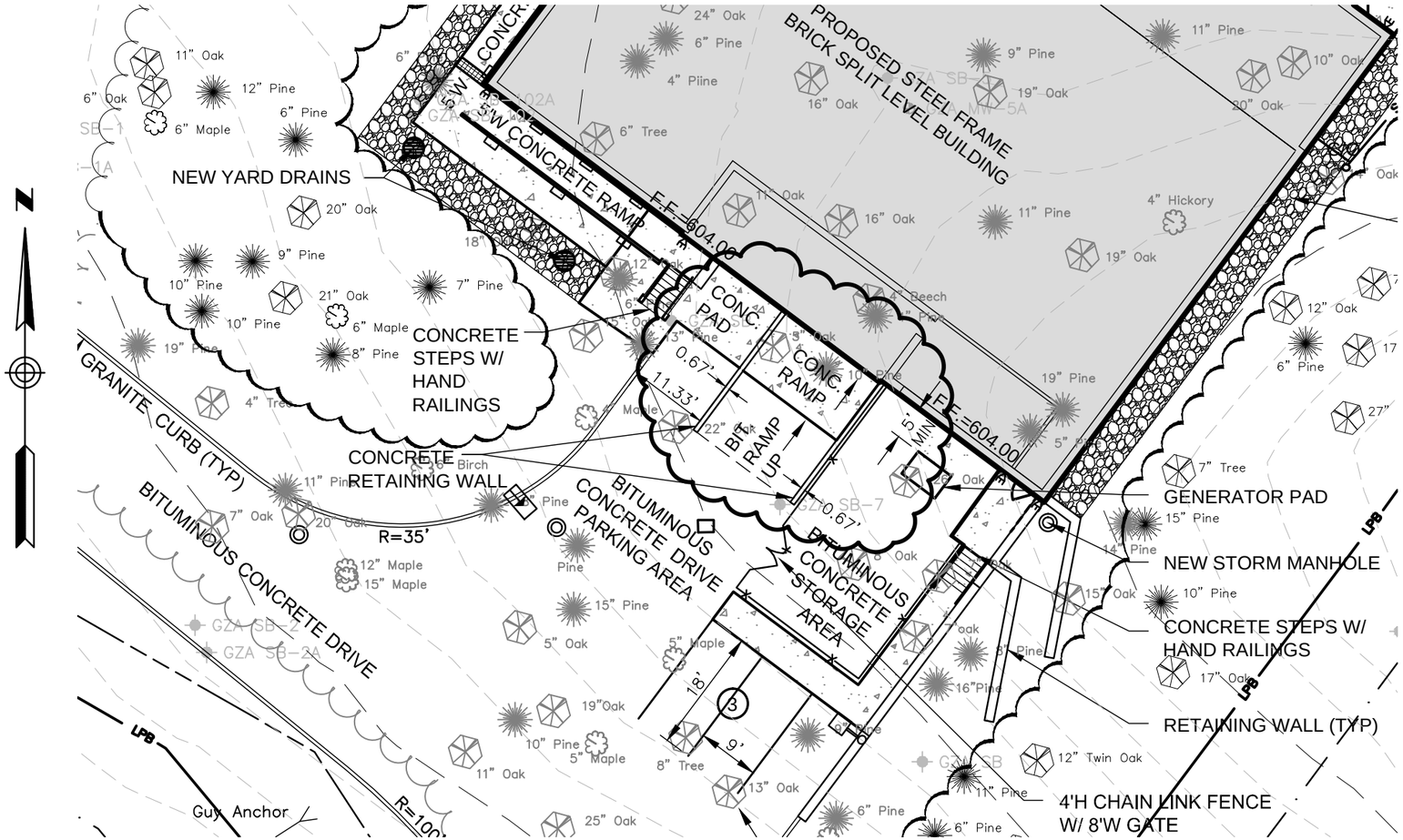
FIRE ALARM

SK-FA101 FIRE ALARM, DATED 6-3-2015.

SPECIFICATION SECTIONS

SPECIFICATION SECTION 101400 – SIGNAGE

END OF ADDENDUM #1



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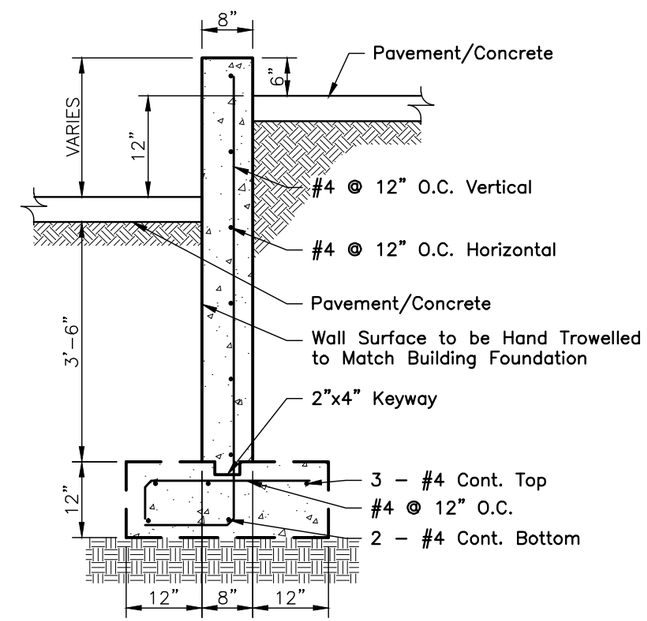

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REFERENCE ADDENDUM: #
REFERENCE RFI: #
REFERENCE SUPPLEMENTAL INFORMATION:
REFERENCE CHANGE ORDER PROPOSAL REQUEST:#
REFERENCE SUBMITTAL:

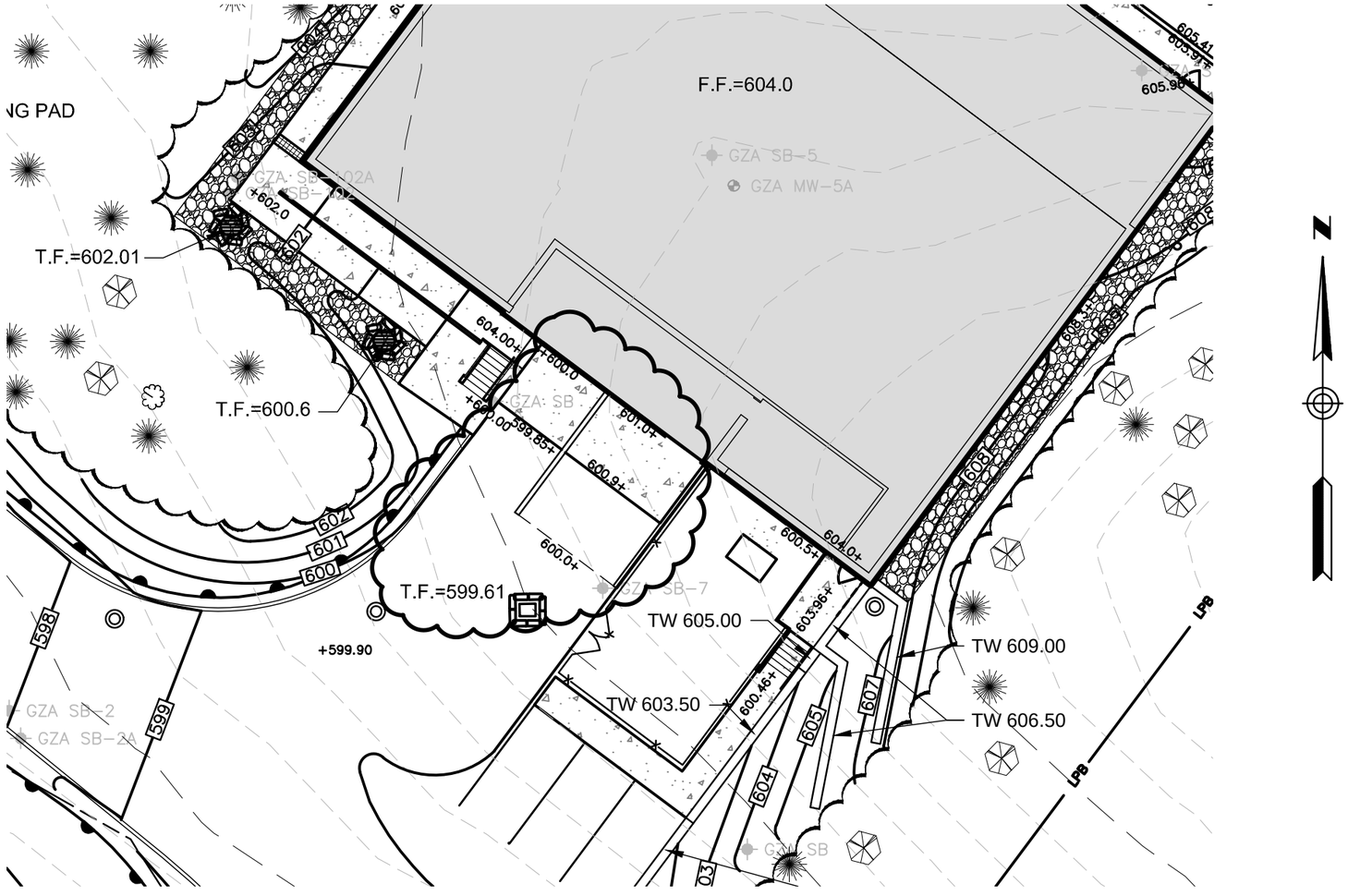
TAI SOO KIM PARTNERS
146 Wyllys Street
Hartford, Connecticut
Tel: (860) 547-1970
Fax: (860) 249-0695

JOB NAME/NUMBER	TITLE	DRAWING NO.
UNIVERSITY OF CONNECTICUT MAIN ACCUMULATION AREA	LOADING DOCK RAMP W/ RETAINING WALLS SITE PLAN	SK - C-1A
SCALE: 1"=20'		
DATE: 6/2/2015 ISSUED: 6/3/2015		

Loureiro
Engineering • Construction • EH&S • Energy • Waste

LOADING DOCK RETAINING WALL DETAIL

SCALE: NONE



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REFERENCE RFI: #
REFERENCE SUPPLEMENTAL INFORMATION:
REFERENCE CHANGE ORDER PROPOSAL REQUEST:#
REFERENCE SUBMITTAL:

10 0 10 20 30
SCALE IN FEET

TAI SOO KIM PARTNERS 146 Wyllys Street Hartford, Connecticut Tel: (860) 547-1970 Fax: (860) 249-0695	JOB NAME/NUMBER UNIVERSITY OF CONNECTICUT MAIN ACCUMULATION AREA SCALE: 1"=20' DATE: 6/2/2015 ISSUED: 6/3/2015	TITLE LOADING DOCK RAMP W/ RETAINING WALLS GRADING	DRAWING NO. SK - C-1B

Loureiro
Engineering • Construction • EH&S • Energy • Waste

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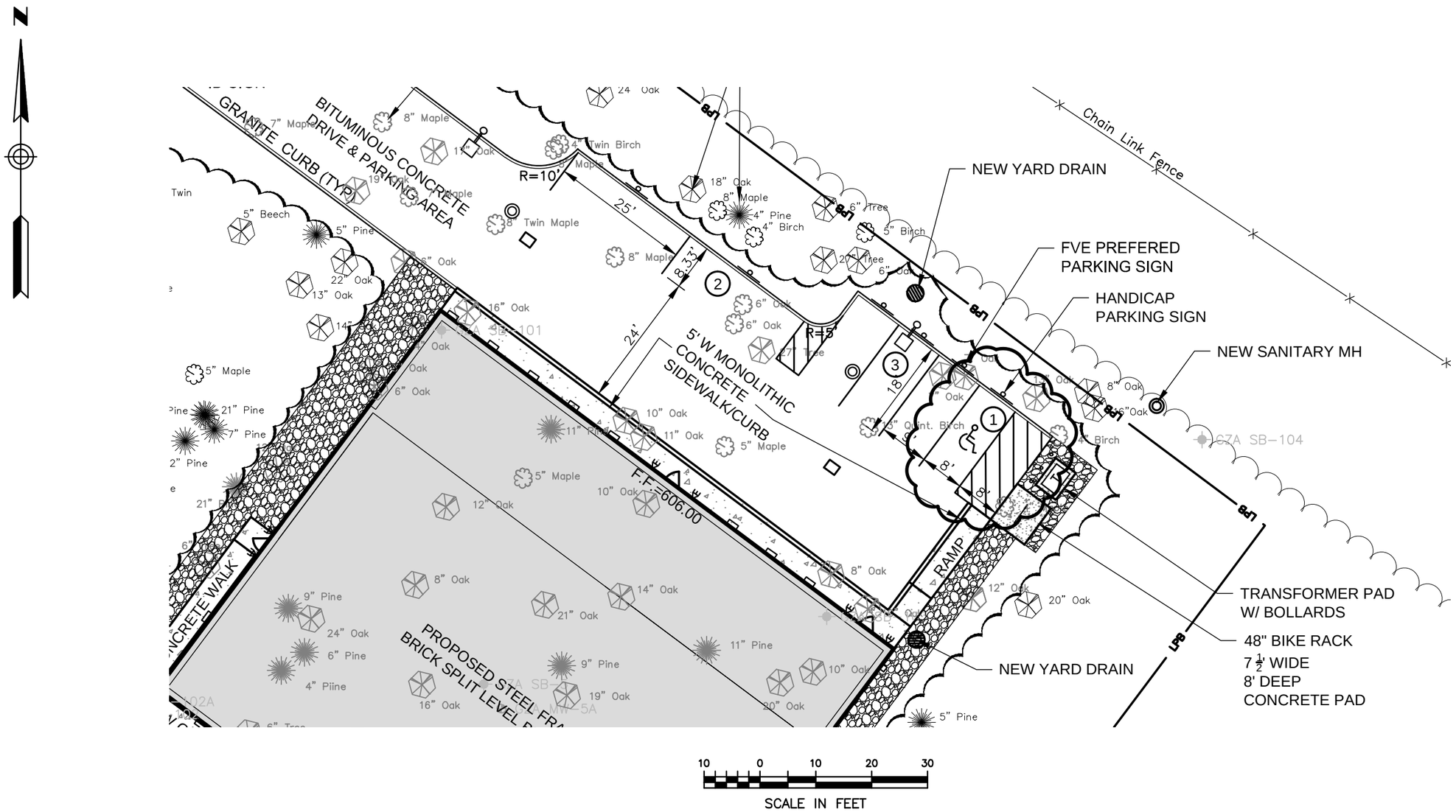
SCALE IN FEET

REFERENCE SHEET: #A
REFERENCE ADDENDUM: #
REFERENCE RFI: #
REFERENCE SUPPLEMENTAL INFORMATION:
REFERENCE CHANGE ORDER PROPOSAL REQUEST:#
REFERENCE SUBMITTAL:

TAI SOO KIM PARTNERS 146 Wyllys Street Hartford, Connecticut Tel: (860) 547-1970 Fax: (860) 249-0695	JOB NAME/NUMBER UNIVERSITY OF CONNECTICUT MAIN ACCUMULATION AREA SCALE: 1"=20' DATE: 6/2/2015 ISSUED: 6/3/2015	TITLE RAMP ELEVATION CHANGE	DRAWING NO. SK - C-2

Loureiro
Engineering • Construction • EH&S • Energy • Waste



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REFERENCE SUPPLEMENTAL INFORMATION:
REFERENCE CHANGE ORDER PROPOSAL REQUEST:#
REFERENCE SUBMITTAL:

TAI SOO KIM PARTNERS 146 Wyllys Street Hartford, Connecticut Tel: (860) 547-1970 Fax: (860) 249-0695	JOB NAME/NUMBER UNIVERSITY OF CONNECTICUT MAIN ACCUMULATION AREA SCALE: 1"=20' DATE: 6/2/2015 ISSUED: 6/3/2015	TITLE VAN ACCESSIBLE HANDICAP PARKING	DRAWING NO. SK - C-3

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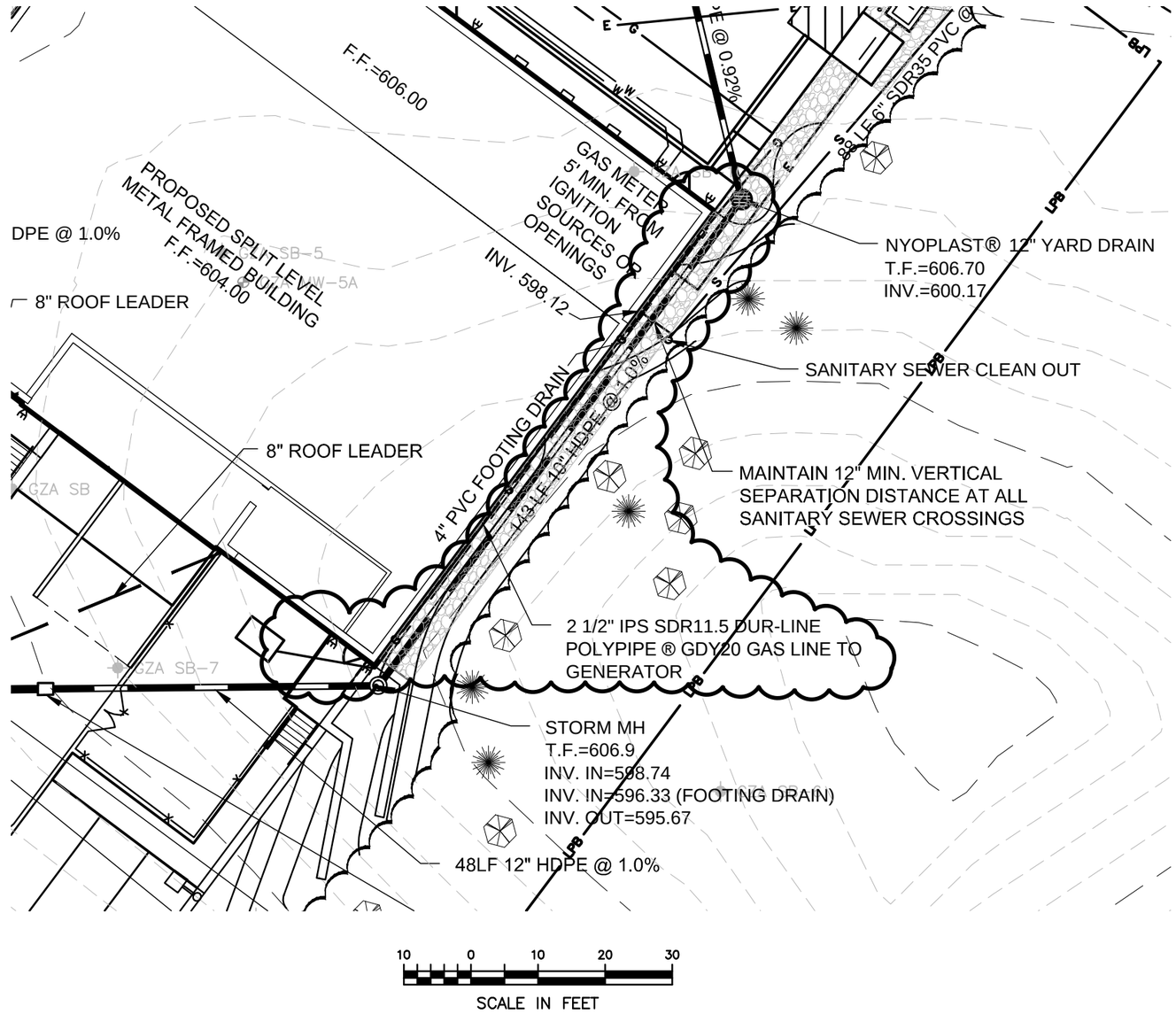

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REFERENCE RFI: #
REFERENCE SUPPLEMENTAL INFORMATION:
REFERENCE CHANGE ORDER PROPOSAL REQUEST:#
REFERENCE SUBMITTAL:

TAI SOO KIM PARTNERS 146 Wyllys Street Hartford, Connecticut Tel: (860) 547-1970 Fax: (860) 249-0695	JOB NAME/NUMBER UNIVERSITY OF CONNECTICUT MAIN ACCUMULATION AREA SCALE: 1"=20' DATE: 6/2/2015 ISSUED: 6/3/2015	TITLE 2 1/2" GAS LINE TO GENERATOR	DRAWING NO. SK - C-4

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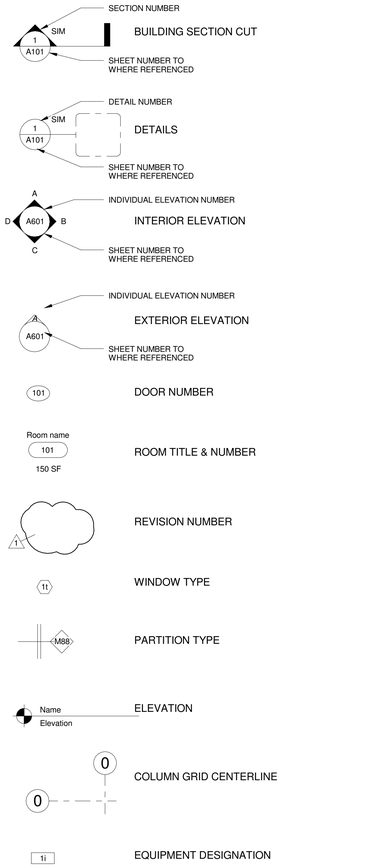
ANNOTATION LEGEND



ABBREVIATIONS

@	- AT
&	- AND
AC.	- ACOUSTIC, ACOUSTICAL
ACT.	- ACOUSTIC TILE
A.D.	- ACCESS DOOR, AREA DRAIN
ADD	- ADDENDUM
ADH	- ADHASIVE
ADJ	- ADJUSTABLE
AFF	- ABOVE FINISHED FLOOR
ALT	- ALTERNATE
AL. ALUM	- ALUMINUM
APPROX	- APPROXIMATE
ARCH	- ARCHITECTURAL
AWP	- ACOUSTICAL WALL PANEL
AUTO	- AUTOMATIC
AV	- AUDIO VISUAL
BD	- BOARD
BLDG	- BUILDING
BLK(G)	- BLOCK(ING)
BM	- BEAM
BOT.	- BOTTOM
B.O	- BOTTOM OF
BRK.	- BRICK
BSMT	- BASEMENT
BTWN.	- BETWEEN
C	- CHANNEL, COURSE
CAB.	- CABINET
CB	- CATCH BASIN
CCTV	- CLOSED CIRCUIT TV
CER	- CERAMIC
C.G.	- CORNER GUARD
CHAM.	- CHAMFER
CHCK	- CHECK
CIRC.	- CIRCUMFERENCE
CJ	- CONTROL JOINT
CL	- CENTER LINE
CLO	- CLOSET
CLG.	- CEILING
CLK(G)	- CAULK(ING)
CLR	- CLEAR
C.M.U	- CONCRETE MASONRY UNIT
COL	- COLUMN
COMP.	- COMPRESSIBLE
CONC.	- CONCRETE
CONF.	- CONFERENCE
CONST.	- CONSTRUCTION
CONT	- CONTINUATION,CONTINUOUS
COORD	- COORDINATE
CORR	- CORRIDOR
CPT.	- CARPET
C.S.	- CAST STONE
CT	- CERAMIC TILE
CUH	- CABINET UNIT HEATER
CUH-S	- CABINET UNIT HEATER - SURFACE MOUNTED
CUH-R	- CABINET UNIT HEATER - RECESSED
CUH-SR	- CABINET UNIT HEATER -
SEMI-	RECESSED
DEMO	- DEMOLISH, DEMOLITION
DET.	- DETAIL
DF	- DRINKING FOUNTAIN
DIA	- DIAMETER
DIAG.	- DIAGONAL
DIFF	- DIFFUSER
DIM.	- DIMENSION
DISP	- DISPOSAL
DIV.	- DIVISION
DMPR	- DAMPER
DN	- DOWN
D.O.	- DOOR OPENING
DPFG	- DAMPPROOFING
DPTN	- DEMOUNTABLE PARTITION
DR	- DOOR
DRN	- DRAIN
DW	- DISHWASHER
DWG(S)	- DRAWING(S)
DWR	- DRAWER
E	- EAST
EA.	- EACH
E.F.	- EXHAUST FAN
E.J.	- EXPANSION JOINT
EL.	- ELEVATION
ELEC.	- ELECTRICAL
ELEV	- ELEVATOR
EMERG	- EMERGENCY
ENCL.	- ENCLOSURE
EQ	- EQUAL
EQUIP	- EQUIPMENT
ESCAL	- ESCALATOR
E.W.C.	- ELECTRICAL WATER COOLER
EXH.	- EXHAUST
EXP.	- EXPANSION
EXIST.	- EXISTING
EXTR.	- EXTERIOR
F.A.	- FIRE ALARM
F.A.I	- FRESH AIR INTAKE
F.D.	- FLOOR DRAIN
FND.	- FOUNDATION
F.E.	- FIRE EXTINGUISHER
FEC	- FIRE EXTINGUISHER CABINET
FEC-R	- FIRE EXTINGUISHER CABINET - RECESSED
FEC-SR	- FIRE EXTINGUISHER CABINET - SEMI RECESSED
FEC-S	- FIRE EXTINGUISHER CABINET - SURFACE MOUNTED
FEV	- FUEL EFFICIENT VEHICLE
FF	- FINISH FLOOR
FF&E	- FURNITURE, FINISHES & EQUIPMENT
FHC	- FIRE HOSE CABINET
FIN.	- FINISH(ED)
FIXT.	- FIXTURE
FL	- FLOOR
FLG	- FLASHING
FLUOR.	- FLUORESCENT
FRTW	- FIRE RETARDANT TREATED WOOD
F.S.P	- FIRE STAND PIPE
FT	- FEET, FOOT
FTG	- FOOTING
FURN	- FURNITURE
FURR.	- FURRED, FURRING
FUT	- FUTURE
F.V.C	- FIRE VALVE CABINET
GA	- GAUGE / GAGE
GALV.	- GALVANIZED
G.B.	- GLAZED BLOCK
G.C.	- GENERAL CONTRACT(OR)
GEN	- GENERATOR
G.F.C	- GROUND FACE CONC. BLOCK
GL.	- GLASS, GLAZING
GL.BLK.	- GLASS BLOCK
GRD	- GROUND
GWB	- GYPSUM WALL BOARD
GYP. BD.	- GYPSUM BOARD
H.C.	- HANDICAP(PED)
HDWR.	- HARDWARE
HEX	- HEXAGON
H.M.	- HOLLOW METAL
HORZ.	- HORIZONTAL
HR	- HOUR
HT	- HEIGHT
HTG.	- HEATING
H.V.A.C.	- HEATING, VENTILATION & AIR CON.
I.D.	- INSIDE DIAMETER
IN	- INCH(ES)
INCL.	- INCLUDED, INCLUDING
INFO	- INFORMATION
INSUL. INS.	- INSULATION
INTR.	- INTERIOR
INTERM	- INTERMEDIATE
INV.	- INVERT
ISO	- ISOLATION
JAN	- JANITOR
J.C.	- JANITOR'S CLOSET
JT.	- JOINT
KD	- KNOCK DOWN
KG	- KILOGRAM
KITC.	- KITCHEN
LAM.	- LAMINATE(D)
LAV.	- LAVATORY
LCC	- LEAD COATED COPPER
LOC	- LOCATION
L.F.	- LINEAR FOOT
LG	- LONG
LGTH.	- LENGTH
LH	- LEFT HAND
LIN	- LINEAR
LL	- LIVE LOAD
LLH	- LONG LEG HORIZONTAL
LLV	- LONG LEG VERTICAL
LN	- LINE
LPB	- LEED PROJECT BOUNDARY
LT	- LIGHTING
LTG	- LIGHTINGING
LT. WT.	- LIGHTING WEIGHT
MACH	- MACHINE
MAN	- MANUAL
M.A.T	- MINERAL ACOUSTIC TILE
MAT	- MATERIAL
MAX	- MAXIMUM
M.B.	- MARKER BOARD
MECH	- MECHANICAL
MED.	- MEDIUM
MEMB	- MEMBRANE
MEZZ	- MEZZANINE
MFR	- MANUFACTURER
MH	- MANHOLE
MIN	- MINIMUM
MISC	- MISCELLANEOUS
M.O.	- MASONRY OPENING
MTD	- MOUNTED
MTG	- MOUNTING
MTL.	- METAL
MULL	- MULLION
N	- NORTH
N.A	- NOT APPLICABLE
N.I.C	- NOT IN CONTRACT
NO., #	- NUMBER
NOM.	- NOMINAL
NRC	- NOISE REDUCTION COEFFICIENT
N.T.S.	- NOT TO SCALE
O.A.	- OVERALL
O.C	- ON CENTER
O.D	- OUTSIDE DIAMETER / DIMENSION
OHD	- OVER HEAD
O.H.	- OPPOSITE HAND
OPNG	- OPENING
OPP	- OPPOSITE
O.R.D.	- OVERFLOW ROOF DRAIN
ORIG.	- ORIGINAL
OVHD	- OVERHEAD
PART.	- PARTIAL
PERP	- PERPENDICULAR
PL. LAM.	- PLASTIC LAMINATE
PLYWD.	- PLYWOOD
PRF	- POURED RESILIENT FLOORING
PRL.	- PARALLEL
PREFAB	- PREFABRICATED
PROJ	- PROJECT
P.T	- PRESSURE TREATED
PTD	- PAINTED
PVG.	- PAVING
PVMT.	- PAVEMENT
Q.T	- QUARRY TILE
QTY	- QUANTITY
R	- RADIUS OR RISER
R.A.	- RETURN AIR
RAD.	- RADIUS
RCP	- REFLECTED CEILING PLAN
R.D.	- ROOF DRAIN
RECOM.	- RECOMMENDED
RECPT	- RECEPTACLE
REC.	- RECESSED
REF.	- REFERENCE
REFL.	- REFLECTED / REFLECTIVE / REFLECT
REFR.	- REFRIGERATOR
REG.	- REGISTER
REINF.	- REINFORCED / REINFORCING
REQ.	- REQUIRE / REQUIRED
RESIL.	- RESILIENT
REV.	- REVISION, REVISED
RET.	- RETURN
R.H.	- RIGHT HAND
RM.	- ROOM
R.O.	- ROUGH OPENING
RTD	- RATED
RTG	- RATING
R.W.L	- RAIN WATER LEADER
S	- SOUTH
SAN.	- SANITARY
SBB	- SANDBLASTED BLOCK
S.C.	- SOLID CORE
SC	- SEALED CONCRETE
SCHE.	- SCHEDULE
S.D.	- STORM DRAIN
SECT.	- SECTION
SEW.	- SEWER
SF	- SQUARE FEET/FOOT
SHT.	- SHEET
SHWR	- SHOWER
SIM.	- SIMILAR
S.O.G	- SLAB ON GRADE
SPEC.	- SPECIFICATION
SPKLR	- SPRINKLER
SPKR	- SPEAKER
SQ.	- SQUARE
S.S	- SANITARY SINK
S.S	- STAINLESS STEEL
S.STL	- STAINLESS STELLA
ST	- STREET
STA.	- STATION
STC	- SOUND TRANSMISSION CLASS
STD	- STANDARD
STL	- STEEL
STOR.	- STORAGE
STRG.	- STRINGER
STRL	- STRUCTURAL
STRUCT	- STRUCTURAL
SUBCTG	- SUBCATEGORY
SUSP.	- SUSPENDED
SYS	- SYSTEM
T&B	- TOP AND BOTTOM
T&G	- TONGUE AND GROOVE
T	- TREAD
TAN.	- TANGENT
T.B	- TACK BOARD
TEC.	- TECTUM
TEL	- TELEPHONE OR TELECOM
TEMP.	- TEMPORARY
TER.	- TERRAZZO
THK	- THICKNESS
THRES	- THRESHOLD
THRU	- THROUGH
TMPD	- TEMPERED
T.O.	- TOP OF (SEE OTHER WORD)
TV	- TELEVISION
TYP.	- TYPICAL
UNFIN.	- UNFINISHED
U.O.N	- UNLESS OTHERWISE NOTED
UR	- URINAL
U.P.T	- UNGLAZED PORCELAIN TILE
UTIL.	- UTILITY
VAR.	- VARIES
VAC	- VENTILATION AND AIR CONDITIONING
VCT	- VINYL COMPOSITION TILE
VERT.	- VERTICAL
VEST.	- VESTIBULE
V.I.F	- VERIFY IN FIELD
VT	- VINYL TILE
VWC	- VINYL WALL COVERING
W	- WEST
W/	- WITH
WB	- WHITE BOARD
W.C	- WATER CLOSET
WD.	- WOOD
WDW	- WINDOW
W/O	- WITHOUT
WTPFG	- WATERPROOFING
WWF	- WELD WIRE FABRIC
WT	- WEIGHT

GENERAL NOTES

CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO COMMENCING WORK AND BRING ANY DISCREPANCIES TO THE ATTENTION OF THE ARCHITECT.

CONTRACTOR SHALL NOTIFY THE ARCHITECT IMMEDIATELY OF DISCREPANCIES IN THE DRAWINGS.

DO NOT SCALE DRAWINGS, USE WRITTEN DIMENSIONS ONLY.

ALL DIMENSIONS ARE ROUGH FRAMING DIMENSIONS. DIMENSIONS ARE FROM FACE OF METAL STUD, TO FACE OF CONCRETE BLOCK, TO CENTER LINE OF STRUCTURAL GRID. SEE WALL TYPES FOR ADDITIONAL INFORMATION.

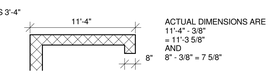
GENERAL REQUIREMENTS FOR MASONRY WALLS WHERE NOT SPECIFICALLY DETAILED OTHERWISE.

ALL MASONRY DIMENSIONS ARE SHOWN AS MODULAR DIMENSIONS UNLESS OTHERWISE NOTED.

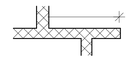
B. MASONRY DIMENSIONS:
UNLESS OTHERWISE INDICATED ALL MASONRY PLAN DIMENSIONS ARE NOMINAL, WITH 'NOMINAL' DEFINED TO MEAN ACTUAL DIMENSION SHOWN OR DIMENSION SHOWN +- 3/8".

MASONRY DIMENSIONS ARE DEFINED TO BE 3/8" LARGER THAN DIMENSIONS SHOWN EXAMPLE:

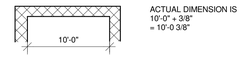
OVERALL DIMENSIONS OF MASONRY WALL LENGTH OR THICKNESS ARE DEFINED TO BE 3/8" SMALLER THAN DIMENSIONS SHOWN EXAMPLE:



DIMENSIONS FROM INSIDE TO OUTSIDE CORNERS ARE ACTUAL EXAMPLE:



INSIDE DIMENSIONS OF MASONRY WALL ARE DEFINED TO BE 3/8" LARGER THAN DIMENSIONS SHOWN EXAMPLE:



THE TERM "TYPICAL" IS USED TO DEFINE A GENERAL CONDITION THAT WILL APPLY TO ALL SUCH CONDITIONS EXCEPT AS OTHERWISE NOTED.

ALL INTERIOR WALL SHALL TERMINATE AT BOTTOM OF METAL DECK OR BOTTOM OF STRUCTURAL STEEL.

ALL SMOKE WALLS OR FIRE RATED PARTITIONS WHICH TERMINATE AT UNDERSIDE OF METAL DECK SHALL HAVE FLUTES AT METAL DECK FILLED SOLID WITH FIRE SAFING INSULATION.

STAIR ENCLOSURES SHALL HAVE NO PENETRATIONS OR OPENINGS FOR WIRING, PIPING, DUCTS, ETC.. EXCEPT FOR THOSE REQUIRED TO SERVE THE STAIR.

ALL PIPES, CONDUITS, CABLES, WIRES, DUCTS, ETC.. THAT PASS THROUGH FLOOR, SMOKE BARRIERS, FIRE RATED PARTITIONS AND FIRE WALLS SHALL HAVE THE SPACE BETWEEN THE PENETRATING ITEM AND THE WALL FILLED WITH EITHER FIRE RESISTANT JOINT SEALER OR FIRE SAFING INSULATION.

FIRESTOPPING SHALL BE PROVIDED IN CONNECTIONS BETWEEN HORIZONTAL AND VERTICAL SPACES SUCH AS SOFFITS, DROPPED CEILINGS AND COVE CEILINGS. FIRESTOPPING SHALL CONSIST OF APPROVED NON-COMBUSTIBLE MATERIALS, SECURELY FASTENED IN PLACE AND SHALL BE CONTINUOUSLY MAINTAINED. FIRESTOPPING SHALL NOT BE CONCEALED FROM VIEW UNTIL INSPECTED AND APPROVED.

INTERIOR WALL AND CEILING FINISHES SHALL BE CLASS A OR B. INTERIOR FINISHES IN STAIRS, CORRIDORS, LOBBIES AND EXITS SHALL BE CLASS A. FLOOR COVERINGS WITHIN STAIRS, CORRIDORS OR EXITS SHALL BE CLASS I OR II.

COORDINATE LOCATION OF ELECTRICAL DEVICES; I.E.: LIGHTINGS, SWITCHES, OUTLETS, FIRE ALARM DEVICES,
SPEAKERS, ETC.,; WITH ELECTRICAL DRAWINGS AND LOCATIONS INDICATED ON ARCHITECTURAL REFLECTED CEILING PLANS AND INTERIOR ELEVATIONS. IF CONFLICT ARISES BETWEEN ELECTRICAL DRAWINGS AND ARCHITECTURAL DRAWINGS CONTRACTOR SHALL NOTIFY ARCHITECT PRIOR TO INSTALLATION OF DEVICE.

HARDWARE NOTES:

ALL RATED DOORS SHALL HAVE CLOSERS AND POSITIVE LATCHING LOCKSETS OR LATCHSETS.

ALL DOORS EXITING 100 0R MORE PEOPLE SHALL HAVE PANIC EXIT DEVICES.

ALL DOORS LEADING TO HAZARDOUS SPACES SHALL HAVE TACTILE WARNING. HAZARDOUS AREAS INCLUDE: CUSTODIAL SPACES, BOILER ROOM, MECHANICAL ROOMS AND ELECTRICAL CLOSETS.

ACCESSIBLE DOOR HARDWARE FOR PEOPLE WITH DISABILITIES SHALL BE PROVIDED TO COMPLY WITH UNIFORM FEDERAL ACCESSIBILITY STANDARDS.

ALL ACCESSIBLE DOORS ON FRONT APPROACH SHALL MEET THE FOLLOWING CRITERIA:

24" MINIMUM CLEARANCE FROM THE DOOR JAMB ON THE LATCH SIDE OF ADJACENT WALL OR MILLWORK.

12" MINIMUM CLEARANCE FROM THE DOOR JAMB ON THE LATCH SIDE TO THE ADJACENT WALL OR MILLWORK. ADJACENT WALL ON HINGE SIDE REQUIRES NO CLEARANCE.

IF A CONFLICT IN DIMENSIONED DRAWINGS OCCURS WITH THE ABOVE CRITERIA, THE CONTRACTOR SHALL BRING IT TO THE ATTENTION OF THE ARCHITECT BEFORE THE DOOR OPENING IS CONSTRUCTED.

REACH RANGE FOR ACCESSIBILITY SHALL MEET THE FOLLOWING CRITERIA:

A. FORWARD REACH

IF CLEAR FLOOR AREA ONLY ALLOWS FORWARD APPROACH TO AN OBJECT, THE MAXIMUM HIGH FORWARD REACH SHALL BE 48" AND THE MINIMUM LOW FORWARD REACH SHALL BE 15". IF THE HIGH FORWARD REACH IS OVER AN OBSTRUCTION, REACH AND CLEARANCES SHALL BE AS SHOWN IN ICC/ANSI A117.1-2003

IF CLEAR FLOOR SPACE ALLOWS PARALLEL APPROACH BY A PERSON IN A WHEELCHAIR, THE MAXIMUM HIGH SIDE REACH ALLOWED SHALL BE 48" AND THE LOW SIDE REACH SHALL BE NO LESS THAN 15" ABOVE THE FLOOR.

ACCESSIBILITY NOTES:

ALL PROGRAMS ARE ACCESSIBLE TO PERSONS WITH DISABILITIES.

ALL ROOMS USED BY PERSONS WITH DISABILITIES HAVE ACCESSIBLE WORK STATIONS.

ALL ACCESSIBLE ELEMENTS ARE MARKED WITH THE INTERNATIONAL SYMBOL OF ACCESSIBILITY AND THE ACCESSIBLE ROUTE HAS 36 INCH MINIMUM CLEARANCE THROUGHOUT (32 INCH CLEARANCE FOR DOORWAYS).

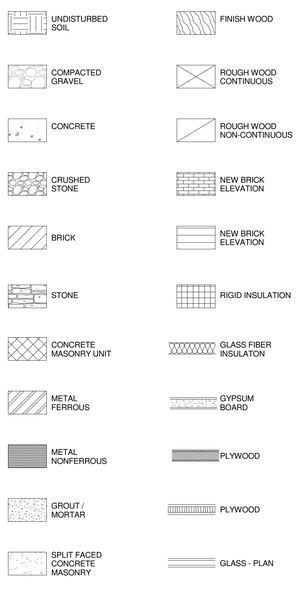
ALL ITEMS SHALL COMPLY WITH SECTION 504, REHABILITATION ACT 1973.

ALL LABS & SHOPS USED BY PERSON W/ DISABILITIES HAVE ACCESSIBLE EMERGENCY EYEWASH & BODY WASH STATION

HIGH PERFORMANCE NOTES:

PROJECT WILL COMPLY WITH CT HIGH PERFORMANCE MANDATORY REQUIREMENTS AND LEED SILVER CERTIFICATION..

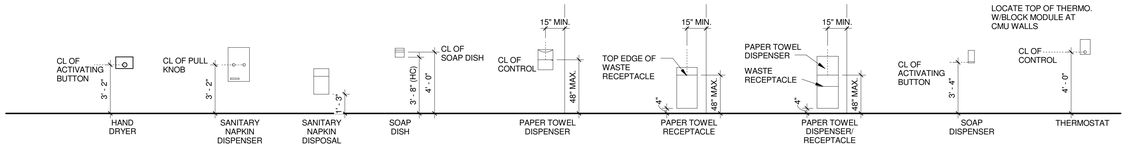
MATERIAL LEGEND



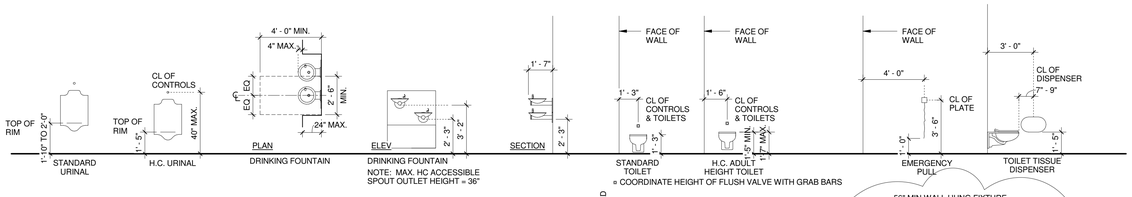
FUTHER GRAPHIC REFERENCES:

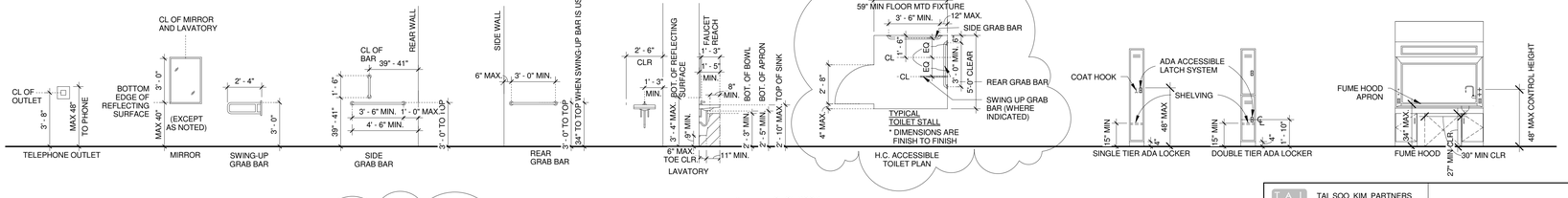
1. GRAPHIC STANDARDS
2. TIME SAVER STANDARDS

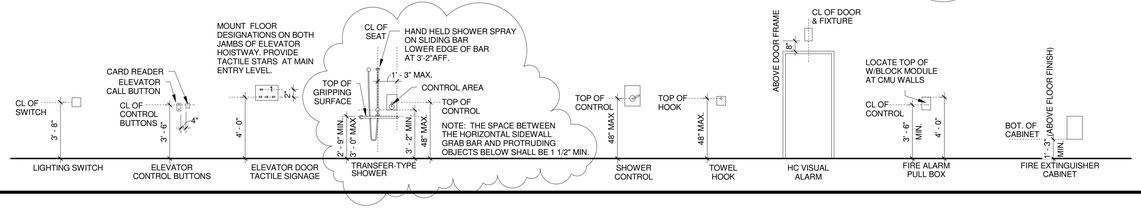
TYPICAL FIXTURE HEIGHTS AND CLEARANCES



NOTE:ALL MOUNTING HEIGHTS SHOWN ON INTERIOR ELEVATIONS SHOULD SUPERSEDE HEIGHTS SHOWN ON THESE DRAWINGS AND ANY DISCREPANCY SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT PRIOR TO INSTALLATION.







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TITLE
GENERAL
INFORMATION

ISSUE DATES		
NO.	ISSUE DATE	PURPOSE
5	Date 5	ADDENDUM #1

UNIVERSITY OF CONNECTICUT

STORRS, CT

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
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DATE: 9/10/2014
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1. **USE GROUP CLASSIFICATION (IBC CHAPTER 3)**

SEPARATED USE:	H-2 (HIGH HAZARD GROUP)
NON-SEPARATED USE WITH B:	S-1 (MODERATE HAZARD STORAGE)
NON-SEPARATED USE WITH S-1:	B (BUSINESS)

2. **CONSTRUCTION TYPE (IBC CHAPTER 6)**

MINIMUM TYPE REQUIRED	TYPE IIB (FULLY SPRINKLERED)
ACTUAL TYPE PROVIDED	TYPE IIB (FULLY SPRINKLERED)

3. **BUILDING HEIGHT (IBC CHAPTER 5)**

ALLOWABLE HEIGHT (STORY/FEET)	1 STORY / 25 FEET (FULLY SPRINKLERED)
ACTUAL HEIGHT (STORY/FEET)	1 STORY / 18' - 0"
STORIES ABOVE GRADE	1 STORY

4. **BUILDING AREA (IBC CHAPTER 5)**

BUILDING AREA (EACH FLOOR INSIDE FACE OF WALL & OVERHANGS)

FIRST FLOOR: 7,334 SF
TOTAL: 7,334 SF

5. **AREA MODIFICATIONS TO TABLE 503**

	NORTH	EAST	WEST	SOUTH
TOTAL PERIMETER =	85 LF	101 LF	101 LF	85 LF
OPEN PERIMETER =	85 LF	101 LF	101 LF	85 LF

TOTAL PERIMETER (F) = 372 LF

TOTAL OPEN PERIMETER = 372 LF
(BUILDING PERIMETER WHICH FRONTS ON A PUBLIC WAY OR OPEN SPACE HAVING 30' OPEN MIN. WIDTH)

WIDTH OF OPEN SPACE (W) = 30.0
If = 100* [(F/P) - 0.25] * (W/30)

% FRONTAGE INCREASE (LF) = 100*[(372/372) - 0.25] * (30/30) = 75%

% OF ALLOWABLE TABULAR AREA, At (IBC TABLE 503) = 100%

% INCREASE FOR FRONTAGE, If (IBC 506.2) = 75%

% INCREASE FOR AUTOMATIC SPRINKLERS, Is (IBC 506.3) = NP

TOTAL PERCENTAGE FACTOR = 175%

CONVERSION FACTOR (CF) 1.75
(TOTAL PERCENTAGE FACTOR/100%)

6. **MIXED OCCUPANCY SEPARATED USES (IBC 302.3.2) (ALLOWABLE AREA 506.4)**

Use Group: H-2 Use Group: S-1
(Includes B Occupancy Non-sepatated)

Actual Area / Allowable Area	+	Actual Area / Allowable Area		≤	1
2,273 / 7,000	+	5,061 / 17,500		≤	1
0.3247	+	0.2892	= 0.614	≤	1

ALLOWABLE AREA per floor (Aa)
(Conversion Factor x Tabular Area from Table 503)

1.75 x 7,000 SF (H-2 most restrictive) = 12,250 SF

ACTUAL BUILDING AREA (each floor)

Actual Area 1st Floor : 7,334 SF < 12,250 SF

TOTAL FLOOR AREA (all stories)

7,334 SF

7. **FIRE RESISTANT RATINGS OF STRUCTURAL ELEMENTS (IBC TABLE 601)**

	REQUIRED	PROVIDED
STRUCTURAL FRAME: INCLUDING COLUMNS, GIRDERS, TRUSSES	0	0
BEARING WALLS - EXTERIOR	NA	NA
BEARING WALLS - INTERIOR	NA	NA
NONBEARING WALLS AND PARTITIONS (EXT.) FIRE SEPARATION DISTANCE >30'	0	0
NONBEARING WALLS AND PARTITIONS (INTERIOR)	0	0
FLOOR CONSTRUCTION (INCLUDING SUPPORTING BEAMS AND JOISTS)	0	0
ROOF CONSTRUCTION (INCLUDING SUPPORTING BEAMS AND JOISTS)	0	0
FIRE WALLS	2	2
EXIT ENCLOSURES (LESS THAN 4 STORIES	1	1
SHAFT ENCLOSURES (LESS THAN 4 STORIES)	1	1
MIXED USE SEPARATION	1	1
FIRE SEPARATIONS, SMOKE BARRIERS	1	1

8. **OCCUPANCY LOAD**

DESIGN LOAD FOR EACH FLOOR: FIRST FLOOR	48
TOTAL EXIT CAPACITY FOR EACH FLOOR: FIRST FLOOR	990
DESIGN TOTAL FOR BUILDING:	48
TOTAL EXIT CAPACITY FOR BUILDING:	990

9. **MODIFICATIONS**

NONE

10. **ACCESSIBLE BUILDING**

DESIGNATED

11. **MINIMUM PLUMBING FIXTURE COUNT**

	BUSINESS (B)	TOTAL REQUIRED	TOTAL PROVIDED
WC FEMALE	: 12/50 = .24	= 1	= 1
WC MALE	: 12/50 = .24	= 1	= 1
LAVS	: 23/50 = .46	= 1	= 2
DRINKING F.	: 23/100 = .23	= 1	= 1
SERVICE SINK	: 1	= 1	= 1

DESIGN TOTAL:
H-2 : TOTAL OCCUPANCY = 48

12. **SPRINKLER PROTECTION**

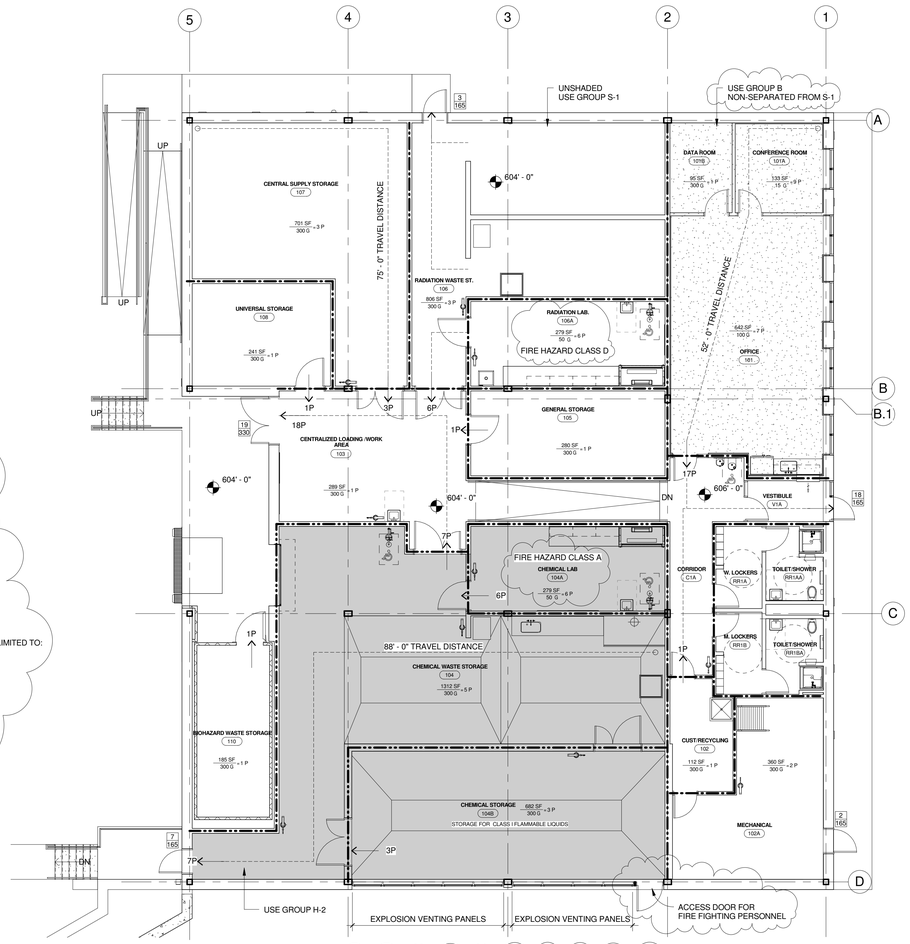
FULLY SPRINKLERED

13. **CODES TO WHICH THIS PROJECT WAS DESIGNED**

A. CURRENT STATE BUILDING CODE W/ SUPPLEMENT:
2003 INTERNATIONAL BUILDING CODE
W/ 2005 CT STATE SUPPLEMENT AND 2009,2011 & 2013 AMENDMENTS
B. CURRENT STATE FIRE CODE W/ SUPPLEMENT:
2003 INTERNATIONAL FIRE CODE
W/ 2005 CT FIRE SAFETY CODE SUPPPLEMENT AND 2009 & 2011 AMENDMENTS
C. STATE HEALTH CODE:
CURRENT CT PUBLIC HEALTH CODE
D. OSHA:
TITLE 29/LABOR
E. AMERICAN NATIONAL STANDARD W/ SUPPLEMENT:
ICC/ANSI A117.1-2003 ACCESSIBLE AND USABLE BUILDINGS
AND FACILITIES, W/ CT STATE SUPPLEMENT
F. HIGH PERFORMANCE BUILDING CONSTRUCTION STANDARDS FOR PUBLIC BUILDINGS
STATE OF CONNECTICUT REGULATION SECTION 16A - 38K1 THROUGH 9
G. ADA - AMERICANS WITH DISABILITIES ACT:
2010 ADA STANDARDS FOR ACCESSIBLE DESIGN
H. CURRENT STATE PLUMBING CODE W/ SUPPLEMENT:
2003 INTERNATIONAL PLUMBING CODE
W/ CT SUPPLEMENT & RELATED DOCUMENT
I. CURRENT STATE MECHANICAL CODE W/ SUPPLEMENT:
2003 INTERNATIONAL MECHANICAL CODE
W/ CT SUPPLEMENT & RELATED DOCUMENT
J. CURRENT STATE ENERGY CODE W/ SUPPLEMENT:
2009 INTERNATIONAL ENERGY CONSERVATION CODE
W/ CT SUPPLEMENT & RELATED DOCUMENT
K. CURRENT STATE ELECTRICAL CODE W/ SUPPLEMENT:
2011 NATIONAL ELECTRICAL CODE (NFPA-70)
W/ CT STATE SUPPLEMENTS, & RELATED DOCUMENTS
L. CODES IN EFFECT AND REFERENCED BY THE STATE OF CONNECTICUT INCLUDING BUT NOT LIMITED TO:
2005 CONNECTICUT FIRE SAFETY CODE WITH 2009 AND 2012 AMENDMENTS
-2002 NFPA 13
-2002 NFPA 72
2010 CONNECTICUT FIRE PREVENTION CODE
CONNECTICUT FLAMMABLE AND COMBUSTIBLE LIQUIDS CODE
-1996 NFPA 30
CONNECTICUT GAS & EQUIPMENT PIPING CODE
-1996 NFPA 54
CONNECTICUT LIQUEFIED PETROLEUM & LIQUIFIED NATURAL GAS CODE
-1995 NFPA 58
CONNECTICUT HAZARDOUS CHEMICALS CODE
-1996 NFPA 45
-1995 NFPA 430

14. **THRESHOLD BUILDING CONDITION**

NO



2 FIRST FLOOR PLAN - Code
1/8" = 1'-0"

CHEMICAL STORAGE ROOM 104B - RELIEF (DEFLAGRATION) VENTING CALCULATION PER NFPA 68 (CODE PATH: IBC 415.7.2.3, IFC 2704.6 SECTION 911, NFPA 68)

VENT AREA CALCULATION

ROOM SURFACE AREA/12.0 = REQUIRED VENT AREA

ROOM SURFACE AREA = 2(LxW) + 2 (LxH) + 2 (WxH)

L = 40'-10" W=16'-8" H=14'-0"

ROOM SURFACE AREA = 2(40.83 x 16.67) + 2 (40.83 x 14) + 2 (16.67 x 14)
ROOM SURFACE AREA = 1,361 + 1,143 + 476
ROOM SURFACE AREA = 2,980 SF

ROOM SURFACE AREA/12.0 = 2,980/12.0 = 248.33 SF REQUIRED VENT AREA

PROVIDED VENT AREA = 9 WALL PANELS @ 25 SF OPERABLE AREA =225 SF
+ 1 ROOF VENT @ 24 SF
= 249 SF TOTAL

249 SF PROVIDED VENT AREA > REQUIRED VENT AREA

DRAWING LEGEND

XXX	ROOM NUMBER
875 / 20 43P	ROOM OCCUPANCY LOAD: AREA IN SQUARE FEET; ROOM OCCUPANCY LOAD; OCCUPANCY LOAD FACTOR
191	MAX.. ALLOWABLE EGRESS OCCUPANCY OF STAIR
440	MAX.. ALLOWABLE OCCUPANCY OF CORRIDOR
X / 165	EXIT CAPACITY: ACTUAL EGRESS OCCUPANCY OF DOOR OR STAIR; MAX.. ALLOWABLE EGRESS OCCUPANCY OF DOOR OR STAIR
	ACCESSIBLE AREA OR EXIT
	ACCESSIBLE AT GRADE (FLUSH CONDITION)
R	REQUIRED EXTERIOR EXIT
AOR	AREA OF REFUGE
	SMOKE RESISTANT CONSTRUCTION (TIGHT TO DECK ABOVE SEAL ALL PENETRATIONS TO RESIST PASSAGE OF SMOKE)
	3 HOUR FIRE RATED WALL (TIGHT TO DECK ABOVE)
	2 HOUR FIRE RATED WALL (TIGHT TO DECK ABOVE)
	1 HOUR FIRE RATED WALL (TIGHT TO DECK ABOVE)
	LINE OF LUMINESCENT WALL BASE

DOOR CLEAR EGRESS WIDTHS

GENERAL SPACES:
.2 FACTOR

X / 165	3'-0" DOOR (33" CLR.)
X / 330	6'-0" DOOR (66" CLR.)

TABLE 1004.1.2
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT

LOCKER ROOMS	=	50 GROSS
OFFICE	=	100 GROSS
ACCESSORY STORAGE AREAS AND MECH... EQUIP. RM...	=	300 GROSS

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
CODE PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD
5	Date 5	ADDENDUM #1

PROJECT: MAIN ACCUMULATION AREA
UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\bhickcox.TSKP\Documents\140202 UCONN_MAA - Central - CA - 2014_SKHickcox.rvt

DATE: 9/10/2014
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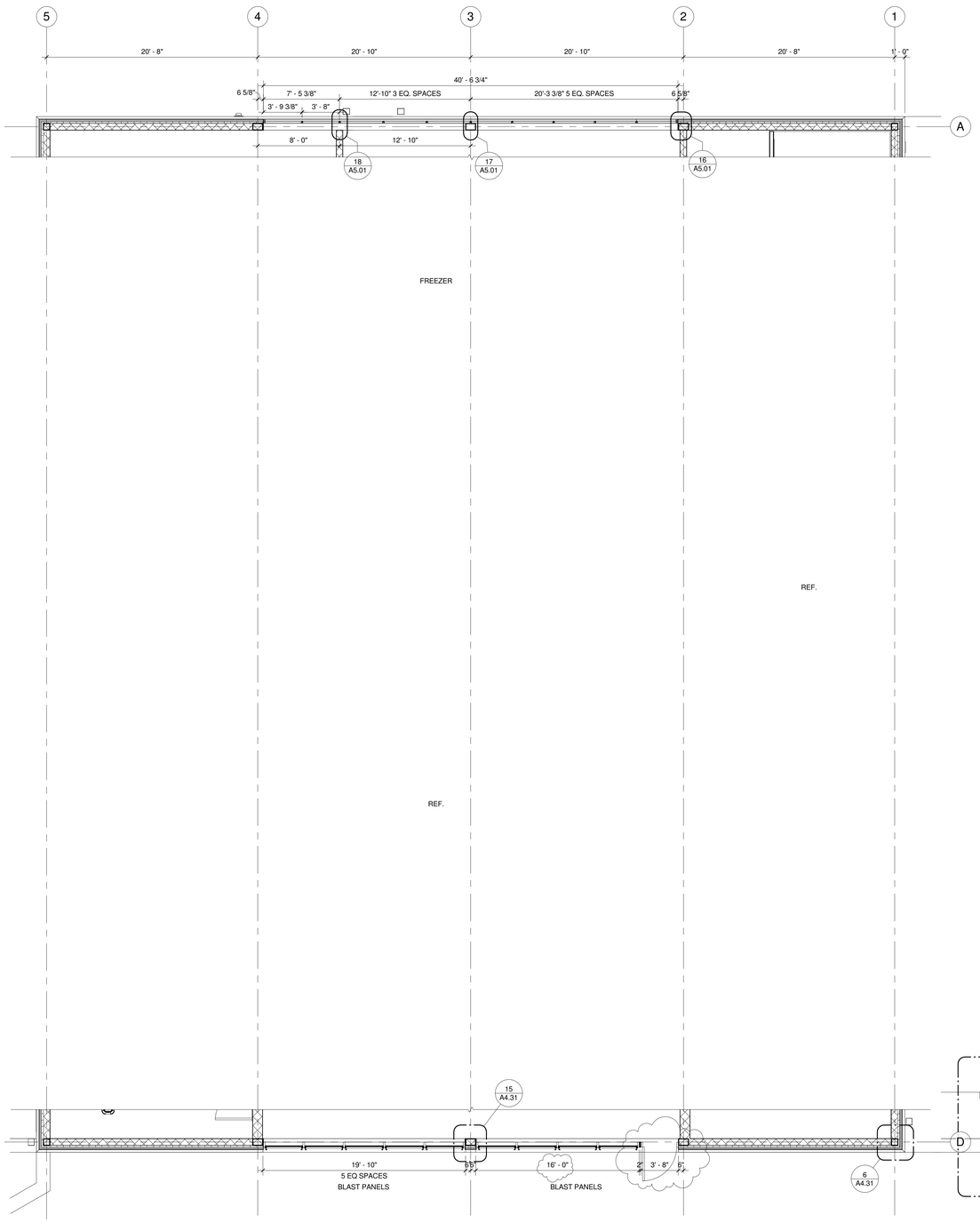
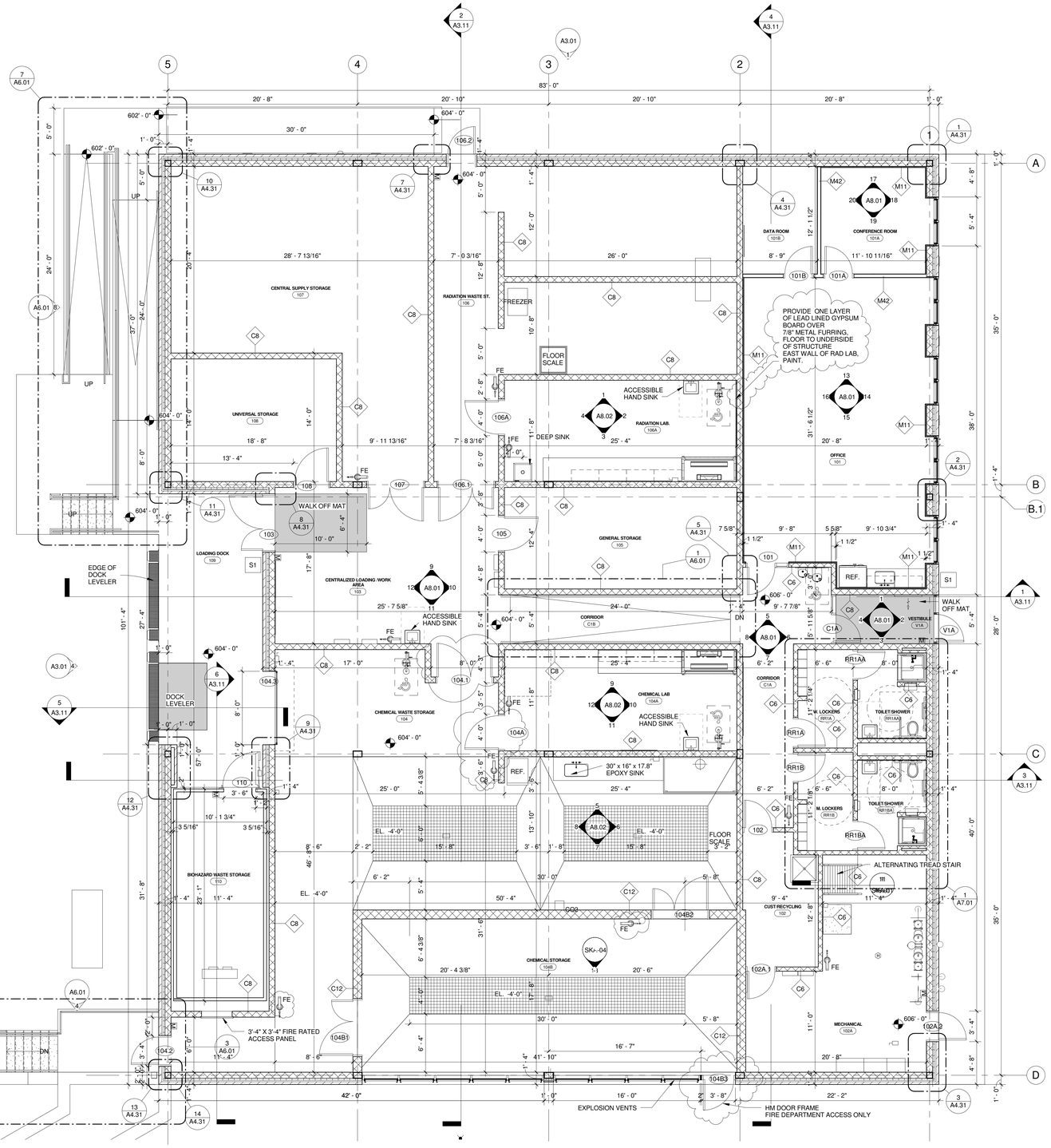


2 CLERESTORY PLAN
3/16" = 1'-0"



1 FIRST FLOOR PLAN
3/16" = 1'-0"

N TRUE NORTH

N TRUE NORTH

SIGNAGE KEY

NOTE: LOCATIONS SHOWN FOR INFORMATION ONLY. SIGNAGE SHOWN ON THIS DRAWING WILL BE PROVIDED BY THE OWNER.

S1 - LEED IEQp2 ENVIRONMENTAL TOBACCO SMOKE CONTROL

TEXT: "NO SMOKING WITHIN THE BUILDING OR WITHIN 25 FEET OF THE BUILDING"

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HARTFORD, CONNECTICUT
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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE

FIRST FLOOR PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD
5	Date 5	ADDENDUM #1

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202

FILE PATH
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DRAWN BY: OCT
CHECKED BY: BH

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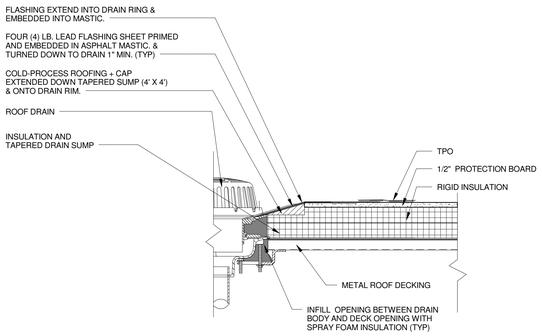
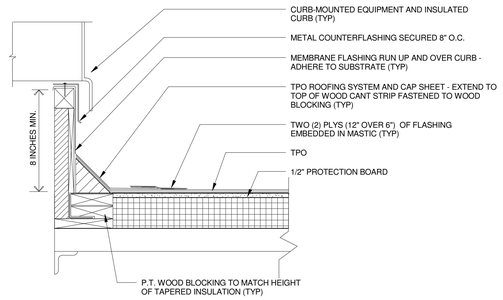
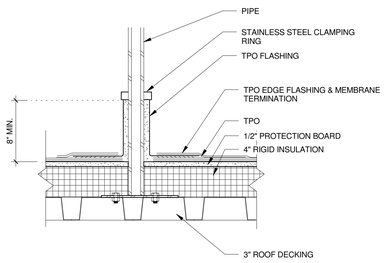


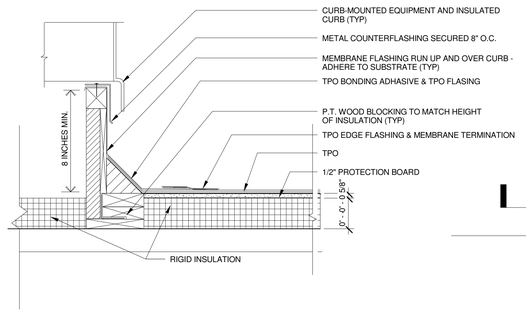
5 ROOF DRAIN DETAIL - TYPICAL
1 1/2" = 1'-0"



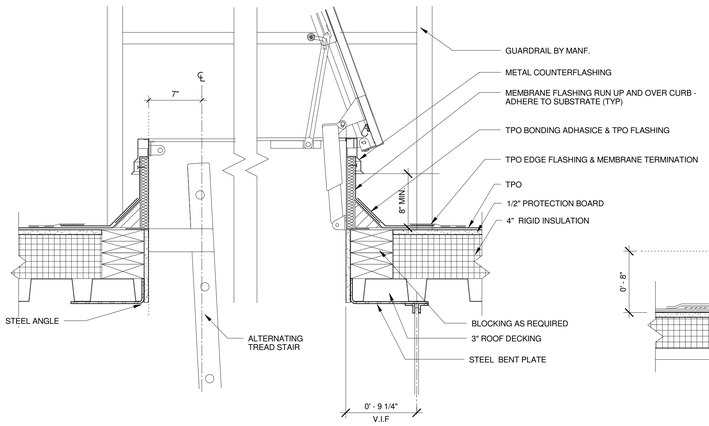
2 MECHANICAL CURB FLASHING DETAIL 1 - TYPICAL
1 1/2" = 1'-0"



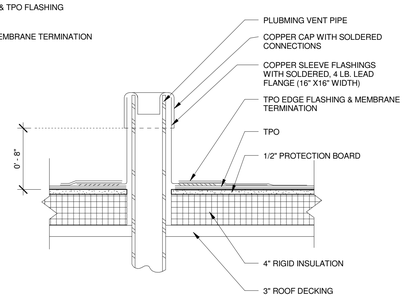
6 PIPE FLASHING DETAIL - TYPICAL
1 1/2" = 1'-0"



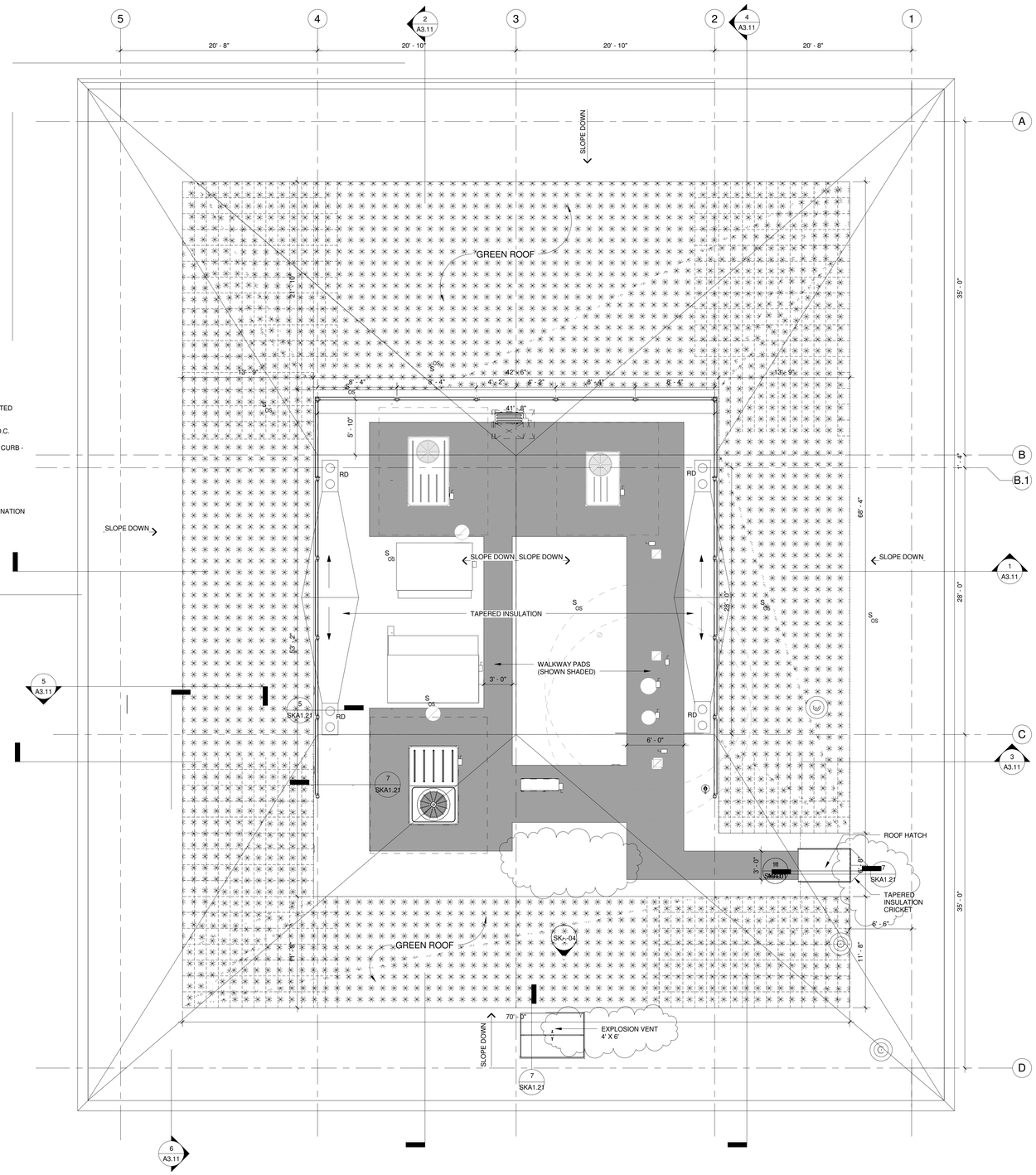
3 MECHANICAL CURB FLASHING DETAIL 2 - TYPICAL
1 1/2" = 1'-0"



7 ROOF HATCH/EXPLOSION VENT DETAIL - TYPICAL
1 1/2" = 1'-0"



4 VENT PIPE FLASHING DETAIL - TYPICAL
1 1/2" = 1'-0"



1 ROOF PLAN
3/16" = 1'-0"

TYPICAL ROOF SYSTEM:

- TPO MEMBRANE
- 1/2" COVER BOARD
- 2 LAYERS, 2" THICK POLYISOCYANURATE INSULATION (R=20)
- METAL ROOF DECK

NOTE:
PRE-GROWN VEGETATIVE MODULAR TRAY SYSTEM WHERE SHOWN

TAI SOO KIM PARTNERS ARCHITECTS
146 WYLLYS STREET
HARTFORD, CONNECTICUT
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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
ROOF PLAN & DETAILS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD
5	Date 5	ADDENDUM #1

PROJECT: MAIN ACCUMULATION AREA
UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 1402002
FILE PATH: C:\Users\bhickcox.TSKP\Documents\1402002_UCONN_MAA - Central - CA - 2014_bhickcox.rvt

DATE: 9/10/2014
SCALE: As indicated
DRAWN BY: Author
CHECKED BY: Checker

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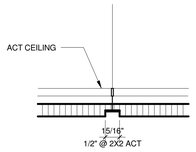
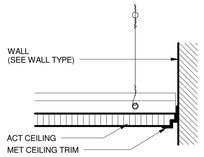
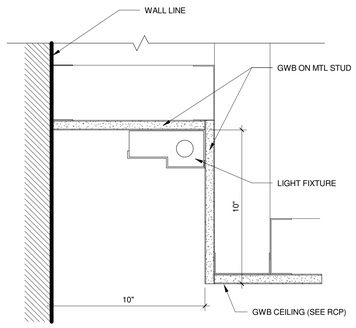


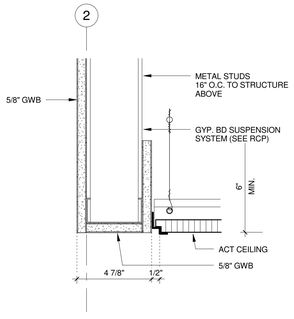
2 ACT CEILING (TYP.)
3" = 1'-0"



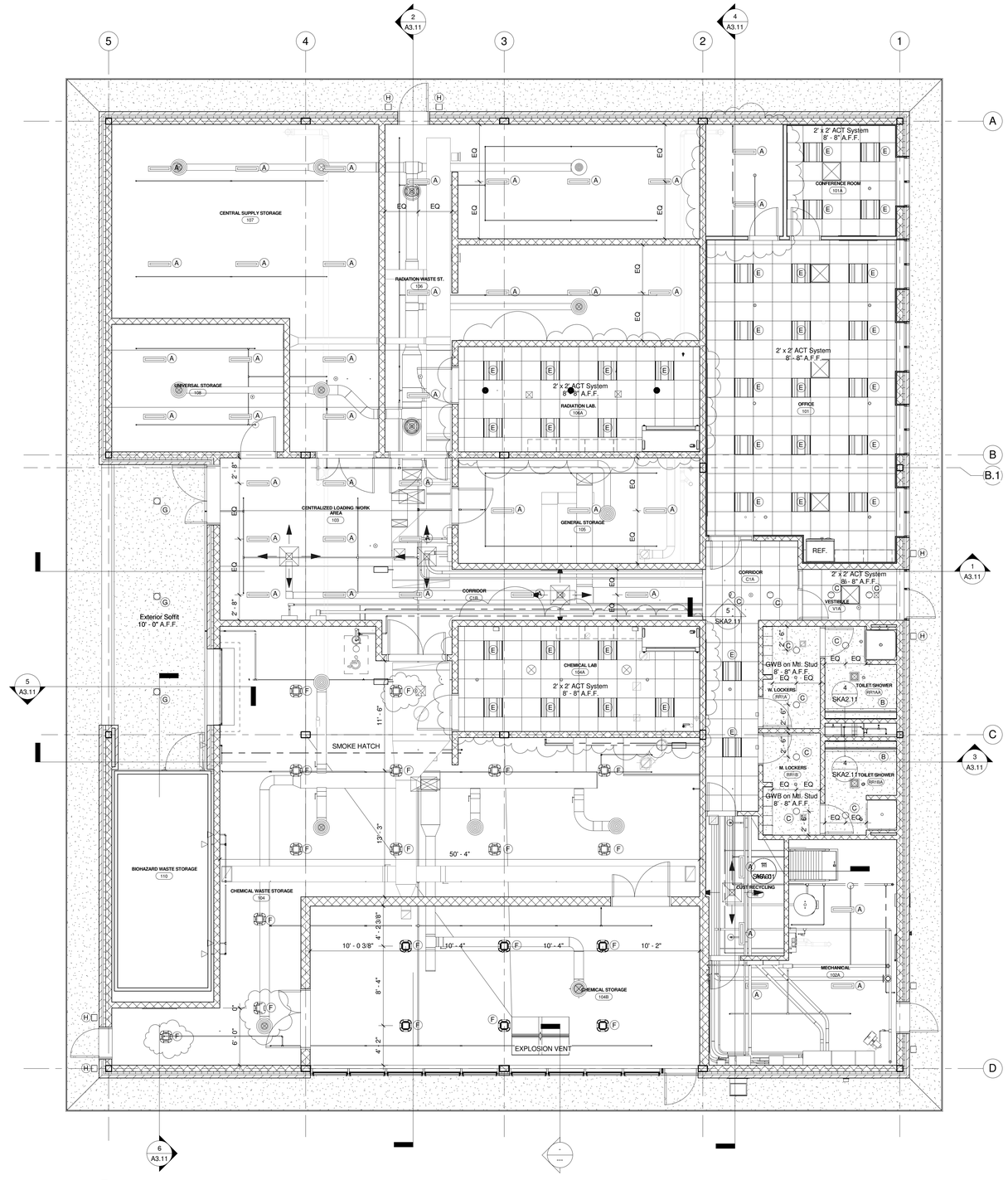
3 ACT CEILING AT WALL (TYP.)
3" = 1'-0"



4 LIGHT POCKET AT TOILET
3" = 1'-0"



5 GWB SOFFIT DETAIL
3" = 1'-0"



1 FIRST FLOOR RCP
3/16" = 1'-0"

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
REFLECTED CEILING PLAN
& DETAILS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD
5	Date 5	ADDENDUM #1

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\bhickcox.TSKP\Documents\140202_UCONN_MAA - Central - CA_R14_bhickcox.rvt

DATE: 9/10/2014
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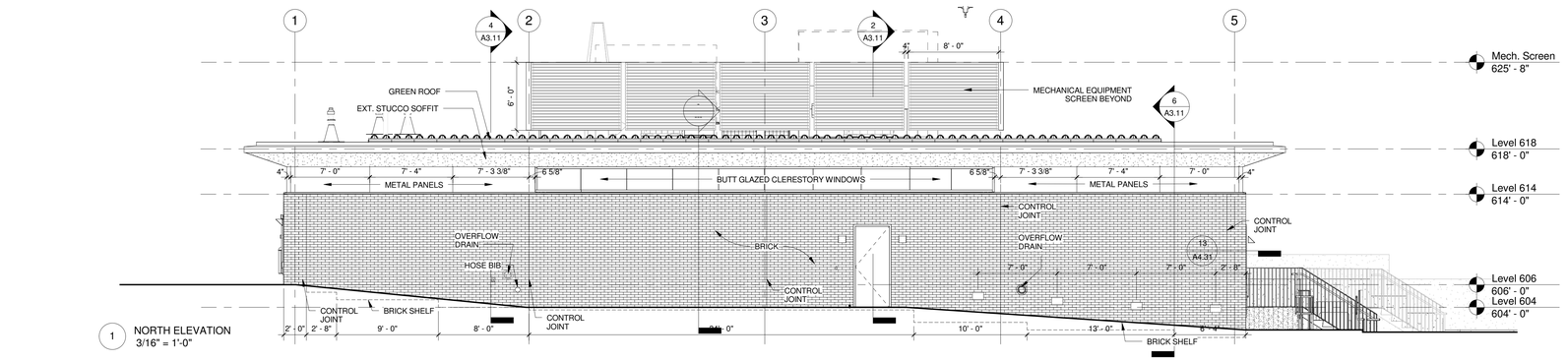
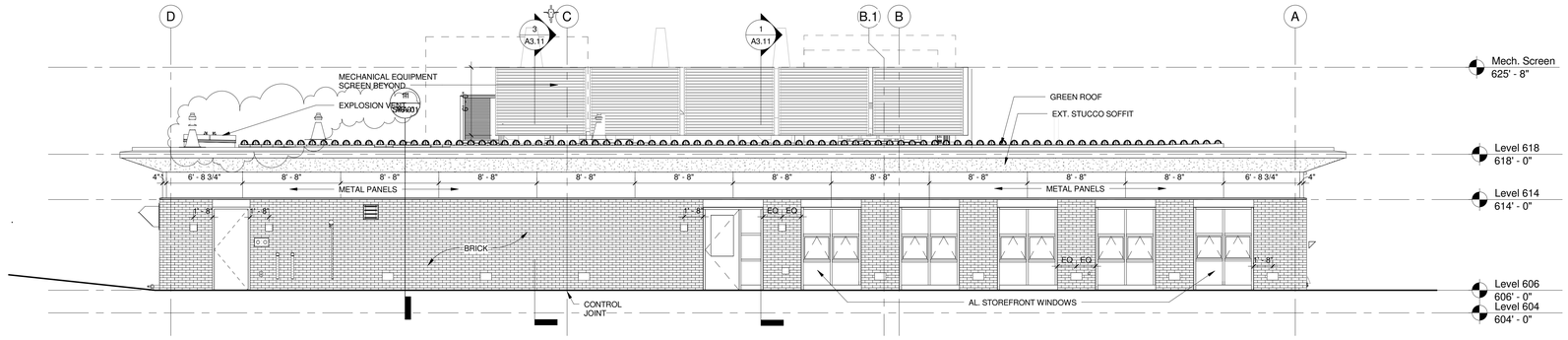


1 NORTH ELEVATION
3/16" = 1'-0"



2 EAST ELEVATION
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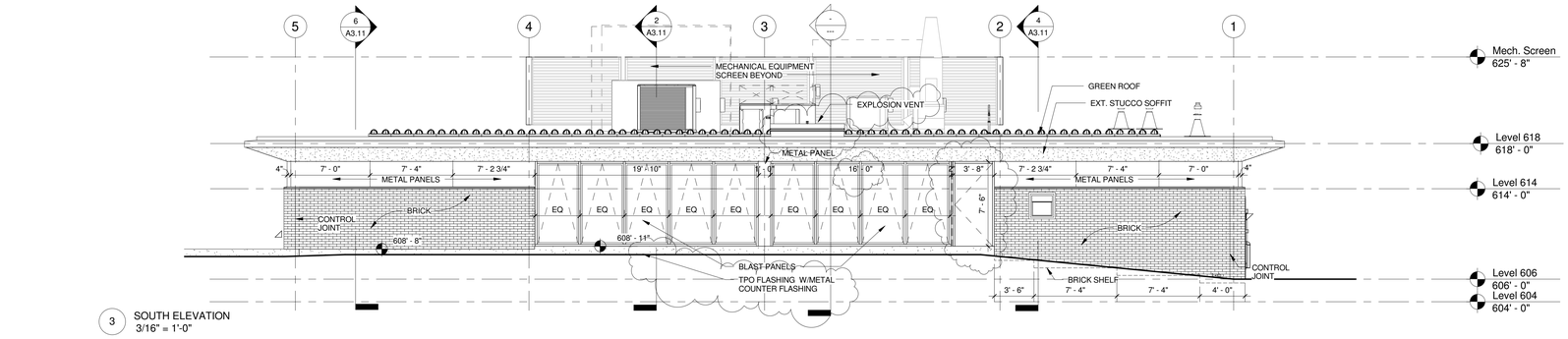
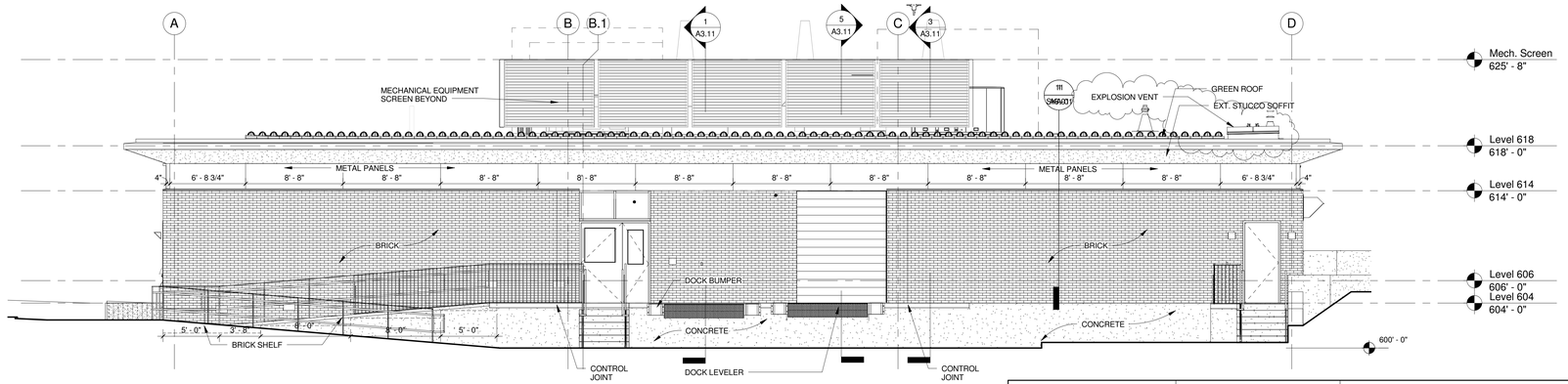


3 SOUTH ELEVATION
3/16" = 1'-0"



4 WEST ELEVATION
3/16" = 1'-0"

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
ELEVATIONS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD
5	Date 5	ADDENDUM #1

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202

FILE PATH
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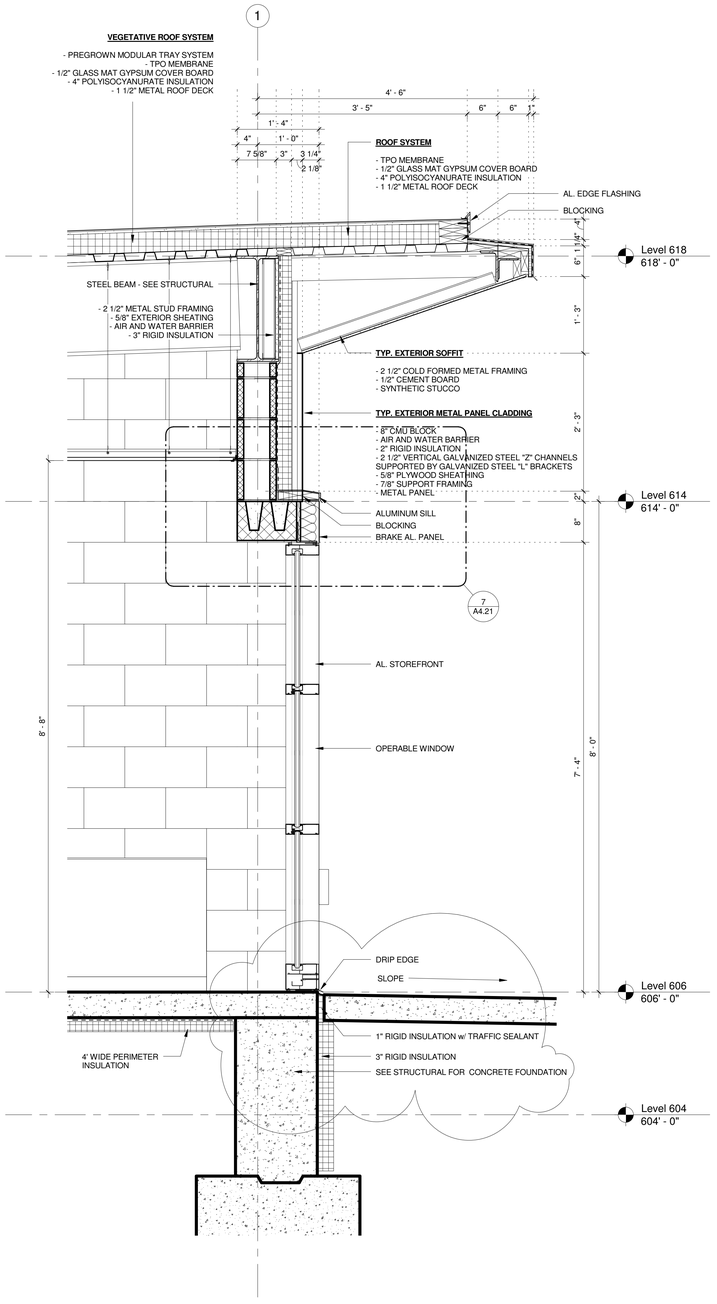
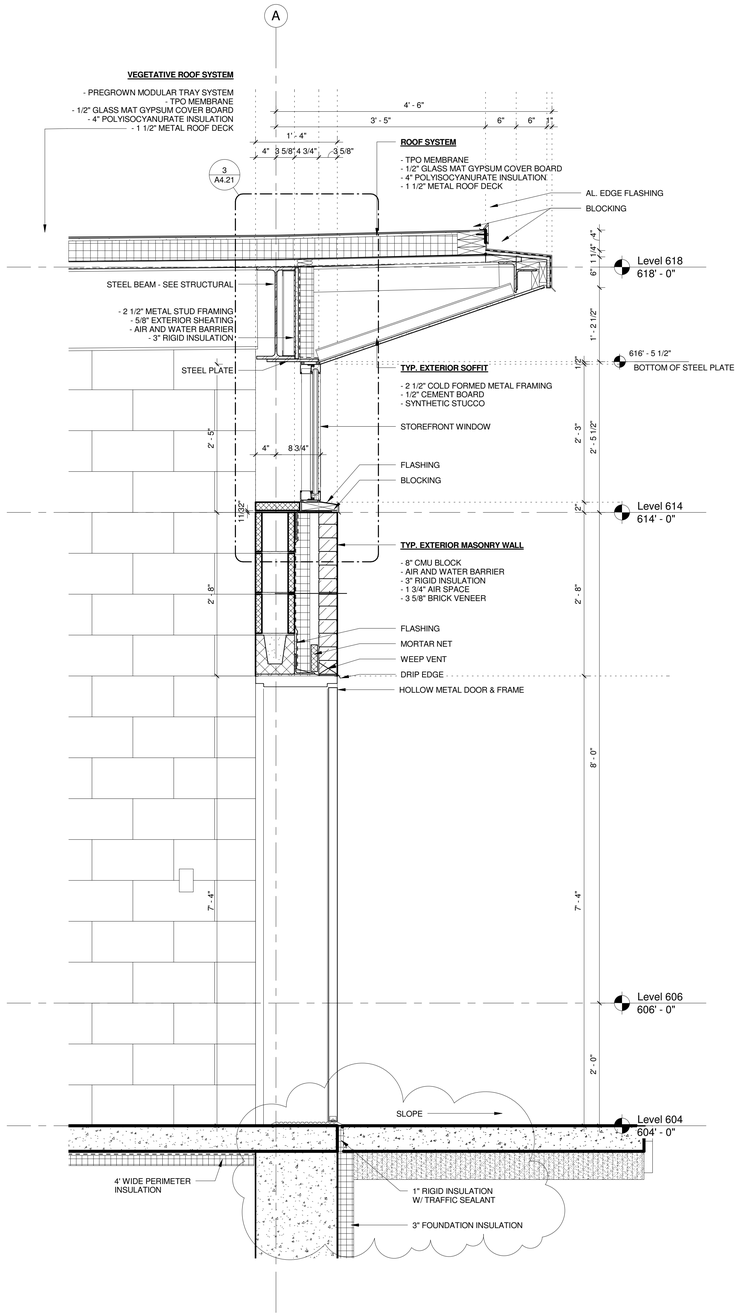
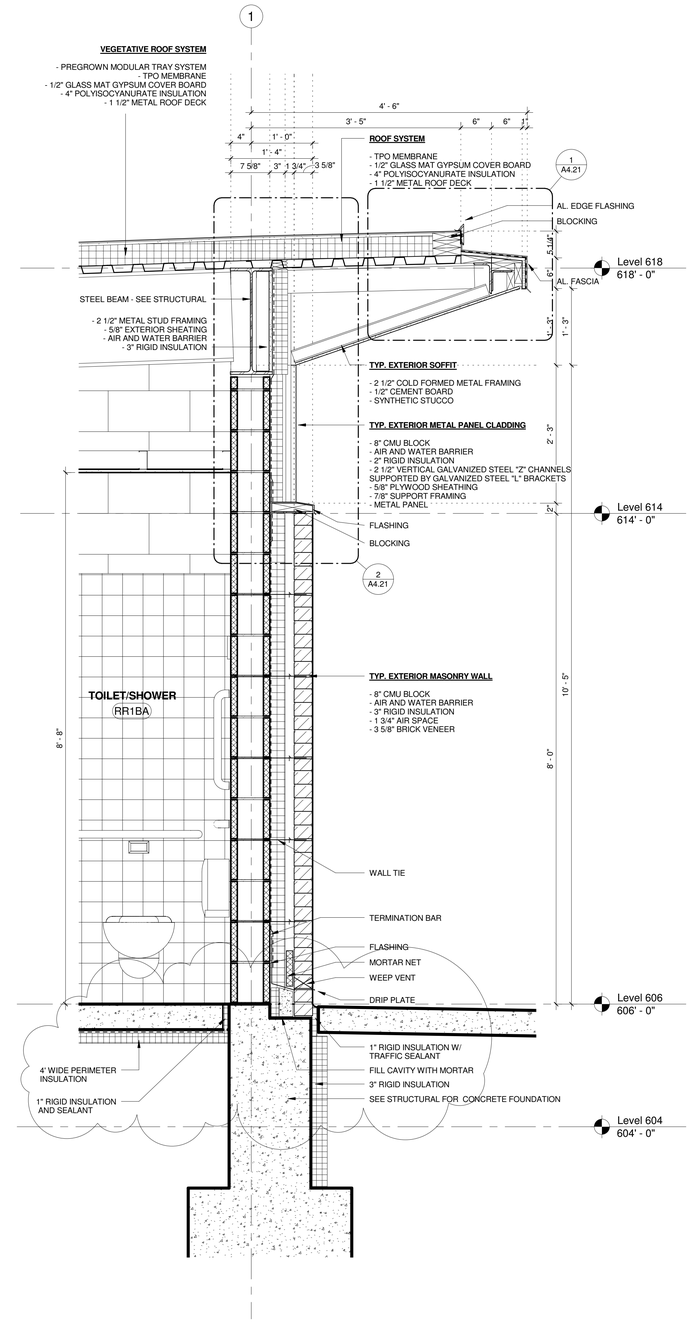


3 WALL SECTION 3
1" = 1'-0"



2 WALL SECTION 2
1" = 1'-0"



1 WALL SECTION 1
1" = 1'-0"

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TITLE
WALL SECTIONS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD
5	Date 5	ADDENDUM #1

UNIVERSITY OF CONNECTICUT

STORRS, CT

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202

FILE PATH
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DATE: 9/10/2014
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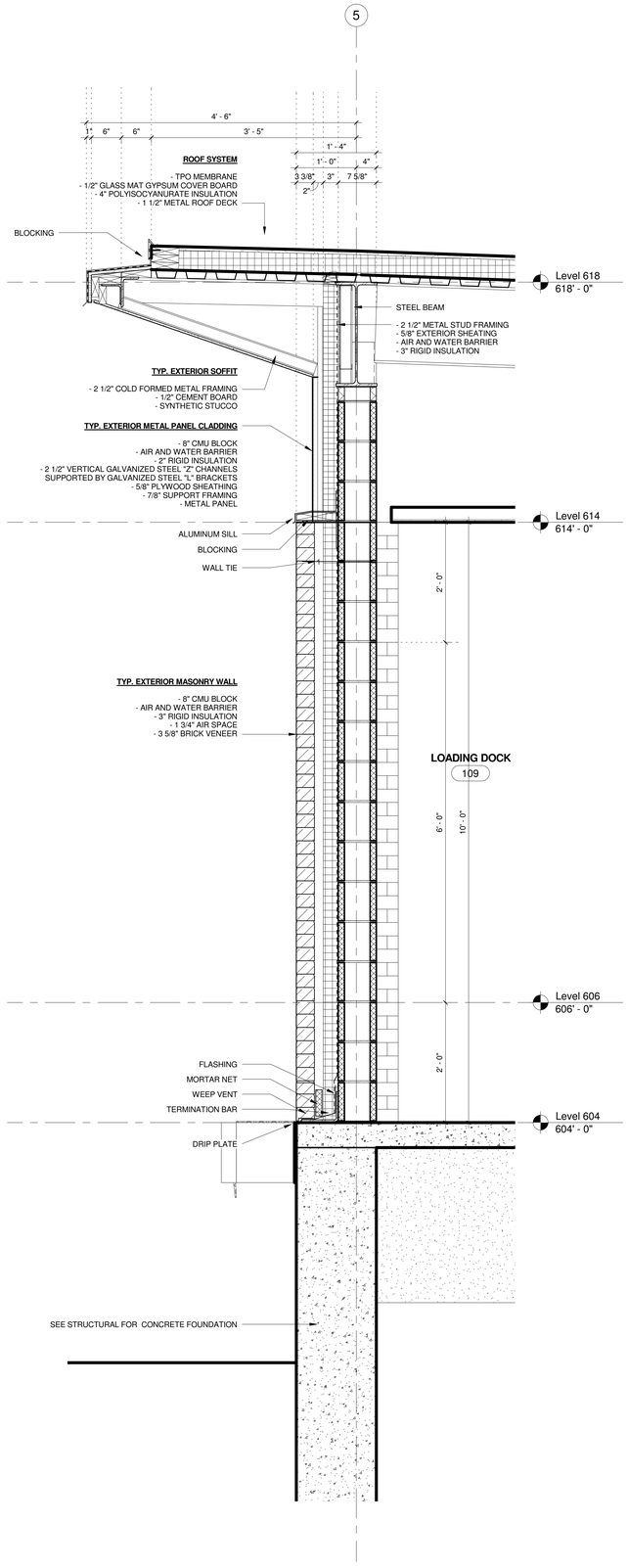
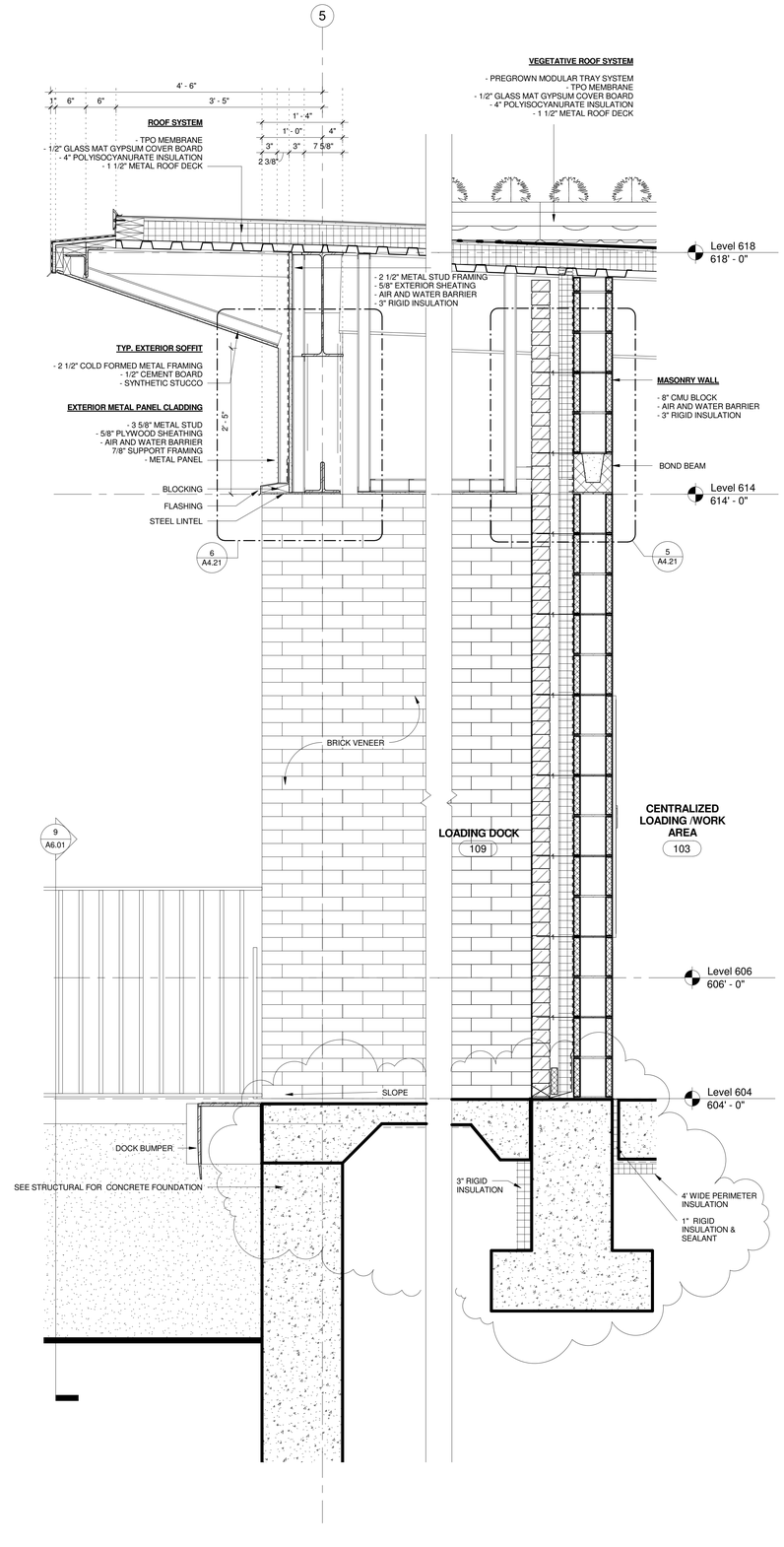
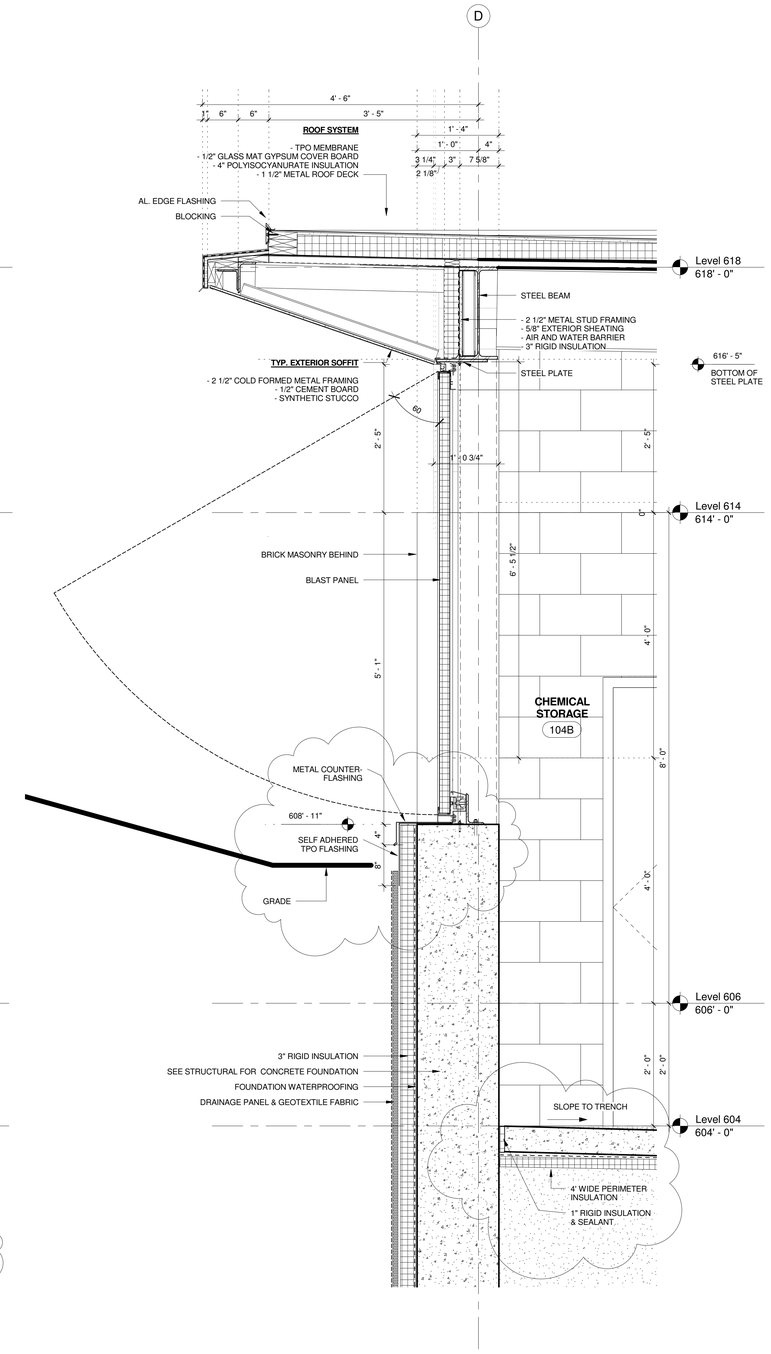


3 WALL SECTION 6
1" = 1'-0"



2 WALL SECTION 5
1" = 1'-0"



1 WALL SECTION 4
1" = 1'-0"

TAI SOO KIM PARTNERS
ARCHITECTS
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HARTFORD, CONNECTICUT
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FAX: (860) 249-0695

UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
WALL SECTIONS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100%CD
5	Date 5	ADDENDUM #1

PROJECT: MAIN ACCUMULATION AREA
UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO: 901807
OFFICE PROJECT NO: 140202
FILE PATH: C:\Users\bhickcox.TSKP\Documents\140202 UCONN_MAA - Central - CA - 2014_bhickcox.rvt

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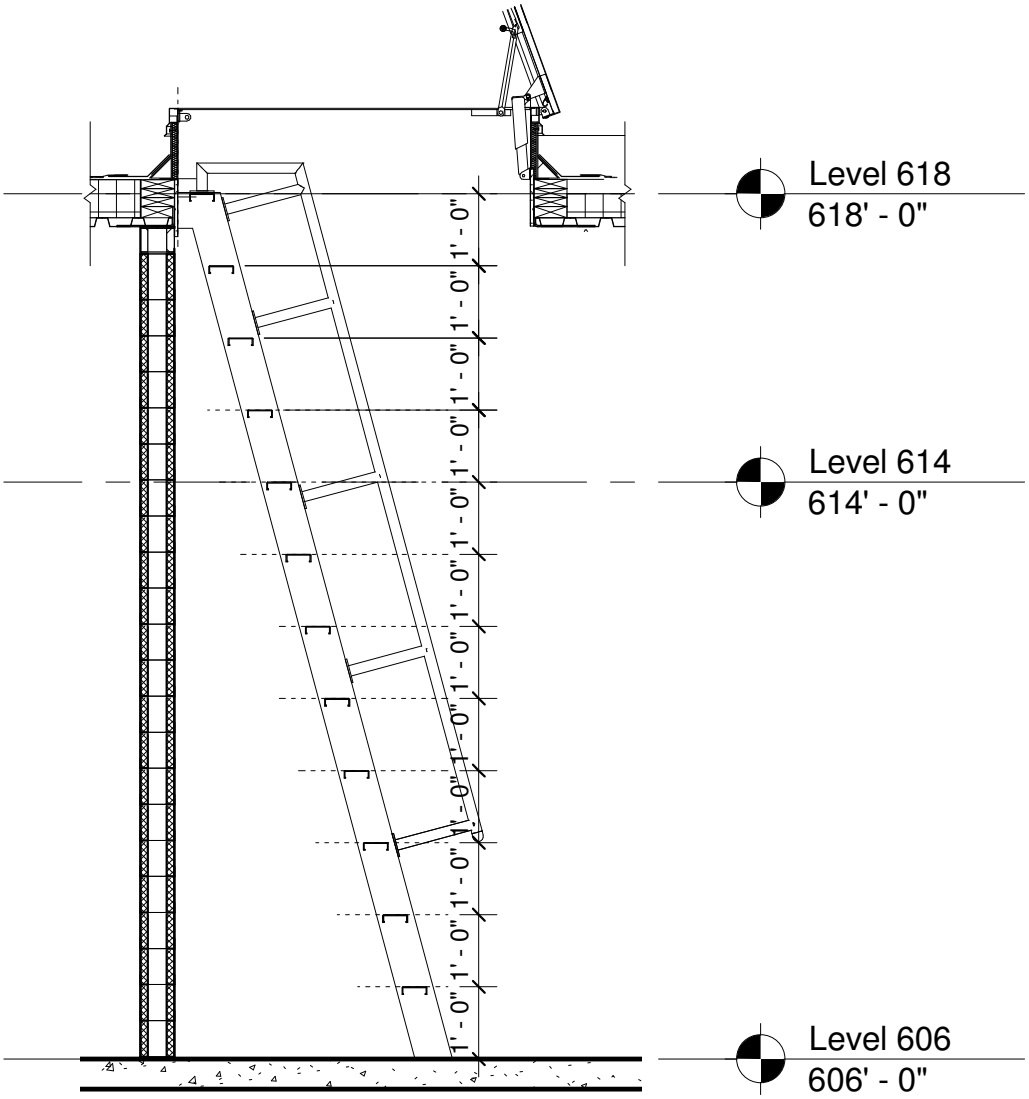

1 ALTERNATING TREAD STAIR
3/8" = 1'-0"

REFERENCE SHEET: A6.01

REFERENCE ADDENDUM: 1

REFERENCE RFI:

REFERENCE SUPPLEMENTAL INFORMATION:

REFERENCE CHANGE ORDER PROPOSAL REQUEST:

REFERENCE SUBMITTAL:

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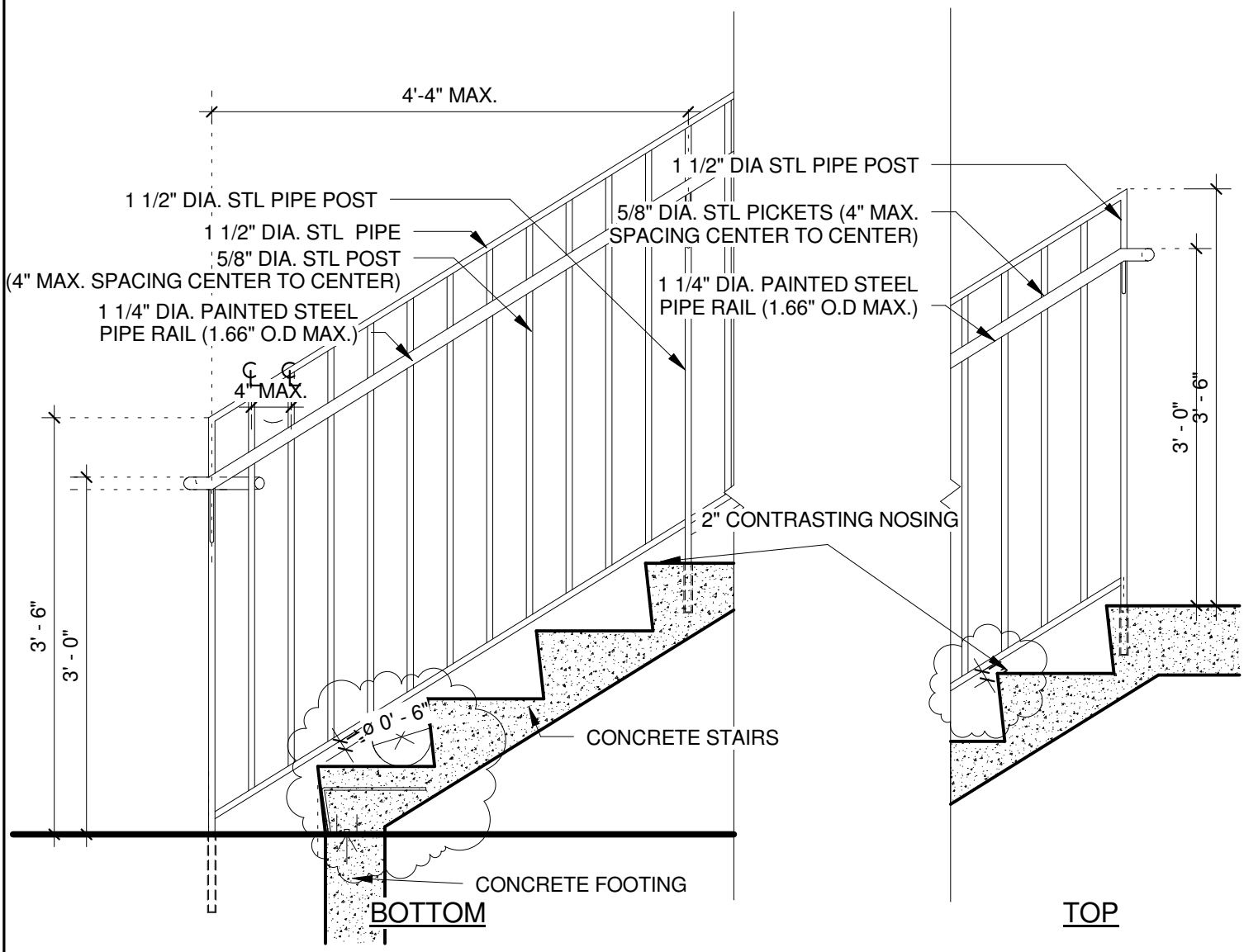
146 Wyllys St
Hartford, Connecticut
Tel: (860) 547-1970
Fax: (860) 249-0695

JOB NAME / NUMBER:		TITLE:	DRAWING NO:
MAIN ACCUMULATION AREA		ALTERNATING TREAD STAIR DETAIL	SKA-01
SCALE: 3/8" = 1'-0"			
DATE: 06/04/15	ISSUED BY: Author		



1 REVISION of STAIR DETAIL
3/4" = 1'-0"

REFERENCE SHEET: A6.02

REFERENCE ADDENDUM: 1

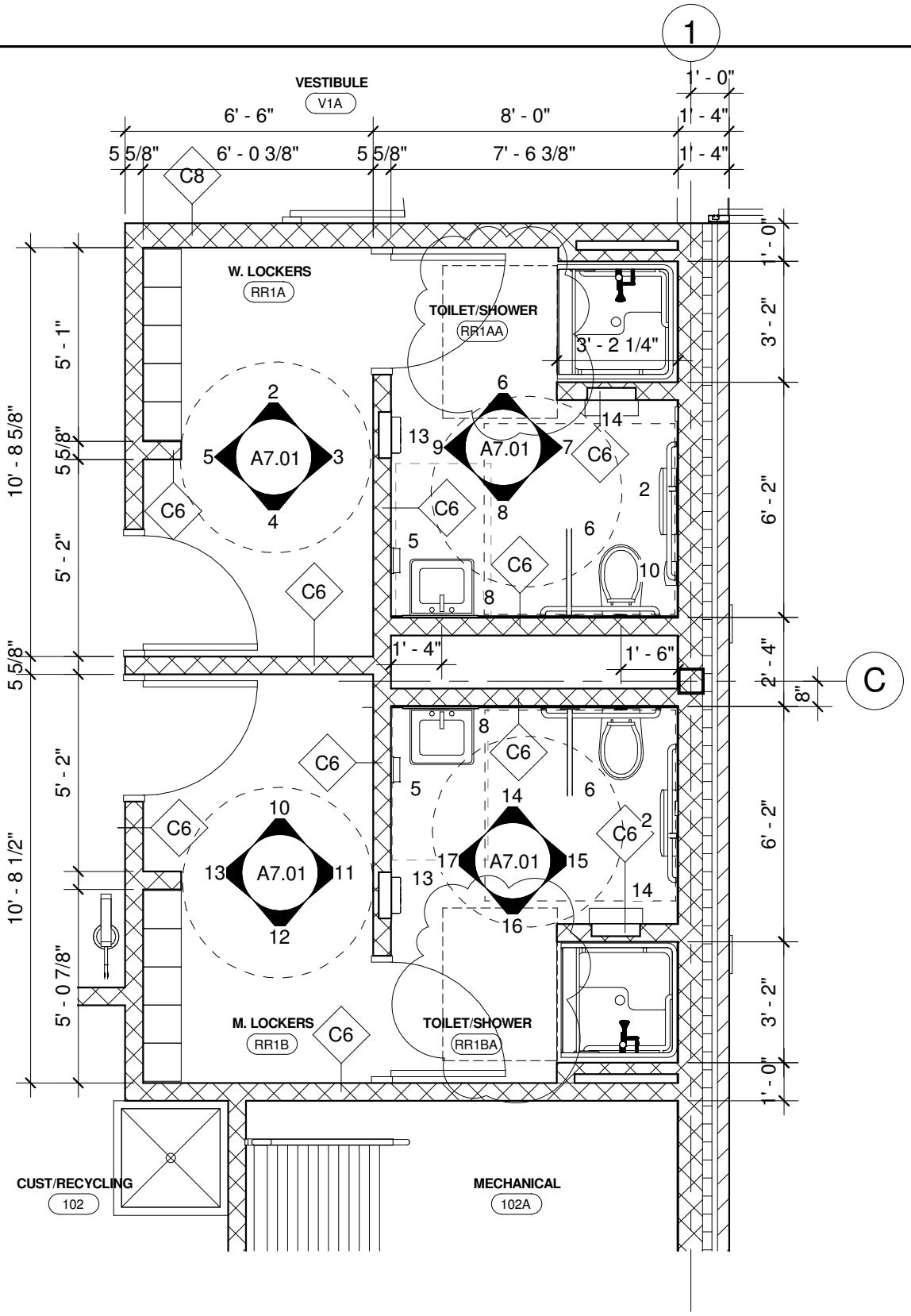
REFERENCE RFI:

REFERENCE SUPPLEMENTAL INFORMATION:

REFERENCE CHANGE ORDER PROPOSAL REQUEST:

REFERENCE SUBMITTAL:

TAI SOO KIM PARTNERS 146 Wyllys St Hartford, Connecticut Tel: (860) 547-1970 Fax: (860) 249-0695	JOB NAME / NUMBER: **MAIN ACCUMULATION AREA** SCALE: **3/4" = 1'-0"** DATE: **06/04/15** ISSUED BY: **Author**	TITLE: **REVISION OF 1/A6.02** **STAIR DETAIL**	DRAWING NO: SKA-02



REFERENCE SHEET: A7.01

REFERENCE ADDENDUM: 1

REFERENCE RFI:

REFERENCE SUPPLEMENTAL INFORMATION:

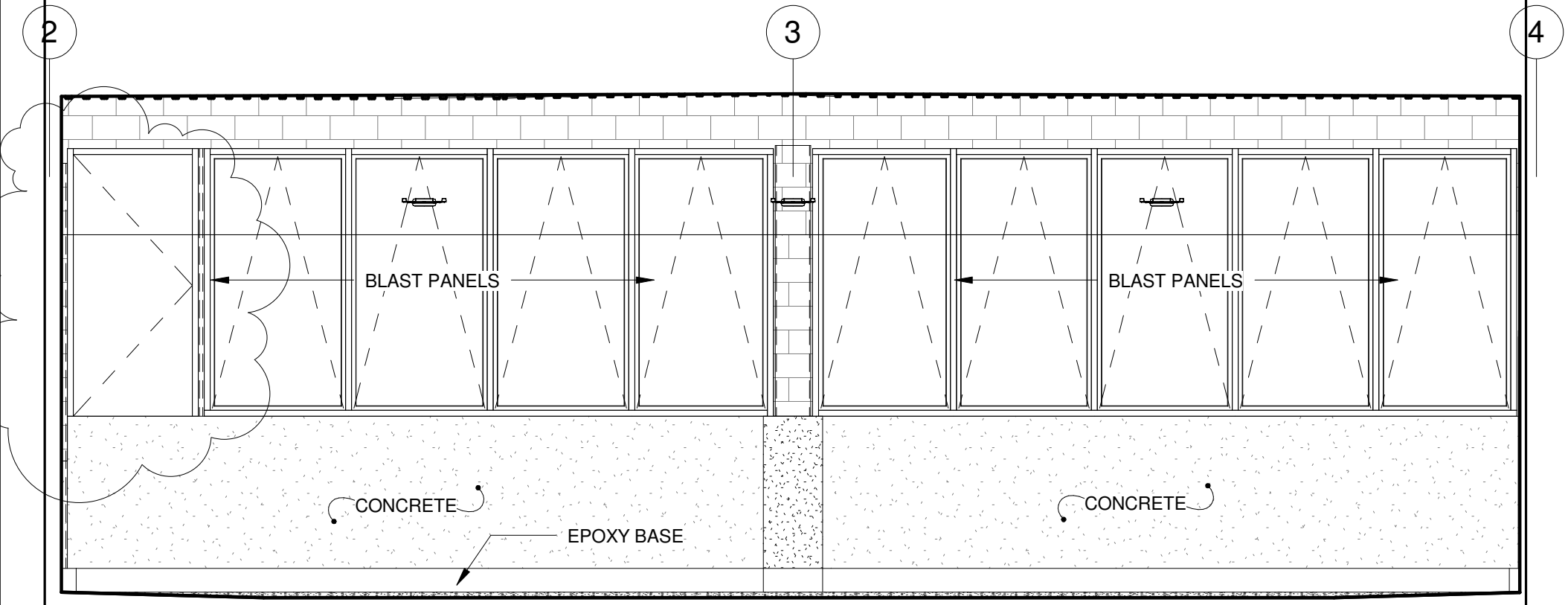
REFERENCE CHANGE ORDER PROPOSAL REQUEST:

REFERENCE SUBMITTAL:

1 TOILET & LOCKERS PLANS-RR1A&RR1B REVISED

1/4" = 1'-0"

TAI SOO KIM PARTNERS 146 Wyllys St Hartford, Connecticut Tel: (860) 547-1970 Fax: (860) 249-0695	JOB NAME / NUMBER: MAIN ACCUMULATION AREA SCALE: 1/4" = 1'-0" DATE: 06/04/15 ISSUED BY: Author	TITLE: DETAIL 1/A7.01TOILET PLAN REVISIONS	DRAWING NO: SKA-03



1 REVISED 104B CHEMICAL STORAGE - SOUTH
1/4" = 1'-0"

REFERENCE SHEET: **A8.02**

REFERENCE ADDENDUM: **1**

REFERENCE RFI:

REFERENCE SUPPLEMENTAL INFORMATION:

REFERENCE CHANGE ORDER PROPOSAL REQUEST:

REFERENCE SUBMITTAL:

TAI SOO KIM PARTNERS
146 Wyllys St
Hartford, Connecticut
Tel: (860) 547-1970
Fax: (860) 249-0695

JOB NAME / NUMBER:	TITLE:	DRAWING NO:
MAIN ACCUMULATION AREA	**104B CHEMICAL STORAGE -SOUTH**	SKA-04
SCALE: **1/4" = 1'-0"**	**REVISED ELEVATION**	
DATE: **06/04/15** / ISSUED BY: **Author**		

GENERAL NOTES:

1. THE PLANS AND SPECIFICATIONS, TO THE BEST OF OUR KNOWLEDGE,COMPLY WITH THE APPLICABLE REQUIREMENTS OF THE INTERNATIONALBUILDING CODE, 2003 EDITION AS SUPPLEMENTED, AMENDED, AND ADOPTED BY THE STATE OF CONNECTICUT.

2. THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE INTERNATIONAL BUILDING CODE, 2003 EDITION AND ALL APPLICABLE FEDERAL AND STATE CODES, STANDARDS, REGULATIONS, AND LAWS.

3. ALL REFERENCED STANDARDS REFER TO THE EDITION IN FORCE AT THE TIME THESE PLANS AND SPECIFICATIONS ARE ISSUED FOR PERMIT.

4. WORK NOT INDICATED ON A PART OF THE DRAWINGS BUT REASONABLY IMPLIED TO BE SIMILAR TO THAT SHOWN AT CORRESPONDING PLACES SHALL BE REPEATED.

5. IN ANY CASE OF CONFLICT BETWEEN THE NOTES, DETAILS AND SPECIFICATIONS, THE MOST RIGID REQUIREMENTS SHALL GOVERN. CONTRACTOR SHALL MAKE NO DEVIATION FROM DESIGN DRAWINGS WITHOUT WRITTEN APPROVAL OF THE ARCHITECT.

6. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS AND COORDINATE WITH ARCHITECTURAL DRAWINGS, DRAWINGS FROM OTHER CONSULTANTS, PROJECT SHOP DRAWINGS AND FIELD CONDITIONS.

7. THE CONTRACTOR SHALL PROTECT EXISTING FACILITIES, STRUCTURES, AND UTILITY LINES FROM ALL DAMAGE.

8. JOB SAFETY AND CONSTRUCTION PROCEDURES ARE THE RESPONSIBILITY OF THE CONTRACTOR.

9. THE BUILDING IS DESIGNED FOR THE FOLLOWING UNIFORMLY DISTRIBUTED LIVE LOADS:

(A) SNOW LOAD - BASIC GROUND SNOW LOAD IS 35 PSF WITH APPLICABLE SNOW SHADOWING FACTORS.

(B) WIND LOADS - DESIGN WIND SPEED: 100 MPH, EXPOSURE "C", CATEGORY III - IMPORTANCE FACTOR: 1.15

(C) SEISMIC LOADS - BASED ON PARAMETERS AS DEFINED IN SECTION 1615 OF THE CONNECTICUT STATE BUILDING CODE.

(1) Ss = .268
(2) S1 = .084
(3) SEISMIC HAZARD EXPOSURE GROUP - GROUP II
(4) SEISMIC DESIGN CATEGORY - B
(5) SOIL PROFILE SITE CLASS C
(6) LATERAL LOAD BRACING SYSTEM FOR MAIN BUILDING ARE MOMENT RESISTANT FRAMES.
(7) R = 3

(D) DESIGN LOADS:
ROOF LIVE LOAD = 35 PSF
GROUND SNOW LOAD = 35 PSF

(E) VENTING PANELS SHOULD BE DESIGNED TO RESIST AN OUTWARD WALL PRESSURE OF 27 PSF

REINFORCED CONCRETE NOTES:

1. STRUCTURAL CONCRETE AND CONCRETING PRACTICES SHALL CONFORM WITH ACI-318- 02, "AMERICAN CONCRETE INSTITUTE, BUILDING CODE FOR REINFORCED CONCRETE." DETAILS SHALL BE IN ACCORDANCE WITH ACI-135, "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES" UNLESS OTHERWISE NOTED ON THE DRAWINGS.

2. ALL STRUCTURAL CONCRETE SHALL BE NORMAL WEIGHT STONE CONCRETE. CONCRETE FOR FOOTINGS, PIERS, GRADE BEAMS, FOUNDATION WALLS, PILE CAPS, SLABS ON GRADE, AND RETAINING WALLS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS UNLESS OTHERWISE NOTED ON THE DRAWINGS.

3. ALL EXPOSED CONCRETE SHALL HAVE AN AIR ENTRAINING AGENT.

4. ALL REINFORCING BARS SHALL CONFORM TO ASTM A615, GRADE 60.

5. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185. CHAIR OR LIFT WIRE FABRIC DURING CONCRETE PLACEMENT TO INSURE PROPER POSITION IN SLAB.

6. ALL REINFORCEMENT SHALL BE SECURELY HELD IN PLACE WHILE PLACING CONCRETE. IF REQUIRED ADDITIONAL BARS OR STIRRUPS SHALL BE PROVIDED BY THE CONTRACTOR TO FURNISH SUPPORT OR ALL BARS.

7. ALL REINFORCING BARS, SHALL BE LAPPED AS SPECIFICALLY DETAILED ON DRAWINGS. WHERE NOT SPECIFICALLY INDICATED ON THE DRAWINGS, ALL REINFORCING BARS SHALL BE LAPPED USING THE TENSION SPLICE LENGTHS IN THE SCHEDULE ON DRAWINGS. LAP WALL TOP HORIZONTAL REINFORCEMENT AT CENTER OF SPAN. LAP WALL BOTTOM HORIZONTAL REINFORCEMENT AT SUPPORT. LAP INSIDE FACE WALL VERTICAL REINFORCEMENT AT SUPPORT. LAP OUTSIDE FACE VERTICAL WALL REINFORCEMENT AT MID-HEIGHT OF WALL. UNLESS OTHERWISE NOTED TERMINATE CONTINUOUS BARS AT DISCONTINUOUS ENDS WITH STANDARD HOOKS.

8. MINIMUM CONCRETE COVER SHALL BE 3/4 INCH FOR SLABS, 1 INCH FOR WALLS AND 1-1/2 INCHES FOR COLUMNS. MINIMUM CONCRETE COVER FOR REINFORCING STEEL SHALL BE 1 INCH FOR SLABS ON GRADE AND WALLS. ALL CONCRETE EXPOSED TO WEATHER OR EARTH SHALL HAVE MINIMUM CONCRETE COVER OF 2 INCHES FOR BARS LARGER THAN #5, 1-1/2 INCHES FOR #5 BARS OR SMALLER. FOR ALL CONCRETE CAST AGAINST EARTH PROVIDE 3 INCHES COVER. ALL CONCRETE PLACED AGAINST PERMANENT SHEETING SHALL HAVE 4 INCHES COVER.

9. PROVIDE CONSTRUCTION JOINTS IN ACCORDANCE WITH ACI-318, CHAPTER 6.4. SUBMIT SHOP DRAWINGS SHOWING CONSTRUCTION JOINT LOCATIONS ALONG WITH THE SEQUENCE OF POURS FOR THE STRUCTURAL ENGINEER'S REVIEW. WALL (CONTINUOUS FOOTING) CONSTRUCTION JOINTS SHALL BE PLACED SO AS TO PROVIDE A 60 FOOT MAXIMUM LENGTH OF CONCRETE PLACEMENT.

10. NO CONCRETE TEST WILL BE ACCEPTED IF CONCRETE IS TAMPERED WITH IN ANY WAY AFTER SAID TEST IS PERFORMED. REPEAT TEST IF WATER IS ADDED AFTER INITIAL SAMPLING.

11. VERTICAL CONSTRUCTION JOINTS IN WALLS SHALL BE USED ONLY WITH PRIOR APPROVAL OF THE ENGINEER AND SHALL BE LOCATED AT LEAST EIGHT FEET FROM ANY WALL OPENING FOR FOUNDATION WALLS.

12. NO HORIZONTAL CONSTRUCTION JOINTS WILL BE PERMITTED IN BEAMS, WALLS AND SLABS UNLESS SPECIFICALLY SHOWN ON THE DRAWINGS OR APPROVED IN WRITING BY THE ENGINEER.

13. THE GENERAL CONTRACTOR SHALL PROVIDE REINFORCING STEEL ERECTOR WITH A SET OF STRUCTURAL PLANS FOR FIELD USE.

14. ALL ADJOINING SURFACES NOT CAST MONOLITHICALLY SHALL BE ROUGHENED TO 1/4 INCH AMPLITUDE FOR THE ENTIRE INTERSECTING SURFACE ACCORDING TO ACI RECOMMENDATIONS.

15. CONTRACTOR SHALL VERIFY DIMENSIONS AND LOCATIONS OF ALL OPENINGS, PIPE SLEEVES, CURBS ETC. AS REQUIRED BY OTHER TRADES BEFORE CONCRETE IS PLACED.

16. FOR LOCATION OF FLOOR DRAINS, CURBS, CONCRETE PADS AND FLOOR DEPRESSIONS SEE ARCHITECTURAL AND MECHANICAL DRAWINGS.

17. COORDINATE LOCATION OF SLOTTED INSERTS, WELDED PLATES, AND OTHER ITEMS TO BE EMBEDDED IN CONCRETE WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.

18. CONTRACTOR SHALL USE RIGID TEMPLATES TO INSTALL ANCHOR BOLTS.

19. PIPES OR CONDUITS ARE NOT PERMITTED TO BE PLACED IN SLAB.

20. TYPICAL SLAB ON-GRADE REINFORCING SHALL BE AS FOLLOWS: TEMPERATURE REINFORCING 6 X 6 - W2.9 X W2.9 WELDED WIRE FABRIC.

FOUNDATION NOTES:

1. DOWELS FROM FOOTINGS INTO PIERS AND WALLS ABOVE, SHALL BE THE SAME SIZE AND NUMBER AS VERTICAL REINFORCEMENT IN PIERS AND WALLS, AND SHALL BE EXTENDED LTE INTO FOOTINGS AND LTS INTO PIERS AND WALLS UNLESS OTHERWISE SHOWN.

2. DROP BOTTOM OF WALLS AND PIERS TO TOP OF FOOTINGS, TO OBTAIN FULL EXTENT OF CONTACT, UNLESS OTHERWISE SHOWN.

3. CENTERLINE OF FOOTINGS AND CENTERLINE OF WALLS, PIERS, COLUMNS, AND BEAMS SHALL BE THE SAME UNLESS OTHERWISE NOTED.

4. NO BACK FILLING SHALL BE DONE AGAINST FOUNDATION AND RETAINING WALLS UNTIL CONCRETE HAS ATTAINED AT LEAST 75% OF ITS 28 DAY STRENGTH. BEFORE BACK FILLING, PROVIDE BRACING FOR WALLS SUSTAINING MORE THAN 3 FEET OF EARTH PRESSURE. THIS BRACING SHALL REMAIN IN PLACE UNTIL ALL SLABS AND BEAMS FRAMING INTO WALL (INCLUDING SLAB ON GRADE) HAVE BEEN PLACED AND SET.

6. CONTRACTOR SHALL BE RESPONSIBLE TO ADEQUATELY PROTECT ALL EXCAVATION SLOPES. WHERE NECESSARY SHEETING AND SHORING OF EXCAVATION SHALL BE PROVIDED WITH ALL REQUIRED TIE BACKS AND BRACING.

7. THE MAXIMUM SLOPE BETWEEN TWO ADJACENT FOOTINGS SHALL NOT EXCEED 2 HORIZONTAL TO 1 VERTICAL.

8. COMPACTION SHALL BE CONTROLLED BY A QUALIFIED TESTING LABORATORY OR GEO-TECHNICAL ENGINEER. TAKE A MINIMUM OF ONE FIELD DENSITY TEST (ASTM D-1557 OR D-2922) FOR EACH LAYER. LOCATION OF TEST SHALL BE RANDOMLY SELECTED BY TESTING AGENCY.

9. FOOTINGS ADJACENT TO EXISTING BUILDING FOUNDATIONS SHALL BE DROPPED TO MATCH BOTTOM OF NEW FOOTING TO BOTTOM OF EXISTING.

STRUCTURAL STEEL NOTES:

1. FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL CONFORM WITH THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, "MANUAL OF STEEL CONSTRUCTION" (LATEST EDITION) OR THE "MANUAL FOR STEEL CONSTRUCTION, LOAD AND RESISTANCE FACTOR DESIGN" (LATEST EDITION).

2. ALL STEEL DETAILS AND CONNECTIONS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE AISC "SPECIFICATIONS FOR STRUCTURAL STEEL BUILDINGS, ALLOWABLE STRESS DESIGN AND PLASTIC DESIGN", (LATEST EDITION) OR THE "MANUAL FOR STEEL CONSTRUCTION, LOAD AND RESISTANCE FACTOR DESIGN", (LATEST EDITION). BRACED FRAME CONNECTIONS SHALL BE DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AISC "SEISMIC PROVISIONS FOR STRUCTURAL BUILDINGS" 2002 EDITION.

3. ALL ROLLED SHAPES SHALL CONFORM TO ASTM STANDARD A572, GRADE 50 UNLESS SPECIFICALLY INDICATED ELSEWHERE ON OTHER DRAWINGS.

4. STEEL FOR TUBE SECTIONS SHALL COMPLY WITH ASTM A500 GRADE B, FY = 46 KSI. PIPE STEEL SHALL COMPLY WITH ASTM A 500 GR B, FY = 42 KSI.

5. ALL CONNECTION MATERIAL, BASE PLATES, ANGLES AND MISCELLANEOUS FRAMING SHALL CONFORM TO ASTM STANDARD A-36 UNLESS OTHERWISE NOTED.

6. SHOP AND FIELD CONNECTIONS NOT SPECIFICALLY DETAILED ON THE DRAWINGS MAY BE BOLTED OR WELDED.

7. WHEN NOT SPECIFICALLY DETAILED ELSEWHERE ON THE DRAWINGS, ALL BEAM TO BEAM AND BEAM TO COLUMN CONNECTIONS SHALL BE TWO SIDED WEB ANGLE CONNECTIONS.

8. ALTERNATE CONNECTIONS WILL BE ACCEPTED ONLY WITH THE 8 WRITTEN APPROVAL OF THE ENGINEER. HOWEVER, THE ENGINEER SHALL BE THE SOLE JUDGE OF ACCEPTABILITY AND THE CONTRACTOR'S BID SHALL ANTICIPATE THE USE OF THOSE SPECIFIC DETAILS SHOWN ON THE DRAWINGS. IN ANY EVENT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF SUCH ALTERNATE DETAILS WHICH HE PROPOSES.

9. WHEN INDICATED AS BOLTED ON THE DRAWINGS, ALL SHOP OR FIELD BOLTED BEAM TO BEAM CONNECTIONS SHALL BE BOLTED CONNECTIONS USING 3/4 INCH DIAMETER A325 BEARING BOLTS IN STANDARD HOLES UNLESS SPECIFICALLY NOTED OTHERWISE.

10. ALL BEAMS AND GIRDERS SHALL BE CONNECTED FOR 115% OF REACTION DENOTED BY THE SYMBOL V ON PLAN. IF NO REACTION IS GIVEN PROVIDE CONNECTIONS PER NOTE 12 BELOW.

11. ALL BEAM AND GIRDER CONNECTIONS SHALL BE A LEAST CAPABLE OF DEVELOPING THE UNIFORMLY DISTRIBUTED LOAD CAPACITY OF THE MEMBER USING THE REACTION FROM THE ALLOWABLE LOAD OF BEAM AS TABULATED IN THE MANUAL OF STEEL CONSTRUCTION PART 2, (LATEST EDITION) UNLESS NOTED OTHERWISE.

12. WHEN INDICATED AS BOLTED ON THE DRAWINGS, ALL SHOP OR FIELD BOLTED COLUMN SPLICES, COLUMN TO BEAM CONNECTIONS AND BRACING CONNECTIONS SHALL BE BEARING TYPE CONNECTIONS USING 3/4 INCH DIAMETER A325 BOLTS IN STANDARD HOLES.

13. SPLICES SHALL BE ALLOWED ONLY AT LOCATIONS SPECIFICALLY INDICATED ON THE STRUCTURAL DRAWINGS UNLESS APPROVED OTHERWISE BY THE ENGINEER IN WRITING.

14. OVERSIZED OR SLOTTED HOLES SHALL NOT BE USED FOR ANY CONNECTIONS UNLESS SPECIFICALLY INDICATED ON THE DRAWINGS OR APPROVED IN WRITING BY THE ENGINEER.

15. ALL ANCHOR RODS SHALL CONFORM TO F1554 UNLESS OTHERWISE NOTED.

16. THE STRUCTURAL STEEL CONTRACTOR SHALL COORDINATE THE BOTTOM OF BASE PLATE ELEVATION WITH THE TOP OF CONCRETE ELEVATION. IN CASE OF CONFLICT, THE CONTRACTOR SHALL MAKE ALLOWANCE IN HIS BID FOR THE MOST STRINGENT REQUIREMENTS.

17. ALL WELDS INDICATED SHALL MEET THE MINIMUM WELD SIZE SPECIFIED BY THE CURRENT AISC MANUAL OF STEEL DESIGN.

18. ALL WELDING SHALL BE PERFORMED BY QUALIFIED WELDERS IN ACCORDANCE WITH A.W.S. SPECIFICATIONS, (LATEST EDITIONS). ALL WELDING ELECTRODES SHALL CONFORM TO A.W.S. A5.1 GRADE E-70. BARE ELECTRODES AND GRANULAR FLUX SHALL CONFORM TO A.W.S. A5.17, F7O A.W.S. FLUX CLASSIFICATION.

19. PROVIDE WELDED STIFFENER PLATES ON BOTH SIDES OF THE WEB OF BEAMS AT POINTS OF CONCENTRATED LOAD.

20. THE FILLER BEAMS SHOULD BE SPACED EQUALLY BETWEEN THE SUPPORTS IF NOT OTHERWISE NOTED ON THE DRAWINGS.

21. CUTS, HOLES, COPING, ETC. REQUIRED FOR WORK OF OTHER TRADES SHALL BE SHOWN ON THE SHOP DRAWINGS AND MADE IN THE SHOP. CUTS OR BURNING OF HOLES IN STRUCTURAL STEEL MEMBERS IN THE FIELD WILL NOT BE PERMITTED.

22. STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH ARCHITECTURAL AND MECHANICAL DRAWINGS AND DRAWINGS RELATED TO OTHER TRADES. THE GENERAL CONTRACTOR IS RESPONSIBLE TO CHECK AND COORDINATE DIMENSIONS, CLEARANCES, ETC., WITH THE WORK OF OTHER TRADES.

23. THE STRUCTURAL STEEL CONTRACTOR SHALL VERIFY AND COORDINATE THE LOCATIONS OF BEAMS AND GIRDERS AROUND ELEVATORS WITH THE ARCHITECTURAL AND MECHANICAL DRAWINGS.

24. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH SHOP DRAWINGS TO BE APPROVED PRIOR TO FABRICATING STEEL.

REINFORCED MASONRY NOTES:

1. CONCRETE BLOCK SHALL BE HOLLOW LOAD-BEARING CONCRETE MASONRY UNITS CONFORMING TO ASTM C90. CONCRETE MASONRY SHALL HAVE A PRISM STRENGTH FM' OF 1800 PSI. PRISM STRENGTHS SHALL BE DETERMINED BASED ON TESTS IN ACCORDANCE WITH ASTM E 447 METHOD B, EXCEPT THAT PRISMS SHALL BE CONSTRUCTED IN STACK BOND WITH A HEIGHT TO THICKNESS RATIO BETWEEN 1.33 AND 5.0 AND WITH A MINIMUM OF ONE JOINT.

2. MORTAR SHALL BE TYPE M MORTAR WITH MINIMUM 28 DAY COMPRESSIVE STRENGTH AS REQUIRED TO OBTAIN THE PRISM STRENGTH SPECIFIED ABOVE.

3. ALL CELLS CONTAINING REINFORCING SHALL BE FILLED SOLID WITH GROUT. GROUT SHALL SATISFY THE REQUIREMENTS OF ASTM C 476. GROUT COMPRESSIVE STRENGTH SHALL BE 1500 PSI, TESTED IN ACCORDANCE WITH ASTM C 1019. CONTRACTOR HAS THE OPTION OF GROUTING ALL CELLS.

4. DOWELS FROM FOUNDATIONS AND / OR SLABS SHALL BE PLACED TO ALIGN WITH CELLS IN CMU TO RECEIVE REINFORCING.

5. GROUT SHALL BE PLACED BY LOW-LIFT METHOD. MAXIMUM GROUT POUR HEIGHT SHALL BE FOUR (4) FEET.

6. HORIZONTAL REINFORCEMENT SHALL BE DUR-O-WAL TRUSS OR LADDER TYPE REINFORCEMENT, OR APPROVED EQUAL, WITH 2 - 9 GAGE CROSS WIRES AND 9 GAGE CROSS WIRES AT EVERY OTHER COURSE.

7. FOR NON-LOAD BEARING CONCRETE MASONRY, PROVIDE #5 AT 48" O.C. VERTICAL REINFORCEMENT IN THE CENTER OF THE BLOCKS AND GROUT ALL CELLS CONTAINING REINFORCING: THE FIRST CELL AT CORNERS AND ENDS OF WALLS SHALL BE REINFORCED WITH 1 - #5 AND GROUTED. 1 - #5 (EXTENDING 2'-0" BEYOND CORNERS) SHALL BE PLACED ON ALL SIDES OF WALL OPENINGS.

8. FOR LOCATION AND THICKNESS OF MASONRY WALLS, SEE ARCHITECTURAL DRAWINGS.

METAL DECK NOTES:

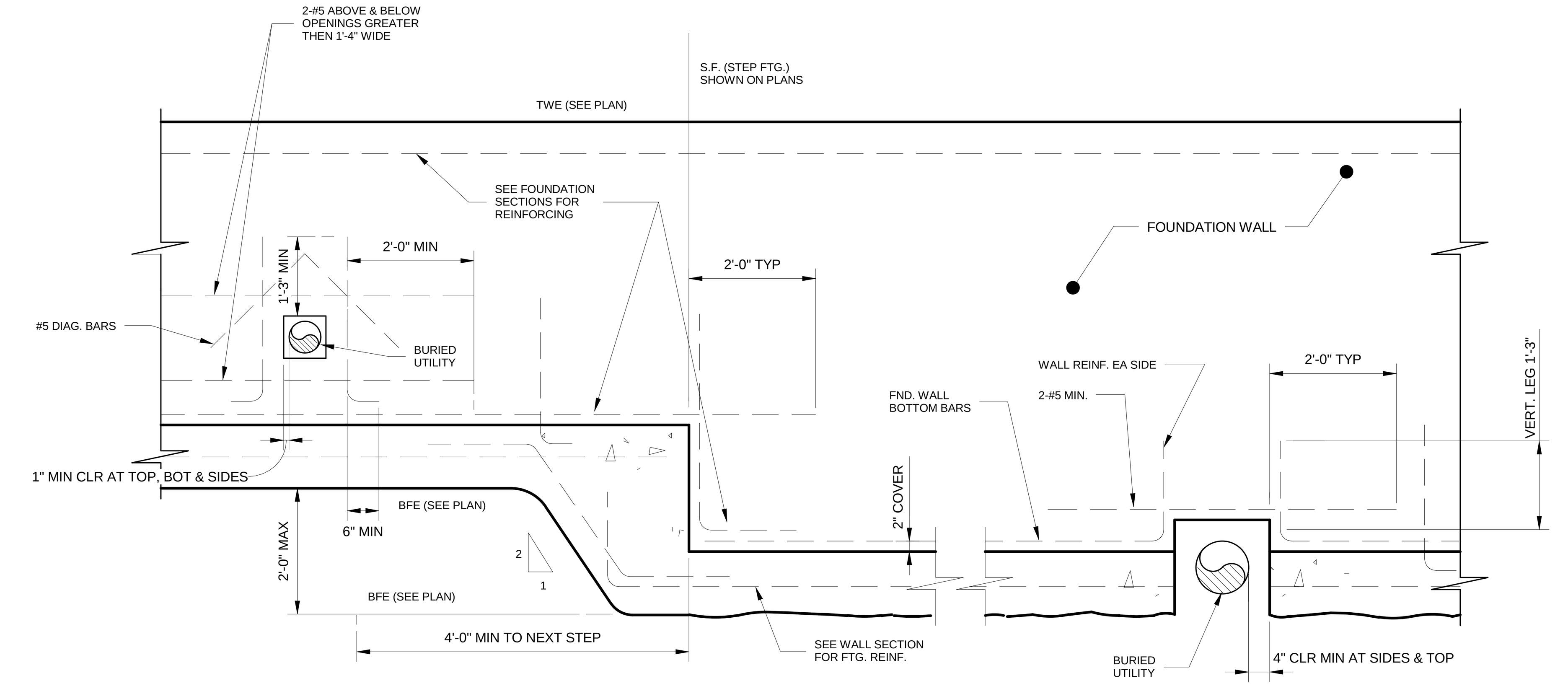
1. SEE PLANS FOR SIZE, TYPE, AND EXTENT OF METAL DECKING.

2. ALL METAL DECK SHALL BE FABRICATED AND INSTALLED FOR A MINIMUM THREE SPAN CONDITION. ONE SPAN CONDITIONS ARE PROHIBITED, UNLESS SPECIFICALLY INDICATED ON DWGS.

3. ALL METAL DECK UNITS SHALL BE FASTENED TO THE STEEL FRAMEWORK AT ENDS OF UNITS AND AT ALL INTERMEDIATE SUPPORTS BY WELDS NOT LESS THAN 3/4 IN. DIAMETER SPACED AT A MAXIMUM OF 12 INCHES ON CENTER (EVERY OTHER RIB) IN THE FIELD OF THE ROOF AND 6 INCHES ON CENTER (EVERY RIB) AT ALL SUPPORTS IN THE ROOF CONERS AND PERIMETER. THE WIDTH OF THE ROOF PERIMETER STRIP WAS CALCULATED AT 18 FEET. SIDE LAPS OF ADJACENT UNITS MAY BE FASTENED BETWEEN SUPPORTS BY BUTTON PUNCHING AT INTERVALS NOT EXCEEDING 24 INCHES ON CENTER.

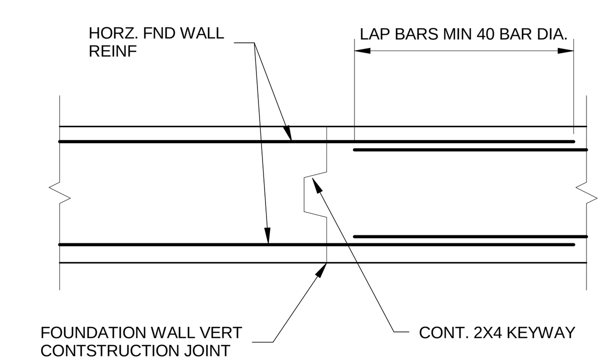
4. LOADS HUNG FROM METAL FLOOR DECK HANGER TABS SHALL NOT EXCEED 60 LBS. / HANGER TAB. IN ADDITION LOADS ON HANGERS SHALL BE DISTRIBUTED IN SUCH A MANNER THAT THE TRIBUTARY LOADS FOR EACH HANGER SHALL NOT EXCEED 5 POUNDS PER SQUARE FOOT. MECHANICAL EQUIPMENT SHALL NOT BE HUNG DIRECTLY FROM METAL DECK.

5. DECKING CONTRACTOR SHALL COORDINATE DECK OPENING SIZES AND LOCATIONS FROM ARCHITECTURAL AND MECHANICAL DRAWINGS. HE SHALL PROVIDE HEADER MEMBERS OR REINFORCEMENT AS REQUIRED.



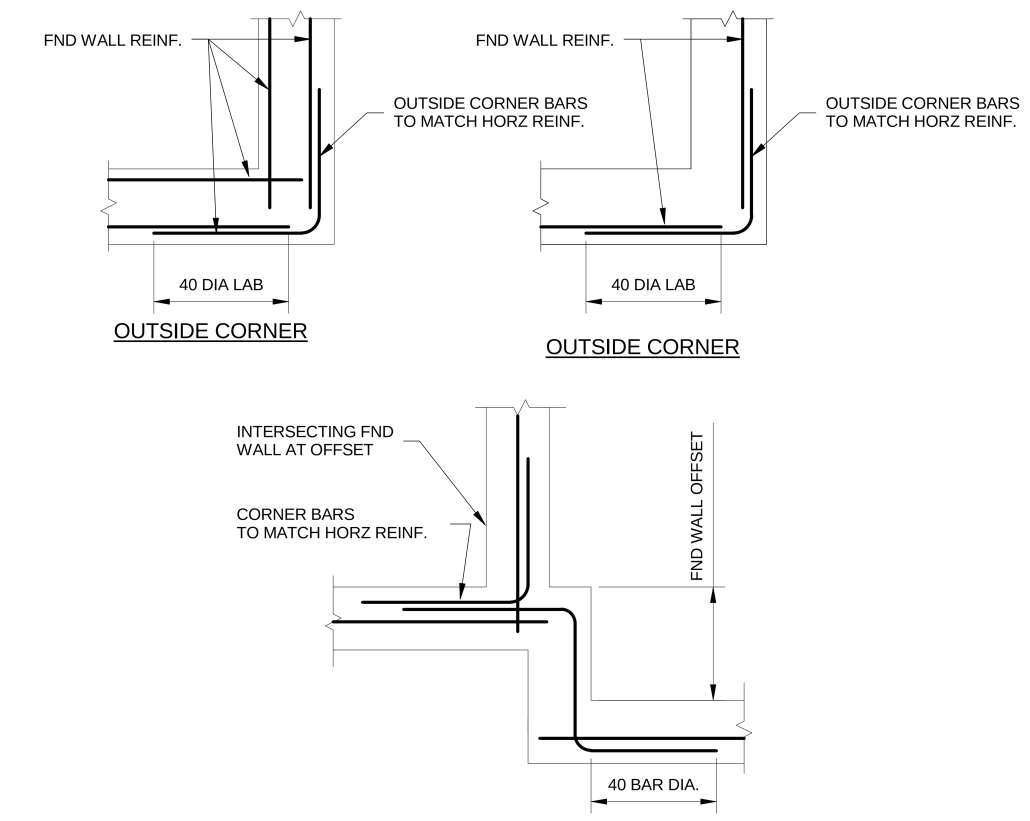
TYP. FOUNDATION WALL / FOOTING DETAILS

N.T.S



FND WALL CONST. JOINT DETAIL

N.T.S



NOTE: VERT WALL REINF NOT SHOWN SEE FOUNDATION SECTIONS

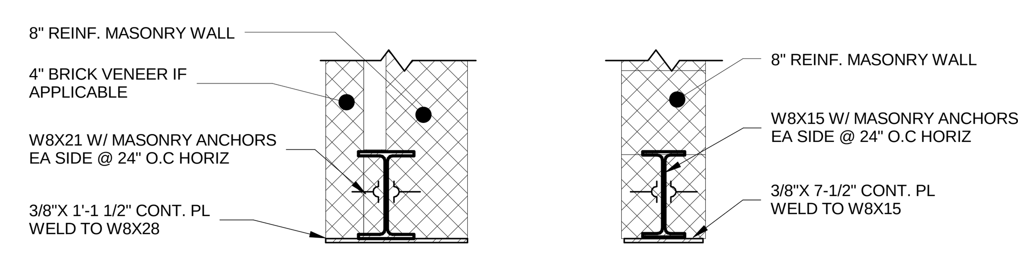
DETAIL - TYPICAL FND WALL CORNER REINF.

N.T.S

LOOSE LINTEL SCHEDULE

LOOSE LINTLE SHALL CONSIST OF ONE ANGLE FOR EACH 4" OF MASONRY AS FOLLOWS

SIZE OF MASONRY OPENING	SIZE OF ANGLE
UP TO 4'-0"	L3 1/2" X 3 1/2" X 5/16"
UP TO 5'-6"	L5" X 3 1/2" X 5/16" LLV
UP TO 7'-6"	L6" X 3 1/2" X 5/16" LLV
UP TO 8'-6"	W8X15 + 3/8" PL W8X28 + 3/8" PL
UP TO 12'-6"	W8X31 + 3/8" PL



2 TYPICAL LOOSE LINTEL SCHEDULE
1" = 1'-0"

SCHEDULE OF EMBEDMENT + SPLICE LENGTH (IN INCHES)

	COMPRESSION		TENSION (f'c = 4,000 psi)								TENSION (f'c = 5,000 psi)								TENSION (f'c = 6,000 psi)							
			EMBEDMENT LENGTH				LAP SPLICE LENGTH				EMBEDMENT LENGTH				LAP SPLICE LENGTH				EMBEDMENT LENGTH				LAP SPLICE LENGTH			
			TOP BARS		OTHER BARS		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS		TOP BARS		OTHER BARS	
BAR SIZE	EMBEDMENT LENGTH	LAP SPLICE LENGTH	CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1		CATEGORY SEE NOTE 1	
			I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
#3	8	12	19	28	14	21	24	36	19	28	17	25	13	19	22	32	17	25	16	23	12	17	20	29	16	23
#4	11	15	25	37	19	28	36	48	25	37	22	33	17	25	29	43	22	33	20	30	15	23	26	39	20	30
#5	14	19	31	46	24	36	40	60	31	46	28	41	21	32	36	54	28	41	25	38	19	29	33	49	25	38
#6	17	23	37	55	28	43	48	72	37	55	33	50	25	38	43	65	33	50	30	45	23	35	39	59	30	45
#7	19	27	54	81	42	62	70	105	54	81	48	72	37	56	63	94	48	72	44	66	34	51	57	86	44	66
#8	22	30	62	92	47	71	80	120	62	92	55	83	42	64	72	108	55	83	50	76	39	58	65	98	50	76
#9	25	34	70	104	54	80	90	136	70	104	62	93	48	72	81	121	62	93	57	85	44	66	74	111	57	85
#10	28	39	78	117	60	90	102	153	78	117	70	105	54	81	91	137	70	105	64	96	49	74	83	125	64	96
#11	31	43	87	130	67	100	113	170	87	130	78	117	60	90	101	152	78	117	71	106	54	82	92	138	71	106
NOTATION USED ON DWG	LCE	LCS	LTE				LTS				LTE				LTS				LTE				LTS			

1 SCHEDULE OF EMBEDMENT AND SPLICE LENGTH
SCALE: NOT TO SCALE

NOTES FOR SCHEDULES OF SPLICE LENGTH:

1. THE SCHEDULES BELOW INCLUDES SPLICE LENGTHS WHICH SATISFY THE PROJECT REQUIREMENTS AND THE FOLLOWING CRITERIA.

fy=60,000psi
CONCRETE WEIGHT = 150lb/cu.ft.

TENSION SPLICE LENGTHS ARE DIVIDED INTO TWO CATEGORIES WHICH SHALL BE APPLIED AS FOLLOWS:

2. CATEGORY I; CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN db, CLEAR COVER NOT LESS THAN db, AND BEAM STIRRUPS OF COLUMN TIES THROUGHOUT Ld NOT LESS THAN THE CODE MINIMUM OR CLEAR SPACING OF BARS BEING DEVELOPED OR SPLICED NOT LESS THAN 2db & CLEAR COVER NOT LESS THAN db.

CATEGORY II; BARS NOT COVERED BY CATEGORY I.

3. USE COMPRESSION LAP SPLICE LENGTH (LCS) AT ALL COLUMN SPLICE LOCATIONS NOT SPECIFICALLY DETAILED AND UNLESS INDICATED OTHERWISE ON PLANS OR DETAIL. USE TENSION SPLICE FOR ALL OTHER SPLICES (UNLESS OTHERWISE SHOWN ON DRAWINGS).

4. THE STANDARD LAP SPLICE (0.0005 x fy x D) IS USED FOR COMPRESSION IN SPLICES AND CLASS "B" SPLICE IS USED FOR TENSION SPLICES. THE CONTRACTOR MAY SUBMIT LESSER SPLICE LENGTHS FOR REVIEW AND APPROVAL AT THE SAME TIME PROVIDING THE FOLLOWING INFORMATION:

A. DETAILS PREPARE AND SUBMITTED BY THE CONTRACTOR INDICATING LOCATION AND PROPOSED LAYOUT OF REBARS AND LENGTHS OF SPLICES.

B. WHERE THE SIZE AND NUMBER OF TIES OR SPIRALS PERMITS THE REDUCTION OF LAP LENGTH, THOSE BARS SHALL BE INDICATED ON THE DETAILS.

C. WHERE COMPUTED STRESS VALUES PERMIT THE REDUCTION OF LAP LENGTH, COMPUTATIONS SHALL BE SUBMITTED FOR REVIEW.

D. THE APPLICABLE SECTION OF THE ACI-95 CODE PERMITTING THE LESSER SPLICE LENGTH SHALL BE INDICATED IN THE SUBMITTED MATERIAL.

5. TOP BARS ARE HORIZONTAL BARS PLACED SO THAT MORE THAN 12 INCHES OF CONCRETE IS CAST IN THE MEMBER BELOW THE BAR.

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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE
STRUCTURAL NOTES

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100% CD
5	6/3/2015	REV 01

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

DATE: 4/6/2015
SCALE: 1" = 1'-0"
DRAWN BY: JRO
CHECKED BY: EGS

STATE PROJECT NO:
OFFICE PROJECT NO: 83TS4.01
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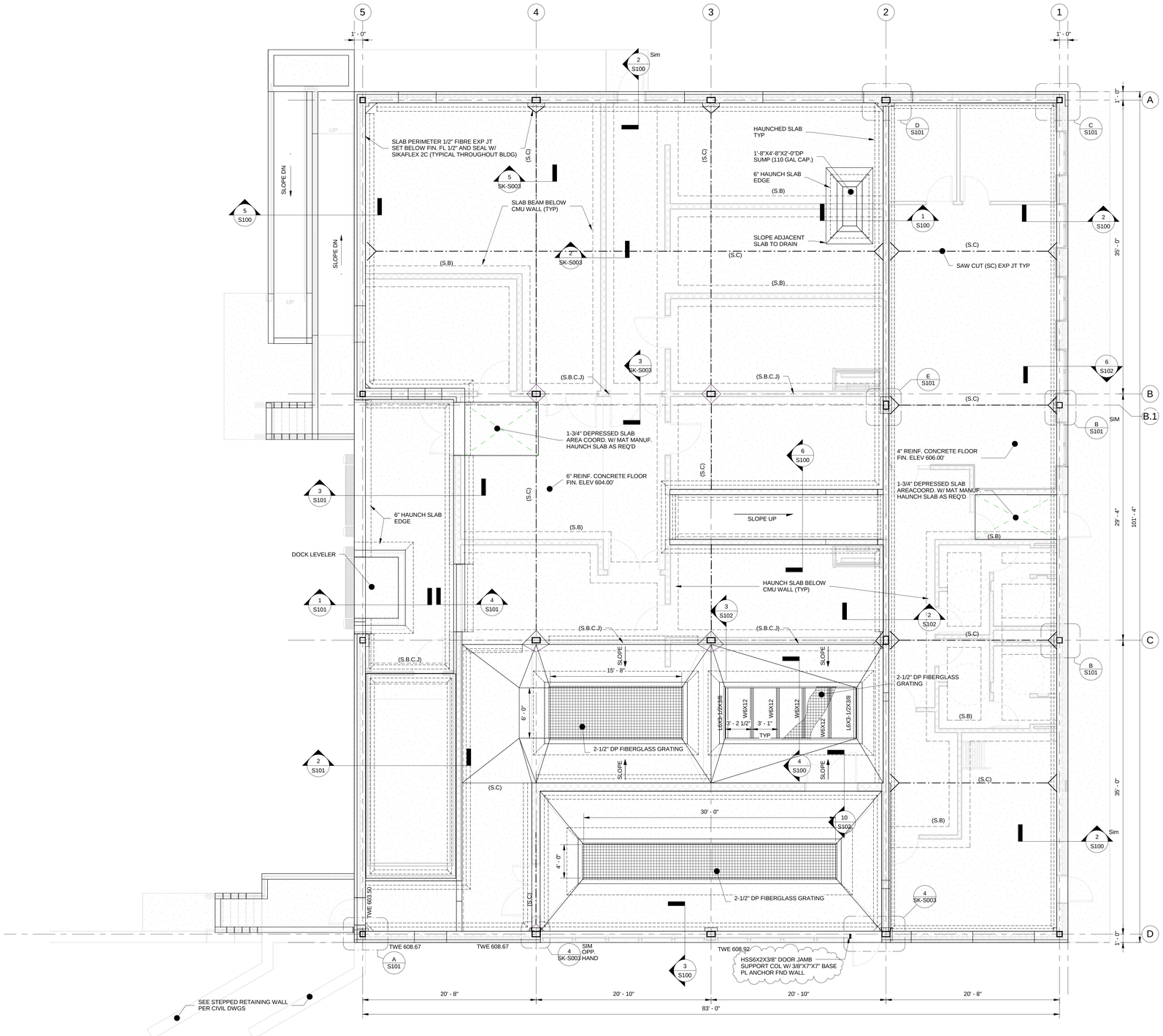

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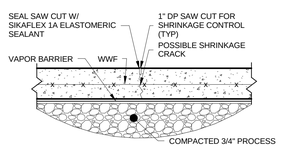
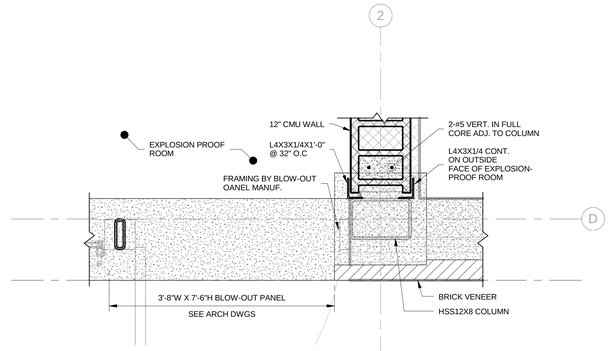
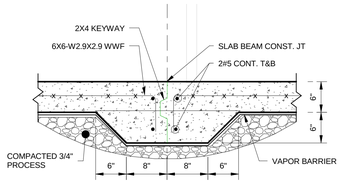
1 FIRST FLOOR PLAN
3/16" = 1'-0"



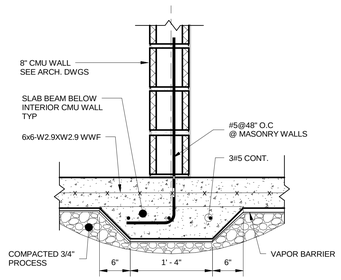
5 SLAB SAW CUT (S.C)
1" = 1'-0"



4 EXPLOSION-PROOF ROOM WALL/COLUMN DETAIL
1" = 1'-0"



3 SLAB BEAM CONST. JOINT (S.B.C.J)
1" = 1'-0"



2 SLAB BEAM (S.B)
1" = 1'-0"

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STORRS, CT

TITLE
FIRST FLOOR PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
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5	6/3/2015	REV 01

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
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DATE: 4/6/2015
SCALE: As indicated
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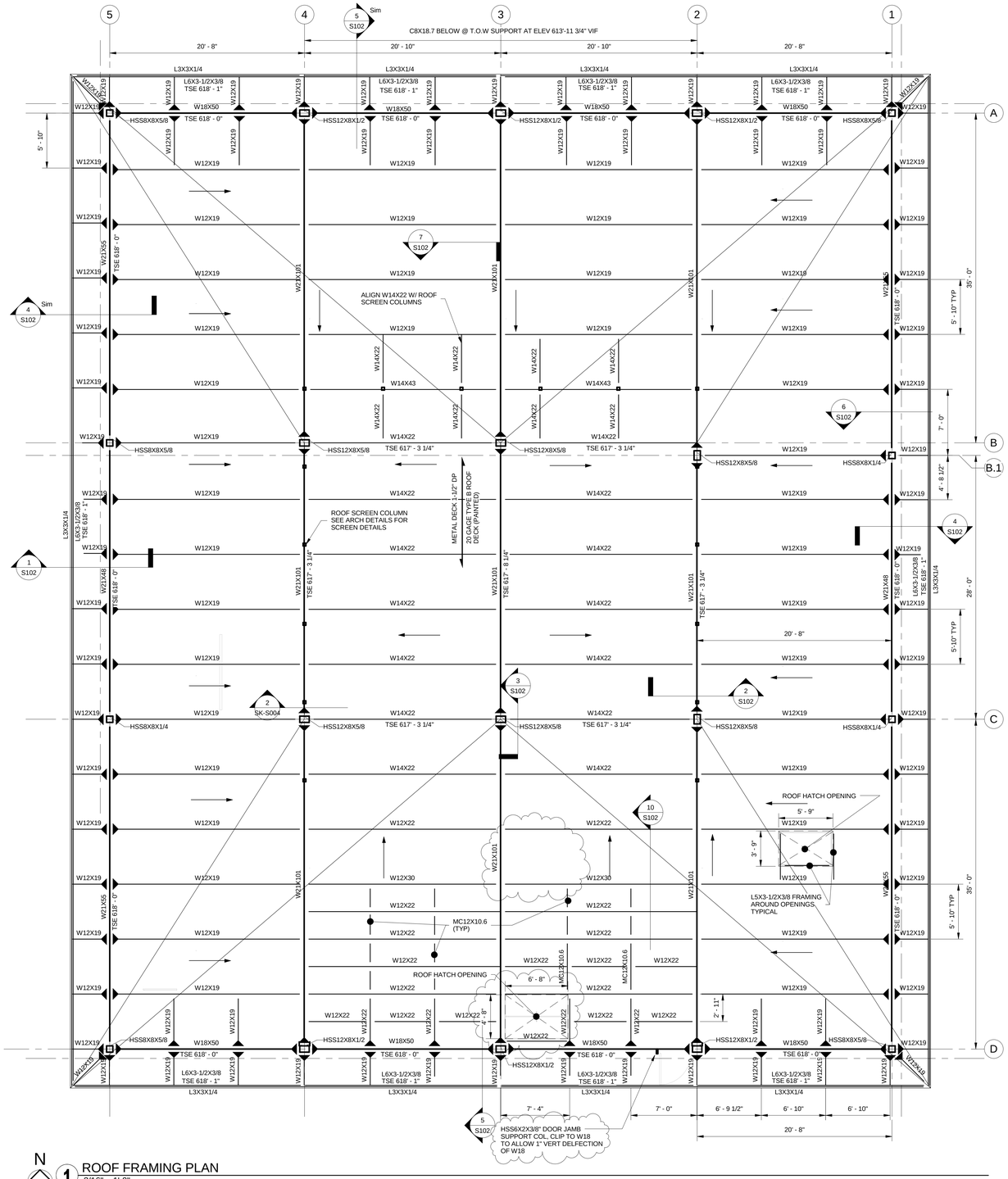
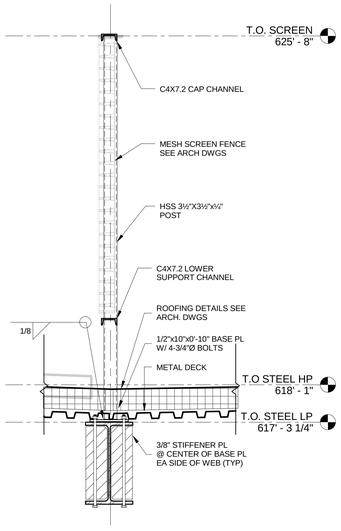


N

1 ROOF FRAMING PLAN
3/16" = 1'-0"



2 ROOF SCREEN FRAMING - DETAIL
3/4" = 1'-0"

COLUMN SCHEDULE

LOCATION	B-1-1 , C-1	A-1 , D-1	B-1-2 , C-2	A-2 , D-2	A-3 , D-3	B-3 , C-3	B-4 , C-4	A-4 , D-4	B-5 , C-5	A-5 , D-5
CAP PLATE	1/2"X8"X0'-8"	MOMENT CONN.	MOMENT CONN.	MOMENT CONN.	MOMENT CONN.	MOMENT CONN.	MOMENT CONN.	MOMENT CONN.	1/2"X8"X0'-8"	MOMENT CONN.
ROOF ELEVATION 618.00'	HSS8 X 8 X 1/4	HSS8 X 8 X 5/8	0'-8" HSS 12 X 8 X 5/8	HSS 12 X 8 X 5/8	HSS 12 X 8 X 5/8	0'-3" HSS 12 X 8 X 5/8	0'-8" HSS 12 X 8 X 5/8	HSS 12 X 8 X 1/2	HSS8 X 8 X 1/4	HSS8 X 8 X 5/8
FIN. FL ELEVATION 604.00'	1'-2½"	1'-2½"	1'-2½"	1'-2½" (A-2) 4'-1½" (D-2)	0'-3" (A-3)	4'-1" (D-3) 0'-3"(B-2) 0'-3"(C-3)	0'-3"(B-4) 0'-3"(C-4)	0'-9"(A-4)	3'-10" (D-4) 0'-9"	0'-9"(A-5) 3'-10" (D-5)
BASE PLATE	3/8"X10"X1'-2"	3/8"X14"X1'-2"	1"X10"X1'-6"	1"X10"X1'-6"	1"X10"X1'-6"	1"X10"X1'-6"	1"X10"X1'-6"	1"X10"X1'-6"	3/8"X10"X1'-2"	1"X14"X1'-2"
ANCHOR RODS	4 - 3/4"øX1'-6"	4 - 3/4"øX1'-6"	4 - 3/4"øX1'-6"	4 - 3/4"øX1'-6"	4 - 3/4"øX1'-6"	4 - 3/4"øX1'-6"	4 - 3/4"øX1'-6"	4 - 3/4"øX1'-6"	4 - 3/4"øX1'-6"	4 - 3/4"øX1'-6"

- ALL ANCHOR RODS SHALL COMPLY WITH ASTM F1554 GRADE 55
- ALL COLUMNS SURFACES IN CONTACT WITH MASONRY SHALL HAVE MASONRY ANCHORS AT 24" O.C VERTICAL

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STATE OF CONNECTICUT
EDWARD G. SHEEHAN JR.
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TITLE
ROOF FRAMING PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100% DD
2	1/16/2015	30% CD
3	3/23/2015	90% CD
4	4/6/2015	100% CD
5	6/3/2015	REV 01

UNIVERSITY OF CONNECTICUT

STORRS, CT

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO:
OFFICE PROJECT NO: 83TS4.01

FILE PATH
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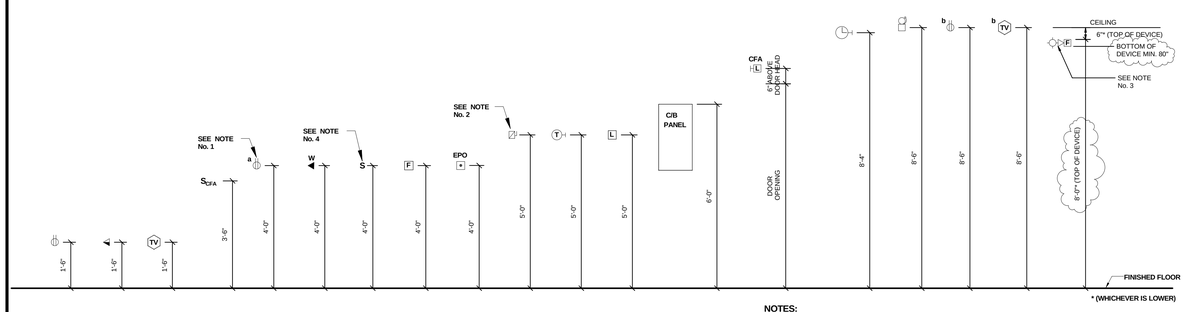
ELECTRICAL SYMBOL LEGEND

SYMBOL	DESCRIPTION
S	SINGLE POLE SWITCH
S_2	DOUBLE POLE SWITCH
S_3	THREE WAY SWITCH
S_4	FOUR WAY SWITCH
S_P	SINGLE POLE SWITCH WITH PILOT LIGHT
S_D	SINGLE POLE DIMMER SWITCH
S_K	SINGLE POLE KEY OPERATED SWITCH
S_a	SINGLE POLE SWITCH (a INDICATES SWITCH LEG)
S_T	SINGLE POLE TIMER SWITCH
S_{WP}	SINGLE POLE SWITCH WITH STAINLESS STEEL WEATHERPROOF COVER PLATE
S_F	FAN CONTROL SWITCH, MINIMUM 3 SPEED SOLID STATE, FLUSH MOUNTED
S_M	SINGLE POLE SWITCH WITH OCCUPANCY SWITCH
CA	CALL-FOR-AID PULLCORD
CA	CALL-FOR-AID COMBINATION LIGHT & BUZZER UNIT
O	CEILING MOUNTED OCCUPANCY SENSOR
	CEILING RECESSED FLUORESCENT, H.I.D. OR INCANDESCENT DOWNLIGHT LUMINAIRE
	WALL MOUNTED FLUORESCENT, H.I.D. OR INCANDESCENT DOWNLIGHT LUMINAIRE
	CEILING RECESSED FLUORESCENT, H.I.D. OR INCANDESCENT WALL WASH LUMINAIRE
	2x2 FLUORESCENT LUMINAIRE
	2x4 FLUORESCENT LUMINAIRE
	1x4 FLUORESCENT LUMINAIRE
	1x8 FLUORESCENT LUMINAIRE
	EMERGENCY/NIGHT LIGHT LUMINAIRE
	EMERGENCY/NIGHT LIGHT LUMINAIRE
	EMERGENCY/NIGHT LIGHT LUMINAIRE
	EMERGENCY/NIGHT LIGHT LUMINAIRE
	BATTERY POWERED EMERGENCY LUMINAIRE.
	REMOTE EMERGENCY LUMINAIRE
	CEILING EXIT SIGN LUMINAIRE SHADING INDICATES FACE AND ORIENTATION. ARROWS NOTE DIRECTION OF EGRESS.
	WALL EXIT SIGN LUMINAIRE SHADING INDICATES FACES AND ORIENTATION. ARROWS NOTE DIRECTION OF EGRESS.
	DUPLEX RECEPTACLE WITH UPPER HALF SWITCH CONTROLLED AND LOWER HALF CONSTANT POWER
a	DUPLEX RECEPTACLE MOUNTED ABOVE COUNTER OR IN CASEWORK. COORDINATE

SYMBOL	DESCRIPTION
	DUPLEX RECEPTACLE
GFI	GFI DUPLEX RECEPTACLE
	SINGLE RECEPTACLE
	DUPLEX RECEPTACLE, FLOOR MOUNTED
	SPECIAL RECEPTACLE, NEMA CONFIGURATION AS INDICATED
J	JUNCTION BOX
R	PULL BOX
	MOTOR, HP AND VOLTAGE AS NOTED
T	TRANSFORMER, KVA AS NOTED
	208/120V CIRCUIT BREAKER PANEL
	480/277V CIRCUIT BREAKER PANEL
	CONTROL PANEL, FUNCTION AS NOTED
	NON-FUSED SWITCH, SIZE AS NOTED
	FUSED SWITCH, SIZE AS NOTED
	COMBINATION FUSED SWITCH AND MAGNETIC STARTER, SIZE AS NOTED
	MAGNETIC MOTOR STARTER
B B B	BUSWAY, SIZE AS NOTED
C C C	POWER CABLE TRAY, SIZE AS NOTED
P	PHOTOCELL
	CLOCK RECEPTACLE
DC	DROP CORD RECEPTACLE
DM	DAMPER MOTOR
VO	VALVE OPERATOR
	PUSHBUTTON OPERATORS STATION
	2 PUSHBUTTON OPERATORS STATION
	3 PUSHBUTTON OPERATORS STATION
	BELL
	GROUNDING ROD OR WIRE AS NOTED
	GROUND ROD
G	GROUNDING CONDUCTOR
T	THERMOSTAT
E	EMERGENCY SYSTEM BRANCH CIRCUIT
NL	NIGHT LIGHT BRANCH CIRCUIT
LV	LOW VOLTAGE BRANCH CIRCUIT
DC	DIRECT CURRENT CIRCUIT
	CONDUIT RUN UP
	CONDUIT RUN DOWN
	CONDUIT CAPPED OFF
	CONDUIT CONTINUED

SYMBOL	DESCRIPTION
FACP	FIRE ALARM CONTROL PANEL
FAAP	FIRE ALARM REMOTE ANNUNCIATOR PANEL
F	FIRE ALARM MANUAL PULL STATION
I	IONIZATION SENSOR OR DETECTOR
P	PHOTOELECTRIC SENSOR OR DETECTOR
H	HEAT SENSOR OR DETECTOR
P D	PHOTOELECTRIC SMOKE SENSOR, DUCT MOUNTED
L	REMOTE LIGHT/TEST STATION FOR DUCT MOUNTED SMOKE SENSOR
F XX	FIRE ALARM HORN/STROBE XX=STROBE INTENSITY
F XX	FIRE ALARM STROBE XX=STROBE INTENSITY
F	FIRE ALARM HORN
FS	WATER FLOW SWITCH
TS	VALVE TAMPER SWITCH
PS	PRESSURE SWITCH
DH	DOOR HOLDER
CM	ADDRESSABLE CONTROL MODULE
AI	ADDRESSABLE INTERFACE MODULE
EOL	END-OF-LINE DEVICE
S	SPEAKER HORN
S	RECESSED CEILING MOUNTED SPEAKER
M	MICROPHONE OUTLET
W	TELEPHONE OUTLET, W=WALL MOUNTED
X/Y	COMBINATION VOICE/DATA OUTLET X=VOICE Y=DATA
TV	CABLE TELEVISION OUTLET
MD	MAGNETIC DOOR SWITCH
ES	ELECTRIC STRIKE
CR	CARD READER
CK	CARD READER WITH KEYBOARD
IR	INFRA-RED DETECTOR
GT	GUARD TOUR
GB	WINDOW GLASS BREAK DETECTOR
R	REFLECTOR PLATE
UD	ULTRASONIC MOTION DETECTOR
PE	PHOTO EYE
TV	CCTV CAMERA
H	ALARM HORN
KR	KEY RESET SWITCH
KP	KEY PAD (WITHOUT CARD READER)
PB	PUSHBUTTTON, DEFINE PURPOSE

ABBREV.	DESCRIPTION
V	VOLTS OR VOLTAGE
A	AMPS OR AMPERAGE
W	WIRE
VA	VOLTAMPERES
KW	KILOWATTS
KVA	KILOVOLTAMPERES
AC	ALTERNATING CURRENT
DC	DIRECT CURRENT
CU	COPPER
AL	ALUMINUM
GND	GROUND
IG	ISOLATED GROUND
C/B	CIRCUIT BREAKER
GFI	GROUND FAULT CIRCUIT INTERRUPTER
PT	POTENTIAL TRANSFORMER
CT	CURRENT TRANSFORMER
VFD	VARIABLE FREQUENCY DRIVE
MCC	MOTOR CONTROL CENTER
PB	PUSHBUTTON
N.O.	NORMALLY OPEN
N.C.	NORMALLY CLOSED
WP	WEATHERPROOF
AFF	ABOVE FINISHED FLOOR
C	CONDUIT
RE	REMOVE EXISTING
ER	EXISTING TO REMAIN
RLE	RELOCATE EXISTING
EMT	ELECTRICAL METALLIC TUBING
RGS	RIGID GALVANIZED STEEL
IMC	INTERMEDIATE METAL CONDUIT
RNC	RIGID NONMETALLIC CONDUIT

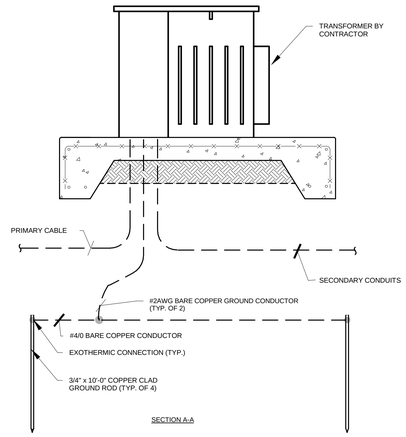


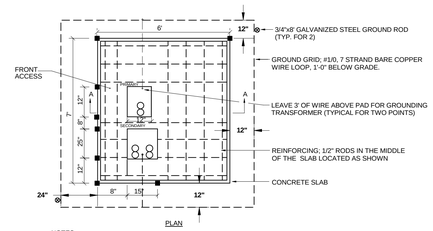
DEVICE MOUNTING HEIGHTS

NTS

NOTES:

1. WHEN MOUNTED ABOVE A COUNTER, MOUNT 6" ABOVE BACK SPLASH.
2. MEASURED TO THE TOP OF THE OPERATING HANDLE IN THE "ON" POSITION. TYPICAL FOR NON-FUSED SWITCHES AND COMBINATION FUSED SWITCH/MAGNETIC STARTERS.
3. FIRE ALARM SPEAKERS, HORNS OR STROBE LIGHTS SHALL BE AT THE SAME HEIGHT.
4. INCLUDES ALL LIGHT SWITCHES, UNLESS OTHERWISE NOTED ON DRAWINGS.



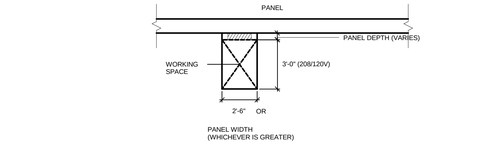


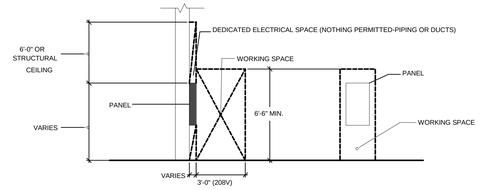
NOTES:

1. CONCRETE PAD SHALL BE IN ACCORDANCE WITH EVERSOURCE SPECIFICATIONS.
   GROUND CONDUCTORS SHALL EXTEND 5'-0" ABOVE PAD.
2. GROUND RODS AND CONDUCTOR CONNECTING THE GROUND
3. RODS SHALL BE A MINIMUM OF 2'-6" BELOW FINISHED GRADE.

PAD MOUNTED TRANSFORMER FOUNDATION DETAIL

NTS

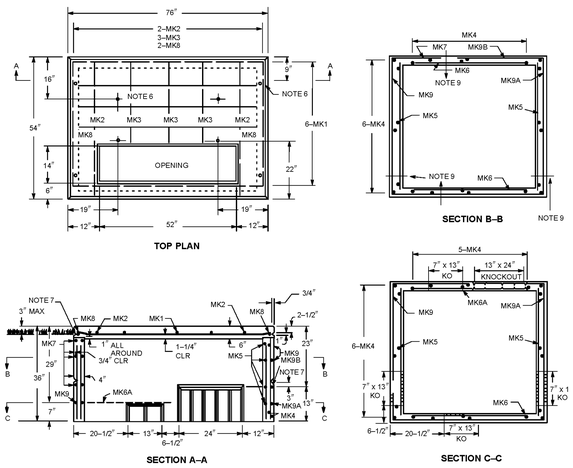




NOTE: ACCESS AND WORKING SPACE AS DETERMINED BY N.E.C. SECTION 110-26.

SPACES ABOUT ELECTRICAL EQUIPMENT

NTS



Trench Details – Direct Buried Cables

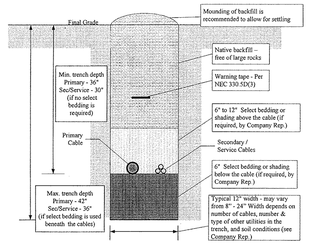
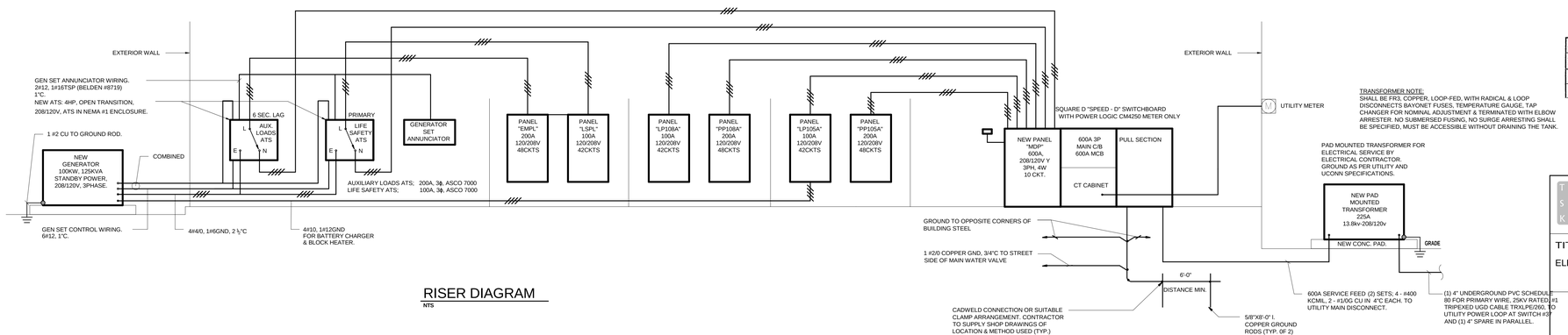


TABLE - MINIMUM COVER REQUIRED PER CODE (INCHES)

Owner / Code	Customer Installed Facilities / NEC (1)				Company / NESC
Voltage (0- 4)	Direct Buried	Rigid Metallic Conduit (RMC)	Rigid Nonmetallic Conduit (RNC)	Street / Road Parking Lot (2)	Direct Buried
0 – 600 V	24	6	18	24	24
> 600 V – 22 kV	30	6	18	24	30



RISER DIAGRAM

NTS

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TITLE

ELECTRICAL LEGENDS

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1	9/12/2014	100%DD
2	1/16/2015	30%CD
3	9/23/2015	90%CD
4	6/3/2015	REV 01

UNIVERSITY OF CONNECTICUT

STORRS, CT

DATE: 6/06/15

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CHECKED BY: JKH

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
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STATE PROJECT NO:

OFFICE PROJECT NO: Project Number

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STATE OF CONNECTICUT JOHN K. HINZE No. 20836 LICENSED PROFESSIONAL ENGINEER

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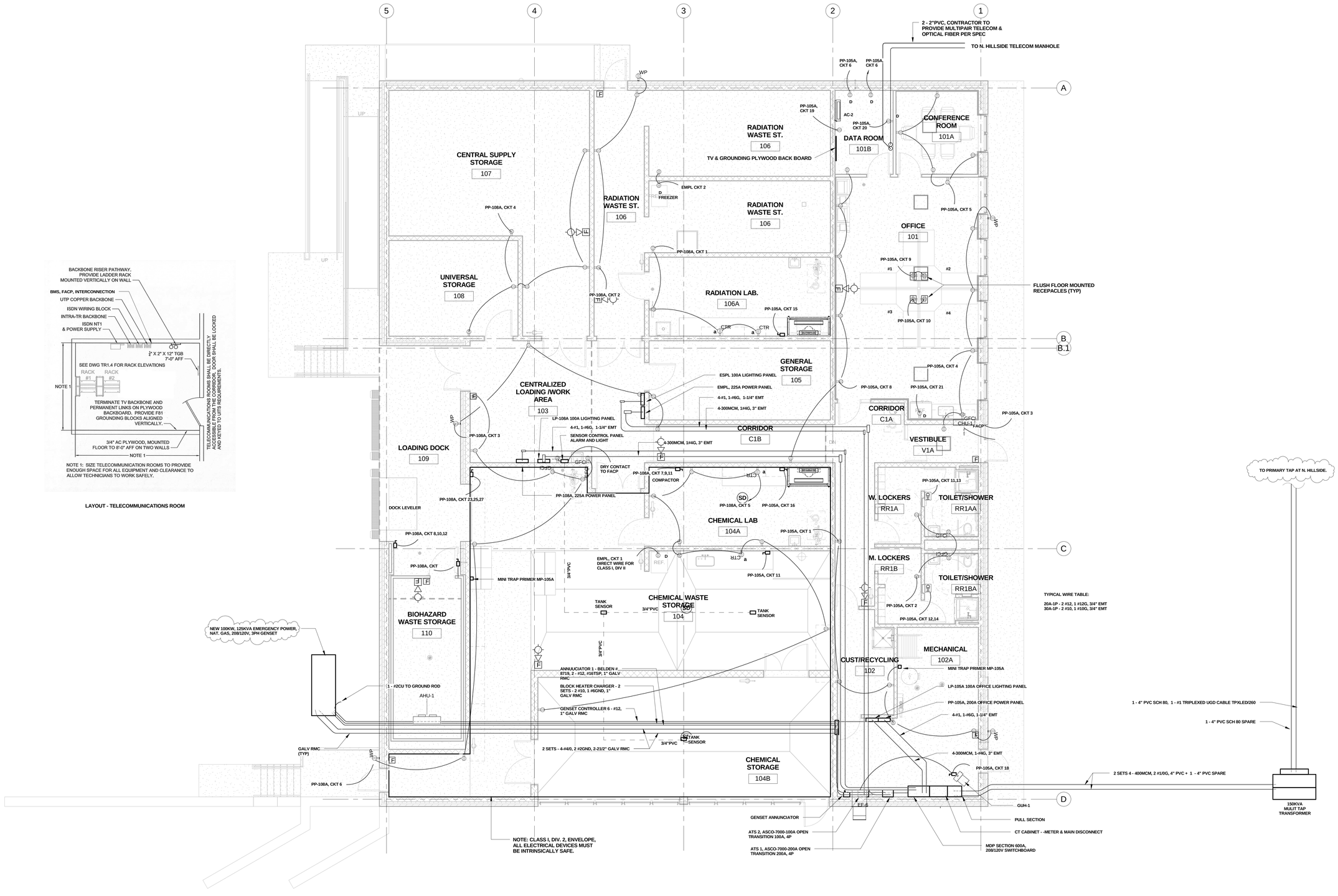
NOTE 1: SIZE TELECOMMUNICATION ROOMS TO PROVIDE ENOUGH SPACE FOR ALL EQUIPMENT AND CLEARANCE TO ALLOW TECHNICIANS TO WORK SAFELY.

LAYOUT - TELECOMMUNICATIONS ROOM



1 POWER PLAN
3/16" = 1'-0"

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TITLE
POWER PLAN

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1	9/12/2014	100%DD
2	1/16/2015	30%CD
3	3/23/2015	90%CD
4	6/3/2015	REV 01

PROJECT: MAIN ACCUMULATION AREA
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LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	LAMPS
A	1'X4' LED SURFACE OR SUSPENDED LED LIGHT, 32W, 4000 LUMENS, 3500K. CREE MODEL# CR-LE-40L HE-35K- -S-	32W LED
B	4' LED SURFACE AMBIENT LUMINAIRE, LED LIGHT, 32W, 4000 LUMENS, 3500K. CREE MODEL# LS4- 40L-35K	44W LED
C	6" CALCULITE LED DOWNLIGHT MEDIUM BEAM, 39W, 2000 LUMENS, 3500K. LIGHTOLIER MODEL# C6L152DL-35K-M-CL-W, WITH FRAME IN KIT C6L20-N	39W LED
D	10"X4" LED OUTDOOR WALL MOUNTED WALK OR STEP LED LIGHT, 13W, 3000K. COLE MODEL# L609-HO	13W LED
E	2'X2' LED TROFFER LENS: FROSTED WHITE ACRYLIC, FINISH: WHITE. CREE MODEL# ZR22-32L-3500K-120/208VOLT-10V	1-35W, 3200 LUMENS LED
F	CLASS 1, DIV 2 SAFESITE LED AREA, POLYCARBONATE LENS, FINISH: GRAY. DIALIGHT MODEL# HZD5C2N-5000LUMEN 4000K-120/208VOLT-10V	48W, 5000 LUMENS LED
G	LED CANOPY LIGHTING, FLAT LENS, WHITE FINISH, 4000K, CREE CPY SERIES, MODEL# CPY250-(VERSION)-DM-F-A-UL-WH-40K.	82W LED
H	EXTERIOR WALL LUMINAIRE, LED, BRONZE FINISH,1000 LUMENS HUBBELL MODEL# LNC-5UL-4K-X	15.5W LED
I-3	EXTERIOR SITE LIGHTING, LED LIGHTING ON 18' POLE, BRONZE FINISH, 4000K, STERNER LIGHTING, MODEL# EXECUTIVE RT21-30L-4K-3-BC	42W LED
I-4	EXTERIOR SITE LIGHTING, LED LIGHTING ON 18' POLE, BRONZE FINISH, 4000K, STERNER LIGHTING, MODEL# EXECUTIVE RT21-60L-4K-5M	42W LED
I-6	EXTERIOR SITE LIGHTING, LED LIGHTING ON 18' POLE, BRONZE FINISH, 4000K, STERNER LIGHTING, MODEL# EXECUTIVE RT21-60L-4K-5W	42W LED
J	LED EXIT SIGN, RED ON WHITE BACKGROUND WITH BATTERY. HUBBELL DUAL LITE EVE SERIES MODEL# EVE-U-R-W- - _	1-3.1W LED
K	2x2 LED TROFFER, KURIZON LIGHTING MODEL# G-5-2x2-3/LED35-UNV-LEX12	1-32W, 2200 LUMENS LED
L	LED EXIT SIGN, CLASS 1, DIV. 2. GROUSEHINDS MODEL# CCH UX60RHAZ	2.7W LED

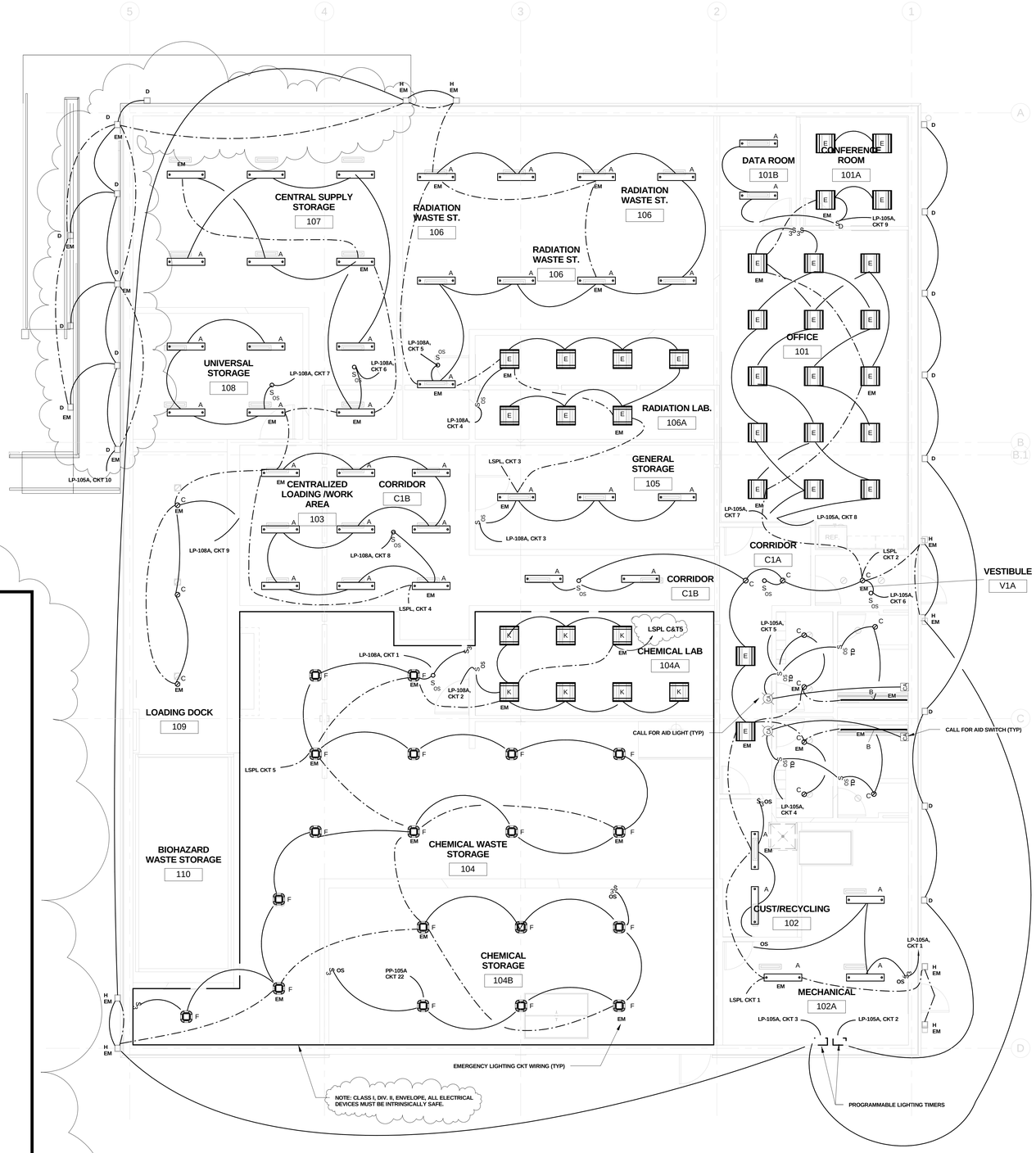
LUMINAIRE SCHEDULE NOTES

1. ALL LED LAMPS SHALL HAVE A COLOR TEMPERATURE RATING OF 3500-4000 DEGREES KELVIN WITH A C.R.I. OF 75 OR BETTER.

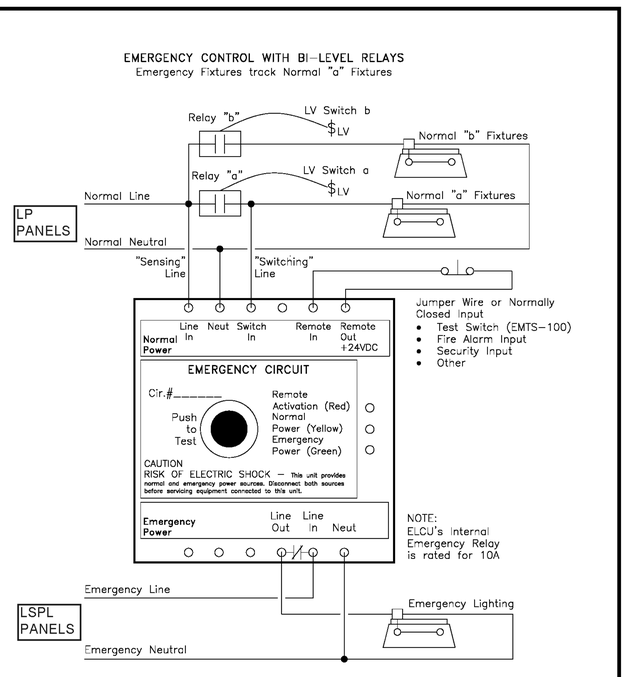
2. ALL LUMINAIRES SHALL BE SUPPORTED FROM BUILDING STRUCTURE.

3. FINAL SELECTION OF ALL LUMINAIRE FINISHES SHALL BE BY THE ARCHITECT.

4. LED LAMPS ARE BASED ON MANUFACTURER.



1 LIGHTING PLAN
3/16" = 1'-0"



Watt Stopper/Legrand
800-879-8585

Title			
ELCU Bi-Level Relays			
Scale	Drawing#	Date	Rev.
None	61-700	11/15/07	2

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TITLE
LIGHTING PLAN

ISSUE DATES

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1	9/12/2014	100%DD
2	1/16/2015	300%CD
3	3/23/2015	90%CD
4	6/3/2015	REV 01

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PROJECT: MAIN ACCUMULATION AREA

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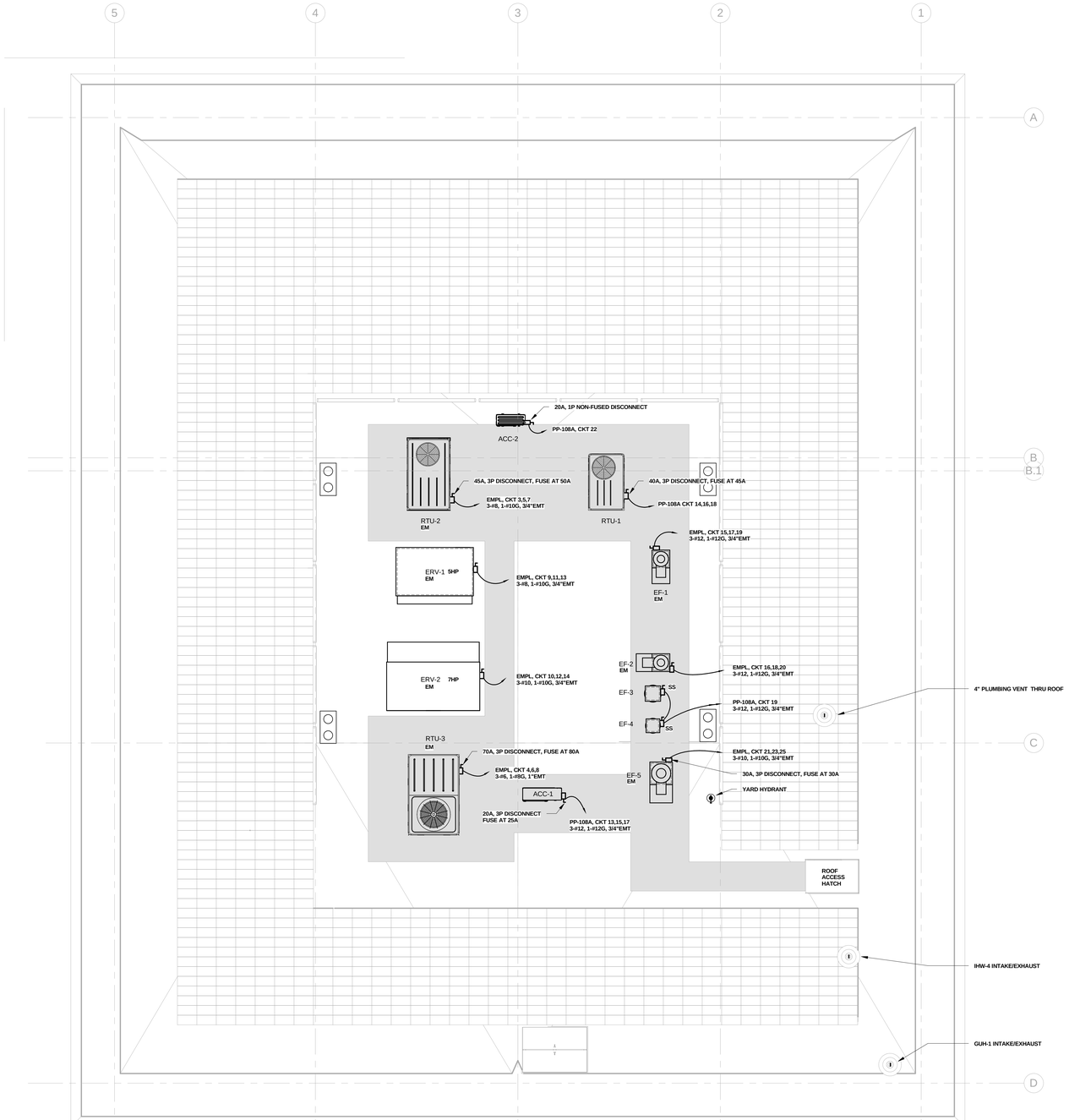

NOTE: GFI CONVENIENCE OUTLET PROVIDED IN ALL RTUs AND MECHANICAL SPEC. AS BUILT INTO UNIT & WITHIN CODE REQUIRED DISTANCE TO OTHER EQUIPMENT.

1 ROOF POWER PLAN
3/16" = 1'-0"

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POWER PLAN ROOF EQUIP.

ISSUE DATES

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1	9/12/2014	100%DD
2	1/16/2015	30%CD
3	3/23/2015	90%CD
4	6/3/2015	REV 01

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SCALE: 3/16" = 1'-0"

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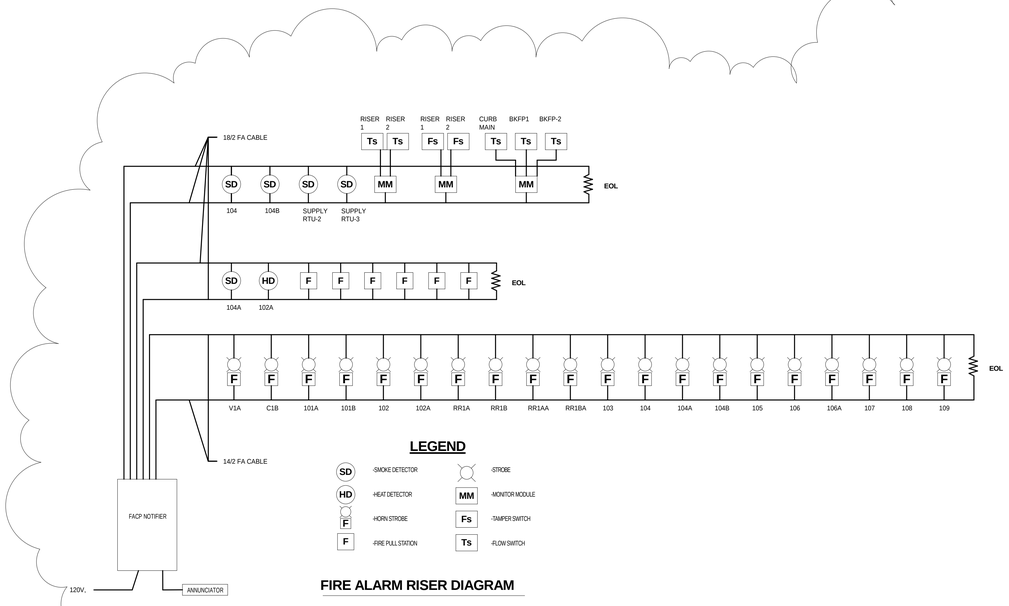
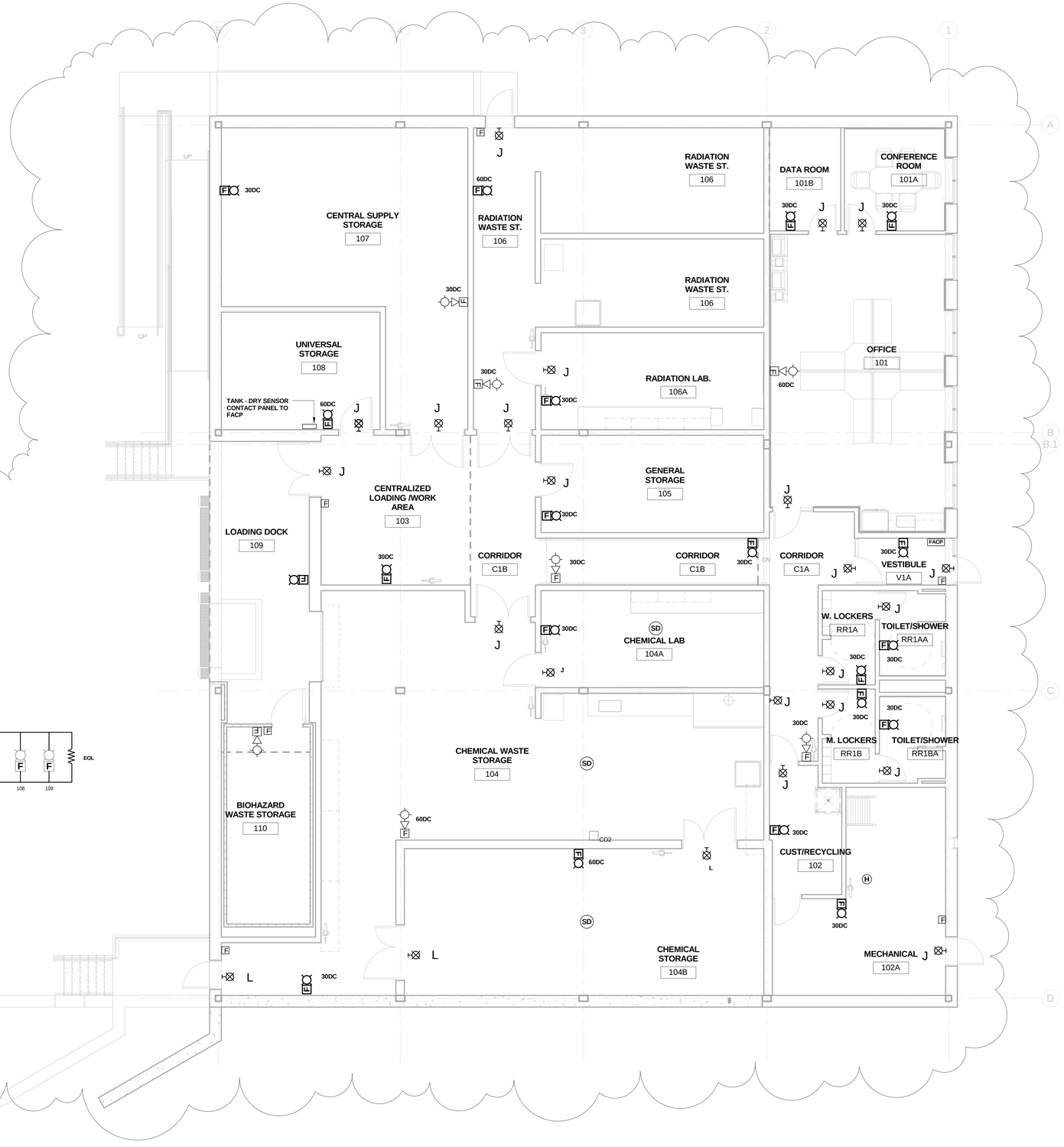


LEGEND

SD	-SMOKE DETECTOR		-STROBE
HD	-HEAT DETECTOR	MM	-MONITOR MODULE
F	-HORN STROBE	Fs	-TAMPER SWITCH
F	-FIRE PULL STATION	Ts	-FLOW SWITCH

FIRE ALARM RISER DIAGRAM



REFER TO LEGEND ON DWG E001 FOR SYMBOLS.

1 FIRE ALARM
3/16" = 1'-0"

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FIRE ALARM

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MECHANICAL SYMBOL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
S/A	SUPPLY AIR		SUPPLY AIR OR OUTSIDE AIR FLOW	UD	UNDERCUT DOOR
R/A	RETURN AIR		RETURN AIR OR EXHAUST AIR FLOW	CUH	CABINET UNIT HEATER
O/A	OUTSIDE AIR		VOLUME DAMPER (VD)	ESP	EXTERNAL STATIC PRESSURE
EXH	EXHAUST AIR		REGISTER OR GRILLE		PIPE ELBOW TURNED UP
EF	EXHAUST FAN		DIFFUSER		PIPE ELBOW TURNED DOWN
AFF	ABOVE FINISHED FLOOR		R/A RECTANGULAR DUCT RISER		PIPE TEE UP
BOD	BOTTOM OF DUCT ELEVATION		S/A RECTANGULAR DUCT RISER		PIPE TEE DN
HX	HEAT EXCHANGER		EXH RECTANGULAR DUCT RISER		PIPE CAP
FD	FIRE DAMPER		R/A ROUND DUCT RISER		GATE VALVE
CFM	CUBIC FEET PER MINUTE		S/A ROUND DUCT RISER		BALL VALVE
C	COLD WATER (DOMESTIC)		EXH ROUND DUCT RISER		PRESSURE GAUGE W/SHUTOFF COCK
ACC	AIR-COOLED CONDENSER	T	THERMOSTAT		CHECK VALVE
RTU	PACKAGED ROOF TOP AC UNIT	M	MOTORIZED DAMPER		BLIND FLANGE
VD	VOLUME DAMPER	TS	TEMPERATURE SENSOR		CONTROL VALVE
UH	UNIT HEATER		FLEXIBLE CONNECTOR		SOLENOID VALVE
PF	PADDLE TYPE FAN		BALANCE VALVE		STRAINER
AC	AIR CONDITIONING		DRAIN VALVE		MANUAL AIR VENT
MAU	MAKE-UP AIR UNIT		PIPE UNION		PIPE REDUCER
CP	CONTROL PANEL		STRAINER WITH BLOWDOWN		DIRECTION OF FLOW
HWS&R	HOT WATER SUPPLY & RETURN		THERMOMETER		2-WAY CONTROL VALVE
P	PUMP	LD	LOUVERED DOOR		3-WAY CONTROL VALVE
UD	UNDERCUT DOOR	AFM	AIR FLOW MONITORING STATION	SD	SMOKE DETECTOR

ROOFTOP AIR CONDITIONING UNIT SCHEDULE

NUMBER	EVAPORATOR FAN CFM	EVAPORATOR FAN TESP	EVAPORATOR FAN RPM	EVAPORATOR FAN HP	COMP/COND FAN NO.	COMP/COND FAN HP	COMP/COND FAN RPM	COMP MOTOR	COND EAT	ELEC	DX COOLING COIL EVAP EAT DB	DX COOLING COIL EVAP EAT WB	COOLING CAPACITY TOTAL	COOLING CAPACITY SENSIBLE	HEATING (GAS-FIRED) EAT	HEATING LAT	HEATING CAPACITY INPUT	HEATING CAPACITY OUTPUT	STAGES	POWER EXHAUST FAN CFM	POWER EXHAUST FAN NO.	POWER EXHAUST FAN HP	MIN EER	UNIT WEIGHT (lbs)	MIN. OUTSIDE AIR %	MANU/ MODEL	REMARKS
RTU-1	1000	1.75"	1128	1.0	1	0.2	1075	2.62 KW	95°F	208/3PH	83.8°F	68.3°F	38.3 MBH	25.82 MBH	40°F	128.9°F	120 MBH	96 MBH	MODULATING	-	1	-	13	750	30	TRANE YHC036	PROVIDE WITH POWER EXHAUST
RTU-2	2400	1.75"	1192	5.0	1	0.75	1075	6.02 KW	95°F	208/3PH	84.2°F	68.5°F	90.27 MBH	65.29 MBH	40°F	96.5°F	150 MBH	120 MBH	MODULATING	-	SEE NOTES	-	11	1300	100	TRANE YHC092	PROVIDE WITH G SERIES 5 CORE ERV WITH POWER EXHAUST
RTU-3	3400	1.75"	1439	5.0	1	0.75	1075	7.60 KW	95°F	208/3PH	83.9°F	68.3°F	117.34 MBH	86.92 MBH	40°F	94.7°F	250 MBH	200 MBH	MODULATING	-	SEE NOTES	-	11	1700	100	TRANE YHC120	PROVIDE WITH D SERIES 6 CORE ERV WITH POWER EXHAUST

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE UNITS WITH THRU-THE-CURB POWER AND GAS, POWER EXHAUST, CONV OUTLET, COMPARATIVE ENTHALPY ECON, ROOF CURB, DISC SWITCH AND INTEGRATED CONTROLS.
3) PROVIDE UNITS WITH 4" DISPOSABLE, PLEATED, MERV13 PARTICULATE FILTERS.

SPLIT AIR CONDITIONING SYSTEM SCHEDULE (DATA CLOSET)

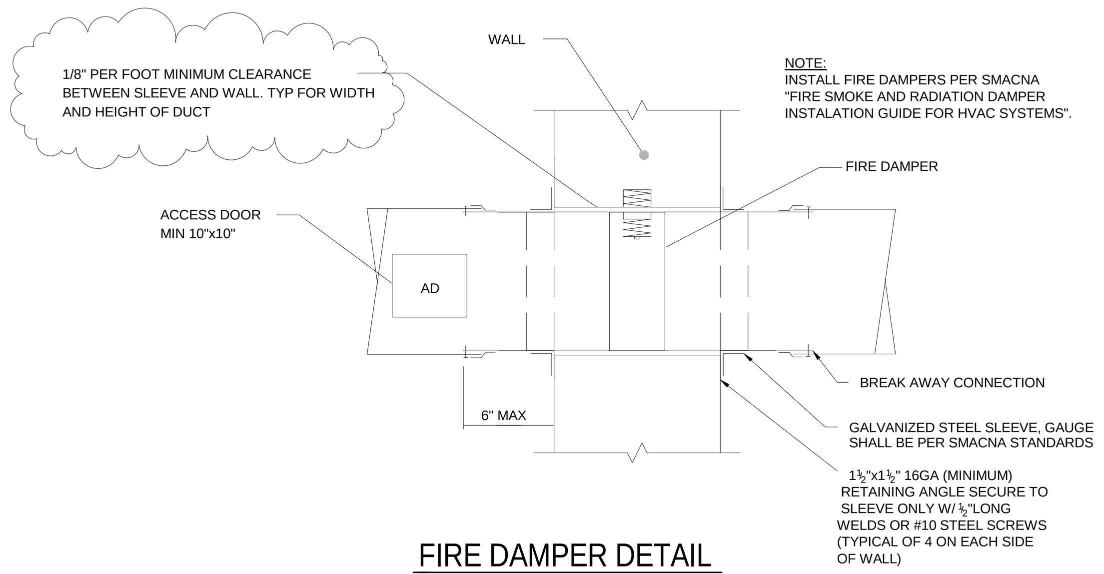
NUMBER	EVAPORATOR UNIT CFM	ESP	RPM	HP	ELEC	COMP/COND UNIT FAN NO.	FAN HP	FAN RPM	COMP MOTOR	COND EAT	ELEC	DX COOLING EVAP EAT DB	EVAP EAT WB	COOLING CAPACITY TOTAL	COOLING CAPACITY SENSIBLE	DX HEATING EVAP EAT DB	EVAP EAT WB	HEATING CAPACITY	ELEC HEATING COIL KW	ELEC	STAGES	MIN SEER	MANU/MODEL	REMARKS
AC-1	400	0" W.G.	-	-	208V/1PH	1	-	-	12 RLA	95°F	208V/1PH	80°F	67°F	18 .0 MBH	12.0 MBH	70°F	60°F	19.0 MBH @47F	-	-	-		15MITSUBISHI PKA-A18HA4/PUZ-A18NHA4	SEE NOTES 2, 3 & 4

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PERFORMANCE NOTED IS WITH FAN AT HIGH SPEED.
3) PROVIDE ALL UNITS WITH DISCONNECT SWITCHES AND CONDENSATE PUMPS.
4) INSIDE AC-X IS WIRED TO OUTSIDE ACC-X.

GAS FIRED UNIT HEATER SCHEDULE

UNIT NO.	TYPE	HEATING SECTION TOTAL INPUT/ OUTPUT	ENT. AIR (F)	TEMP. RISE (F)	FAN MOTOR DATA CFM	HP	VOLTS	PH	HZ	MANUFACTURER MODEL	REMARKS
GUH-1	NAT. GAS	100/80 MBH	60	50	1480	1/20	115	1	60	TRANE MODEL GAND	SEE NOTES 2 & 3

NOTE:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE ALL UH HEATERS WITH REMOTE LINE-VOLTAGE THERMOSTATS AND TAMPER PROOF CONSTRUCTION.
3) ONE STAGE, SEPARATED COMBUSTION UNIT, PROVIDE WITH CONCENTRIC ADAPTER.

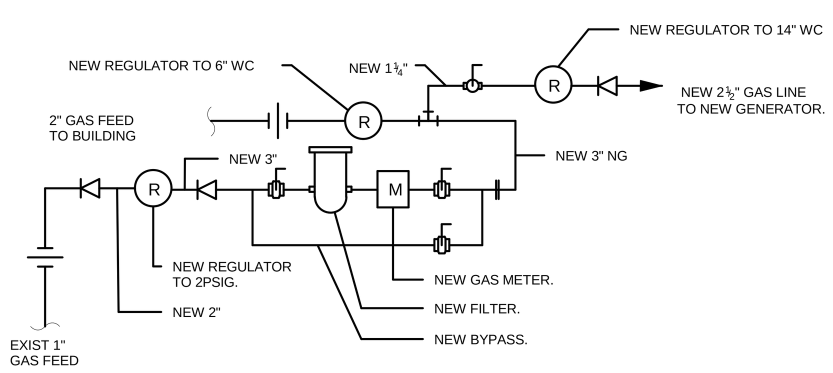


FIRE DAMPER DETAIL
SCALE: NONE

EXHAUST FAN SCHEDULE

NUMBER	AIR FLOW (CFM)	STATIC PRESSURE	MOTOR SPEED	FAN SPEED	HP	ELEC	AREA SERVING	TYPE	MAX dbA	MANU/MODEL	REMARKS
EF-1	1370	0.75"W.G.	1725 RPM	XXX RPM	X	208V/3PH	RAD LAB HOOD	ROOF UPBLAST	X	GREENHECK VEKTOR H-10	SEE NOTES 1, 2 & 3
EF-2	1370	0.75"W.G.	1725 RPM	XXX RPM	X	208V/3PH	CHEM LAB HOOD	ROOF UPBLAST	X	GREENHECK VEKTOR H-10	SEE NOTES 1, 2 & 3
EF-3	200	0.50"W.G.	1725 RPM	XXX RPM	X	120V/1PH	TOILET ROOM	ROOF CENTRIFUGAL	X	GREENHECK XX-XX	SEE NOTES 1 & 2
EF-4	5650	1.20"W.G.	1725 RPM	XXX RPM	X	208V/3PH	WALK IN HOOD	ROOF UPBLAST	X	GREENHECK VEKTOR H-16	SEE NOTES 1, 2 & 3
EF-5	75	0.30"W.G.	1725 RPM	XXX RPM	X	120V/1PH	JAN CLOSET	INLINE	X	GREENHECK XX-XX	SEE NOTES 1 & 2
EF-6	500	0.30"W.G.	1725 RPM	XXX RPM	X	208V/1PH	MECH ROOM	SIDEWALL	X	GREENHECK XX-XX	SEE NOTES 1 & 2

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE ALL FANS WITH DISCONNECT SWITCHES, AND BACKDRAFT DAMPERS.
3) EF-1, 2,&4 SHALL BE EXPLOSION PROOF MODELS.



GAS MAIN SCHEMATIC DIAGRAM
SCALE: NONE

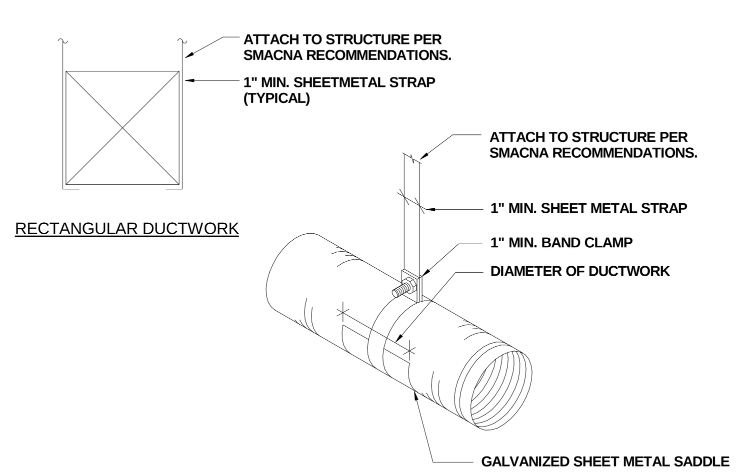
NOTES:
1. THIS CONTRACTOR TO PROVIDE ALL MATERIAL AND LABOR TO UPGRADE THE EXISTING GAS SERVICE AS REQUIRED, PER THE NATURAL GAS UTILITY.

2. ALL PIPING SHALL BE WELDED CARBON STEEL WITH FLANGED COMPONENTS. TEST PER NFPA S4.

ELECTRIC CABINET AND UNIT HEATER SCHEDULE

TYPE	KW	BTUH	ELEC	MANU/MODEL	REMARKS
CUH1	2.0/6.0	20,470	208V/3PH	TRANE FF-HB030	VERTICAL, RECESSED CABINET HEATER, PROVIDE WITH TWO-STAGE HEAT.
CUH2	2.0/6.0	20,470	208V/3PH	TRANE FF-FB030	VERTICAL, SURFACE MOUNTED HEATER, PROVIDE WITH TWO-STAGE HEAT.

NOTE:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE ALL UH HEATERS WITH BUILT-IN THERMOSTATS AND TAMPER PROOF CONSTRUCTION.



NOTES:

1. DO NOT USE POWDER POWERED FASTENING SYSTEMS TO ATTACH SUPPORTS TO STRUCTURE.
2. ALL CHANNEL SECTIONS SHALL BE HOT DIPPED GALVANIZED.
3. SUPPORT SYSTEM MUST NOT DAMAGE DUCT, INSULATION, OR CAUSE DUCT SHAPE DEFORMATION.
4. HANGER SIZES SHALL BE IN ACCORDANCE WITH SMACNA, LATEST EDITION.

DUCTWORK SUPPORT DETAIL
NTS

AIR OUTLET AND INLET SCHEDULE

TYPE	SIZE	MAX CFM	NECK	MAX NC	DESCRIPTION	MANU/MODEL	REMARKS
A	12x12	175	6"	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
B	12x12	250	8"	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
C	24x24	340	8"	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
D	24x24	500	10"	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
E	24x24	600	12"	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
F	24x24	800	14"	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
G	18x10	1000	-	35	4-WAY SUPPLY AIR DIFFUSER	TITUS 272RS	PROVIDE WITH OPPOSED BLADE DAMPER
H	24x18	1200	-	35	SIDEWALL SUPPLY AIR REGISTER	TITUS 272RS	PROVIDE WITH OPPOSED BLADE DAMPER
N	6x6	190	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
O	8x8	400	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
P	12x12	900	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
Q	18x12	1100	-	35		TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
R	18x18	1900	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
S	24x24	3300	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
T	30x12	2000	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) SUPPLY AIR DIFFUSERS SHALL BE 4-WAY THROW UNLESS NOTED OTHERWISE BY A SECOND DIGIT NOTATION (I.E. A3 INDICATES A THREE-WAY THROW TYPE A DIFFUSER). THE DIFFUSER AIR FLOW PATTERN SHALL BE AS NOTED ON THE PLAN DRAWING
3) PROVIDE WITH OPPOSED BLADE DAMPER AND FRAME COMPATIABLE WITH CEILING.

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UNIVERSITY OF CONNECTICUT
STORRS, CT

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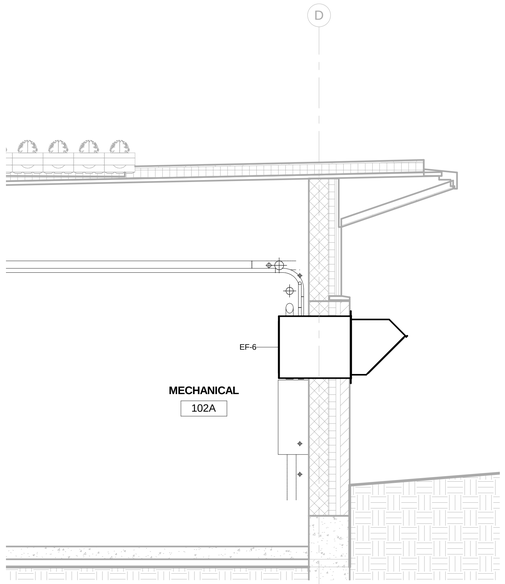
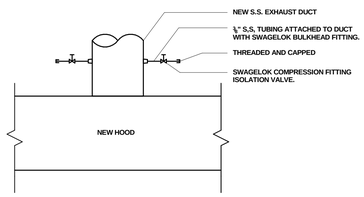
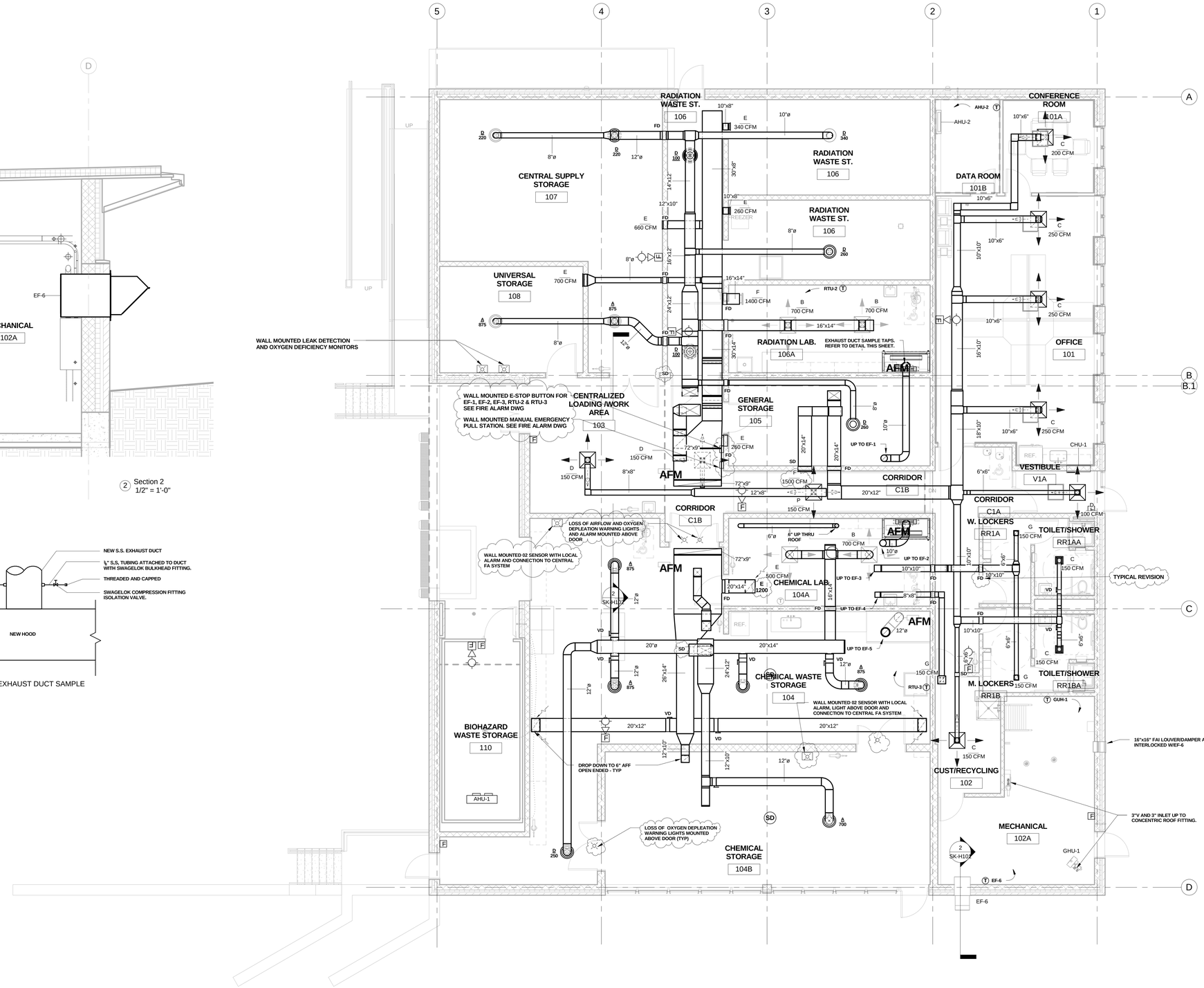


2 Section 2
1/2" = 1'-0"



3 CHEM LAB EXHAUST DUCT SAMPLE POINTS
1" = 1'-0"



1 MECHANICAL PLAN
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TITLE
MECHANICAL PLAN

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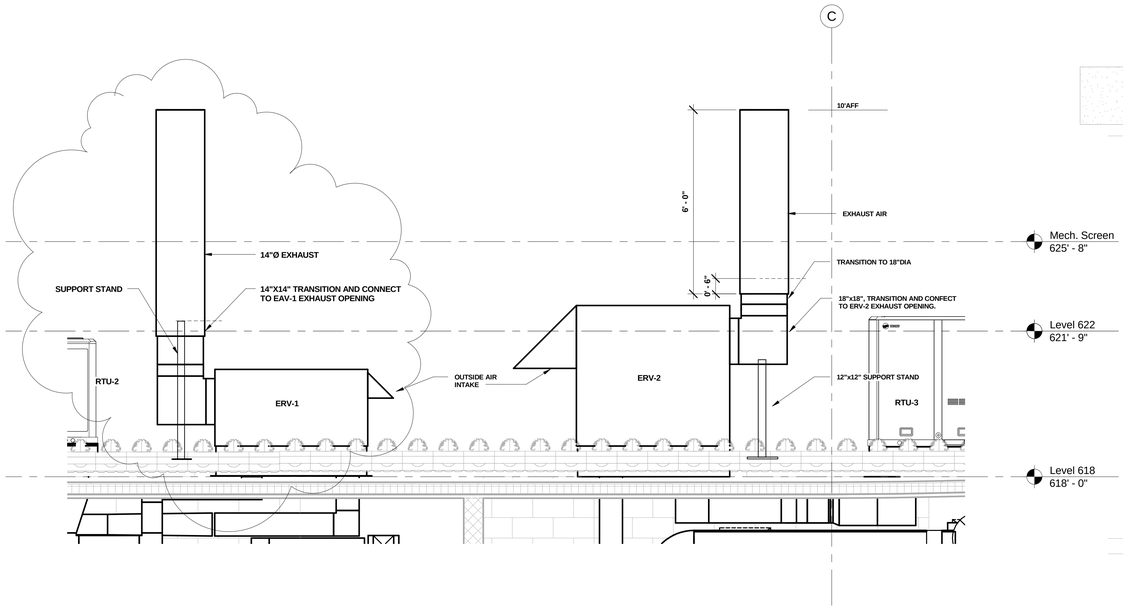
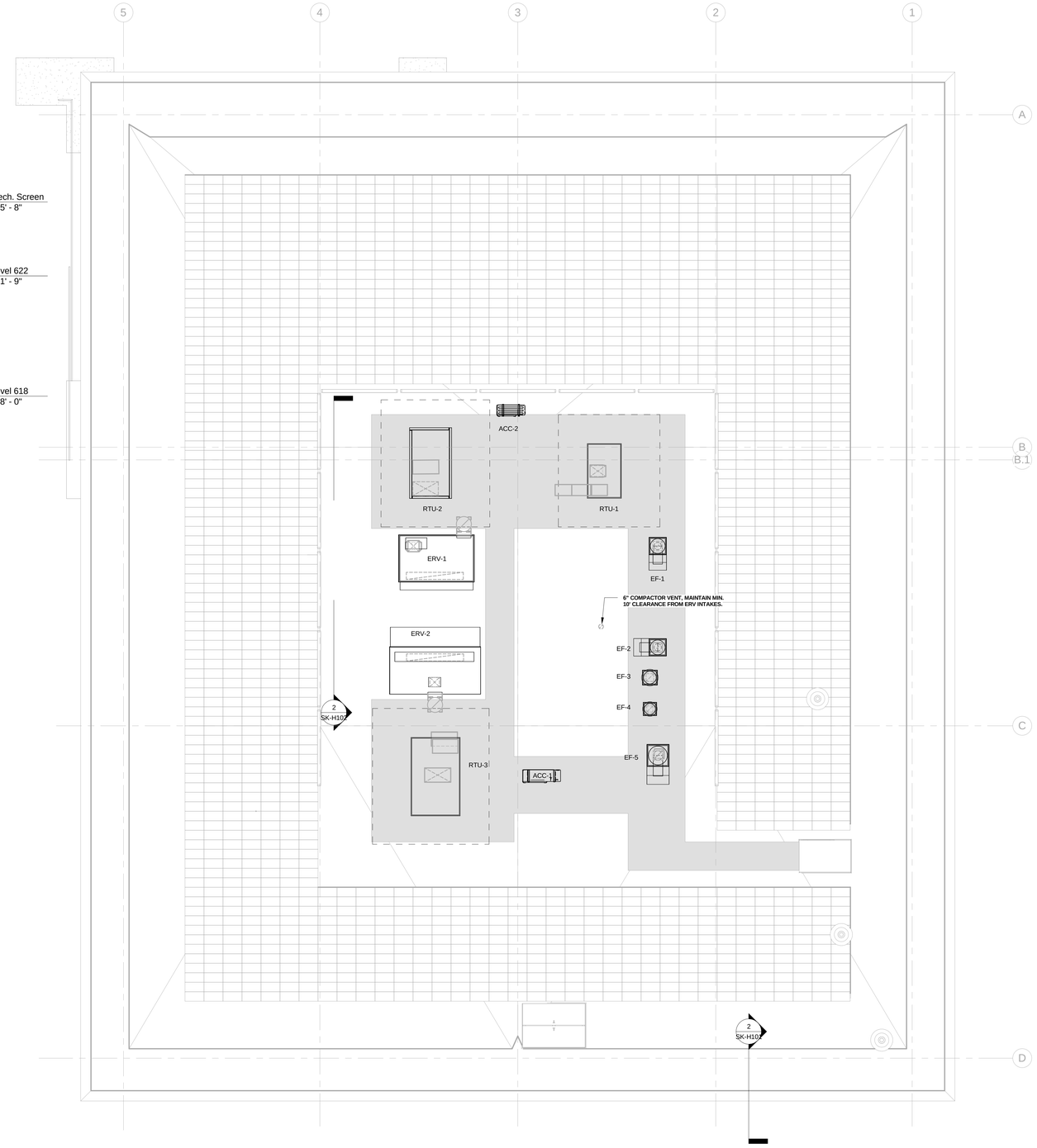


2 Section
1/2" = 1'-0"



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ROOF MECHANICAL PLAN

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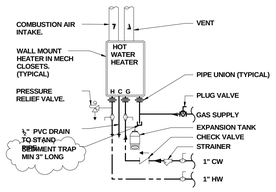
SYMBOL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	WASTE, SOIL AND STORM		OS&Y GATE VALVE		PIPE ELBOW UP
	BURIED WASTE AND SOIL		BUTTERFLY VALVE		PIPE ELBOW DN
	BURIED STORM		CHECK VALVE		PIPE TEE UP
	COLD (C)		PRESSURE REDUCING VALVE		PIPE TEE DN
	HOT (H)		BACKFLOW PREVENTER		PIPE CAP
	HOT WATER RECIRCULATION (R)		PLUG VALVE		UNION
	VENT		3 WAY CONTROL VALVE	CO	CLEAN OUT (CO)
	DIRECTION OF FLOW		MIXING VALVE		CLEAN OUT TO GRADE
FD	FLOOR DRAIN		PRESSURE RELIEF VALVE	FCO	CLEAN OUT IN FLOOR
RD	ROOF DRAIN		STRAINER	WCO	WALL CLEANOUT
ORD	OVERFLOW ROOF DRAIN		CIRCULATING PUMP		THERMOMETER
	BALL VALVE		WATER HAMMER ARRESTOR	HB	HOSE BIBB
	GATE VALVE	T	TEMP SENSOR	ORDD	OVERFLOW ROOF DRAIN DISCHARGE
	PIPE REDUCER	HWS	HOT WATER SUPPLY	TYP	TYPICAL
C	COLD	HWR	HOT WATER RETURN	S	SANITARY
H	HOT	R	RETURN	V	VENT
CW	COLD WATER	W	WASTE	DN	DOWN
HW	HOT WATER	HWS&R	HOT WATER SUPPLY & RETURN	WH	WATER HEATER



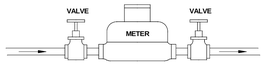
NOTE: INSTALL WATER HEATER PER MANUFACTURERS RECOMMENDATIONS.

WATER HEATER PIPING SCHEMATIC DIAGRAM

FIXTURE PIPING SCHEDULE

SYMBOL	FIXTURE	SOIL OR WASTE	VENT	COLD WATER	HOT WATER	MOUNTING HEIGHT
A	WATER CLOSET-ACCESSIBLE	3	2	1	-	WALL
B	LAVATORY-ACCESSABLE	1 1/2	1 1/4	1/2	1/2	COUINTER
C	SHOWER	2	1 1/2	1/2	1/2	FLOOR
D	MOP SINK	2	1 1/2	1/2	1/2	FLOOR
E	LAB SINK	2	1 1/2	1/2	1/2	COUNTER
F	LAB SINK	1 1/2	1 1/4	1/2	1/2	WALL
G	UTILITY SINK	1 1/2	1 1/4	1/2	1/2	FLOOR
H	EMERGENCY SHOWER AND EYEWASH	-	-	-	1 1/2*	FLOOR
I	SINK-LUNCH AREA	2	1 1/2	1/2	1/2	COUNTER
J	DRINKING FOUNTAIN	1 1/4	1 1/4	1/2	-	WALL

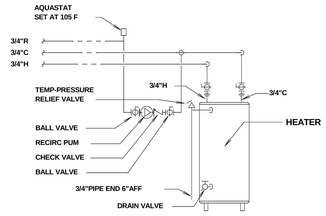
NOTE: COORDINATE FIXTURE MOUNTING HEIGHTS WITH ARCHITECTURAL DRAWINGS.
* - DEDICATED 85F SUPPLY



ALL PIPING AND FITTINGS BY CONTRACTOR.
METER SUPPLIED BY UTILITY.

TYPICAL WATER METER PIPING DETAIL

NTS



EMERGENCY WATER HEATER

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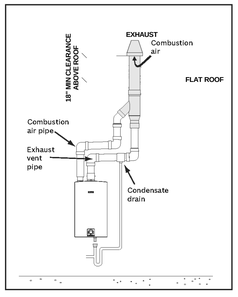

GAS VENT AND INLET PIPING PIPING DETAIL

NTS

TAI SOO KIM PARTNERS ARCHITECTS
148 WYLLYS STREET
HARTFORD, CONNECTICUT
TEL: (860) 547-1970
FAX: (860) 249-0695

Loureiro Engineering Associates, Inc.
100 Northwest Drive • Plainville, Connecticut 06062
Phone: 860-747-6181 • Fax: 860-747-8822
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Email: info@loureiro.com
Loureiro
Engineering • Construction • O&M • Energy • Media

STATE OF CONNECTICUT JOHN P. TWAROG No. 10623 LICENSED PROFESSIONAL ENGINEER

TITLE

PLUMBING DETAILS

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100%DD
2	1/16/2015	30%CD
3	3/23/2015	90%CD
4	6/3/2015	REV 01

UNIVERSITY OF CONNECTICUT

STORRS, CT

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO:

OFFICE PROJECT NO: Project Number

FILE PATH
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DATE: 4/06/15

SCALE:

DRAWN BY: JTF

CHECKED BY: JPT

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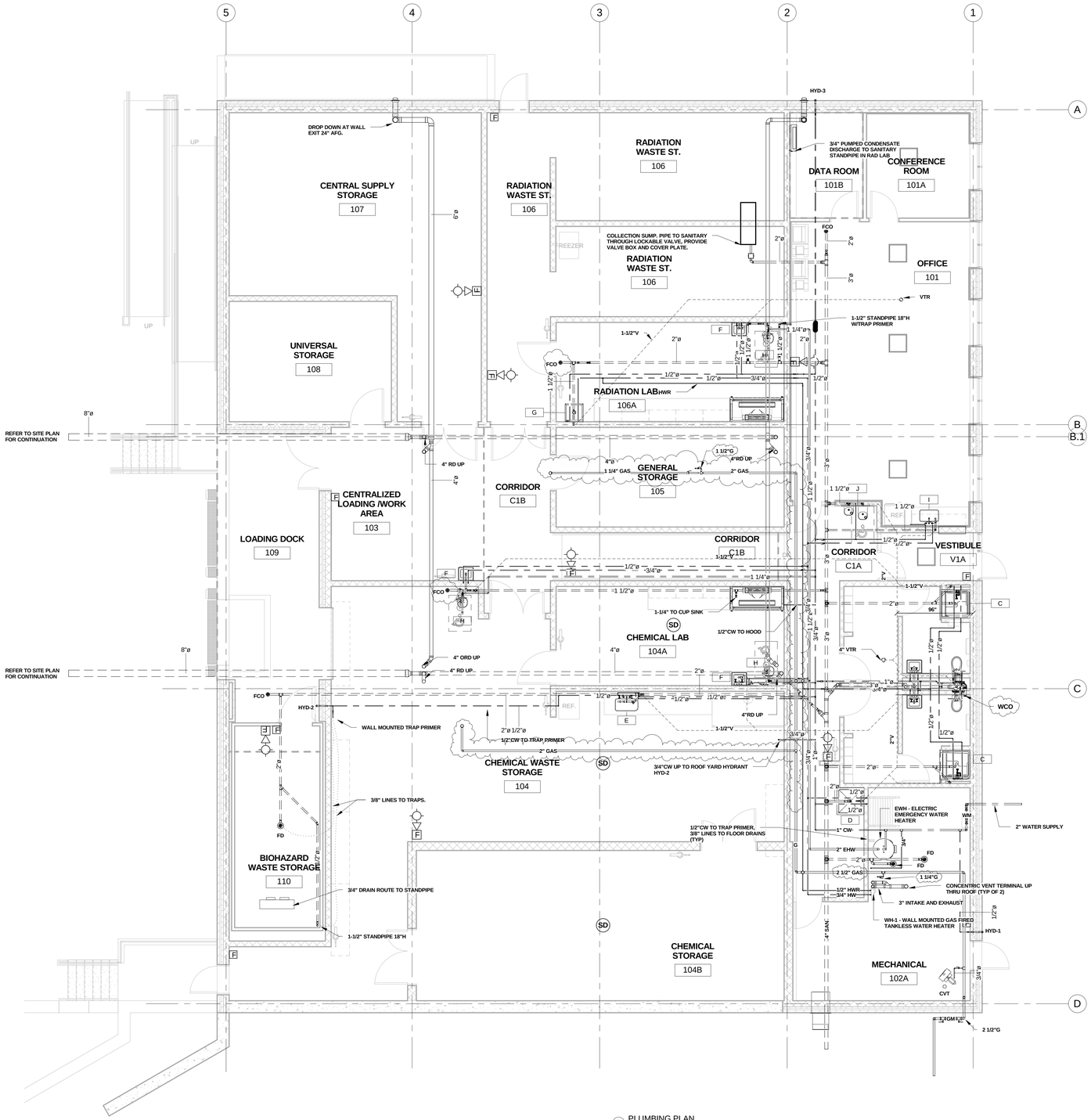

1 PLUMBING PLAN
3/16" = 1'-0"

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TITLE
PLUMBING PLAN

ISSUE DATES

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UNIVERSITY OF CONNECTICUT

STORRS, CT

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO:
OFFICE PROJECT NO: Project Number

FILE PATH
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DATE: 4/06/15
SCALE: 3/16" = 1'-0"
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CHECKED BY: RJS

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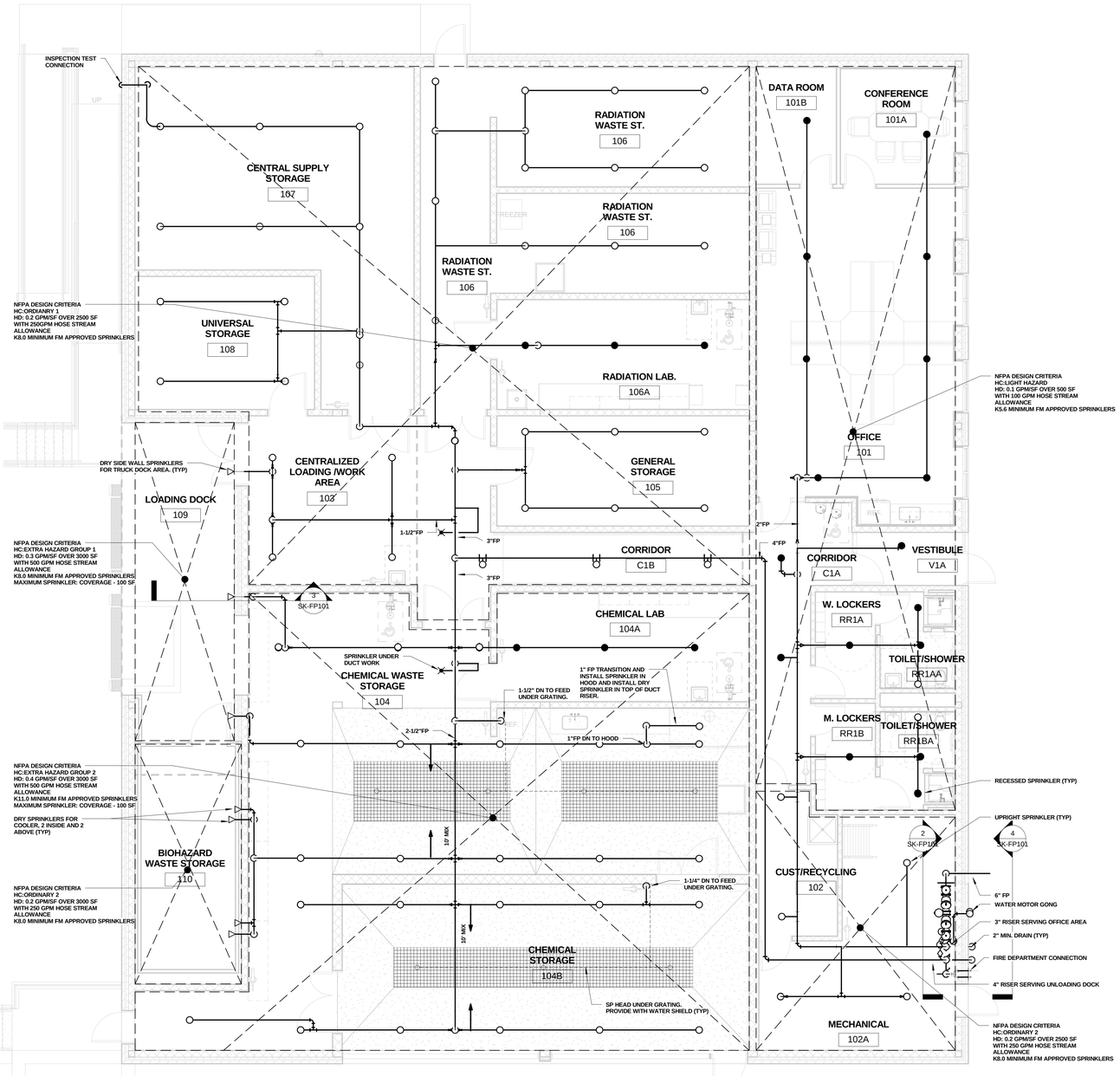
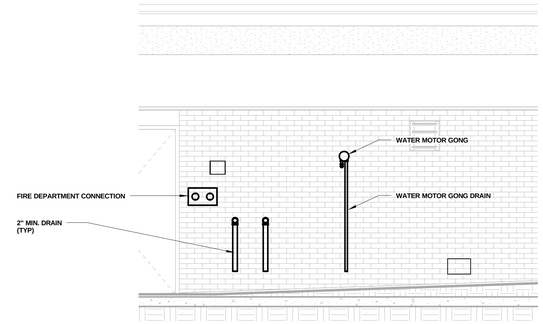


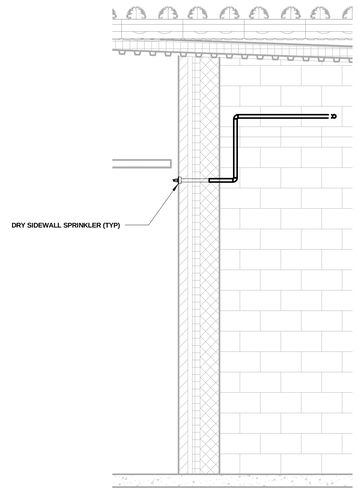
LEGEND

- PENDANT
- UPRIGHT
- PENDANT RECESSED
- SIDEWALL DRY

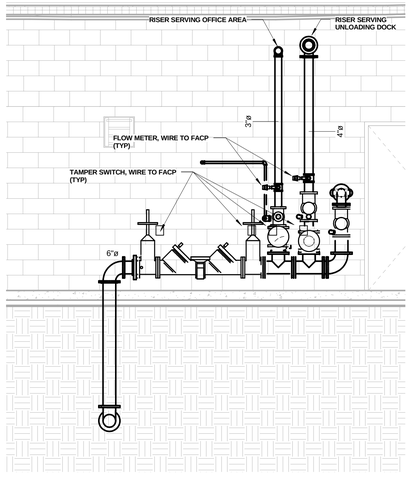
1 FIRE PROTECTION
3/16" = 1'-0"



4 Section 4
3/8" = 1'-0"



3 Section 3
1/2" = 1'-0"



2 Section 1
3/8" = 1'-0"

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Engineering • Construction • O&M • Energy • Water

UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE

FIRE PROTECTION PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100%DD
2	1/16/2015	30%CD
3	3/23/2015	90%CD
4	6/3/15	REV 01

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO:

OFFICE PROJECT NO: Project Number

FILE PATH
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DATE: 4/6/2015

SCALE: As indicated

DRAWN BY: JTF

CHECKED BY: JPT

SK-FP101

STATE OF CONNECTICUT JOHN P. TWAROG No. 10823 LICENSED PROFESSIONAL ENGINEER

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SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. This Section includes the following:

1. Panel Signs.
2. Site Signs.

C. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" additional LEED /CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, recycling, and disposing of non hazardous waste.

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 LEED SUBMITTALS

A. M Rc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for signs.

1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
2. Provide message list, typestyles, and graphic elements, including tactile characters and Braille, and layout for each sign.

C. Samples for Initial Selection: For each sign material indicated that involves color selection.

D. Samples for Verification:

1. One full size sign of each interior type.

E. Sign Schedule: Use same designations indicated on Drawings.

F. Templates: Furnish full-size templates for all messages and graphics.

1.6 QUALITY ASSURANCE

A. Source Limitations for Signs: Obtain signs from one source from a single manufacturer.

B. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal wear.
b. Failure of anchorage devices.

2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Contractor shall have a minimum of seven (7) years experience with projects of this scope, shall provide evidence of successfully completing manufacture of five projects of similar scope to this bid within the preceding two years, and shall provide references of at least five (5) clients who have used their services.

2.2 GRAPHIC REQUIREMENTS

A. Type for signs shall match Adobe Type Library fonts (Adobe Systems Inc.) Garamond.

2.3 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.

B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32.

C. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 6063-T5.

D. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

E. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:

1. Impact Resistance: 16 ft-lbf/in. per ASTM D 256, Method A.
2. Tensile Strength: 9000 lbf/sq. in. per ASTM D 638.

3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D 790.
4. Heat Deflection: 265 deg F at 264 lbf/sq. in. per ASTM D 648.
5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.

F. Fiberglass Sheet: Molded, seamless, thermosetting, glass-fiber-reinforced polyester panels with a minimum tensile strength of 15,000 psi when tested according to ASTM D 638 and with a minimum flexural strength of 30,000 psi when tested according to ASTM D 790.

2.4 DIMENSIONAL CHARACTERS

A. Precision Cut Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Comply with the following requirements.

1. Character Material: Aluminum.
2. Thickness: ½”.
3. Finish: Clear Anodized.
4. Mounting: Concealed studs, noncorroding for substrates encountered.

2.5 INTERIOR PANEL SIGNS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Appenx, Inc.
2. APCO.
3. Best Sign Systems Inc.
4. Mohawk Sign Systems.

B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:

1. Photopolymer Panels: 1/8” thick.
2. Raised graphics with Braille 1/32” above surface with contrasting colors.
3. Edge Condition: Beveled.
4. Corner Condition: Square.
5. Mounting: Unframed.

    a. Wall or Glass mounted with two-face tape.

6. Color: University Standard.
7. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting colors.

C. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be

accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.

2.6 EXTERIOR PANEL SIGNS

A. Exterior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, matching University Standards and complying with the following requirements:

1. Aluminum Sheet: 0.125” thick.
2. Edge Condition: Square.
3. Corner Condition: Square.
4. Mounting: Aluminum Channel Frame.

    a. Support: Welded, painted, galvanized steel tube frame anchored to reinforced concrete footings.

5. Custom Paint Colors: Match University Standards.

2.7 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.

1. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.

2.8 FINISHES, GENERAL

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
2. Shim Plate Mounting: Provide 1/8-inch- thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.
3. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

C. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

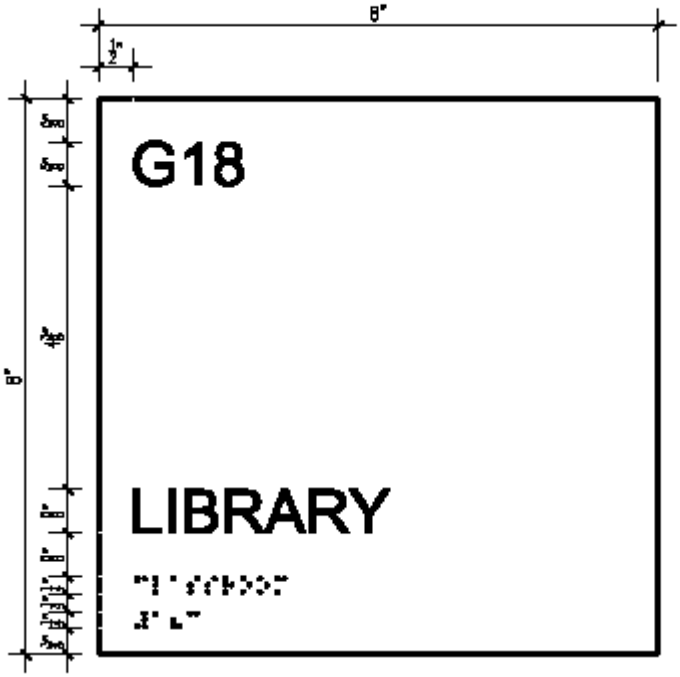
3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

PART 4 - SIGN SCHEDULE

DOOR NUMBER	SIGN TYPE	TEXT-ROOM #	TEXT-ROOM NAME OR MESSAGE
101	I	101	OFFICE
101A	I	101A	CONFERENCE ROOM
101B	I	101B	DATA ROOM
102	I	102	CUSTODIAN AND RECYCLING
103	III	NONE	NO SMOKING WITHIN THE BUILDING OR WITHIN 25 FEET OF THE BUILDING
103	V	NONE	EXIT
104.1	I	104	CHEMICAL WASTE STORAGE
104.2	IV	NONE	EXIT
104A	I	104A	CHEMICAL LAB
104B1	I	104B	CHEMICAL STORAGE
104B2	I	104B	CHEMICAL STORAGE
105	I	105	GENERAL STORAGE
106.1	I	106	RADIATION WASTE STORAGE
106.2	V	NONE	EXIT
106A	I	106A	RADIATION LAB
107	I	107	CENTRAL SUPPLY STORAGE
108	I	108	UNIVERSAL STORAGE
RR1A	III	RR1A	WOMEN
RR1B	III	RR1B	MEN
V1A	III	NONE	NO SMOKING WITHIN THE BUILDING OR WITHIN 25 FEET OF THE BUILDING
V1A	V	NONE	EXIT

PART 5 – SIGN TYPES



SIGN TYPE I - TYPICAL ROOM

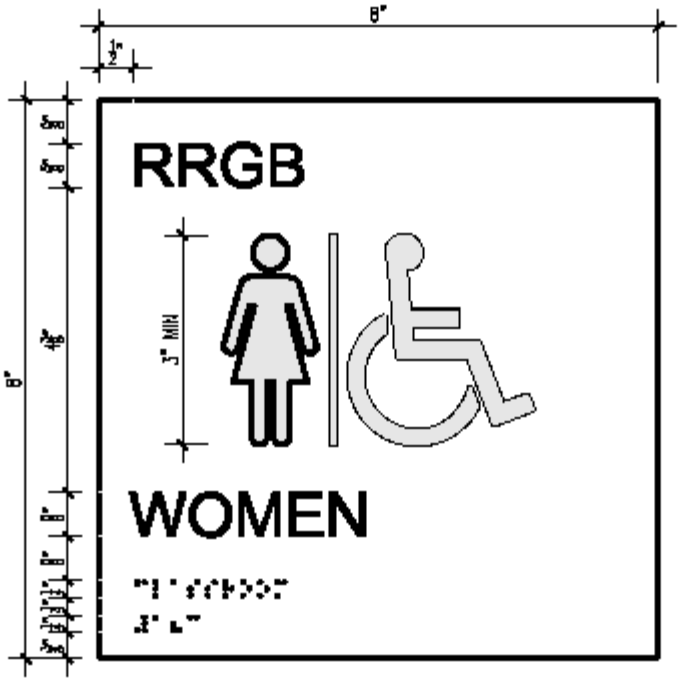
SIGN COLOR: UNIVERSITY STANDARD
COPY COLOR: UNIVERSITY STANDARD
COPY STYLE: 1/32" RAISED ADA TACTILE GRAPHICS AND TEXT/BRAILLE

NOTES:

1. LETTERS AND NUMBERS ON SIGNS SHALL HAVE A WIDTH TO HEIGHT RATIO BETWEEN 3:5 AND 1:1 AND A STROKE WIDTH TO HEIGHT RATIO BETWEEN 1:5 AND 1:10

2. FONT STYLE SHALL BE AS NOTED, ALL UPPER CASE, AND SHALL BE ACCOMPANIED WITH GRADE 2 BRAILLE.

4. SIGNS SHALL BE INSTALLED ADJACENT TO THE LATCH SIDE OF THE DOOR. WHERE THERE IS NO WALL SPACE TO THE LATCH SIDE OF THE DOOR, INCLUDING AT DOUBLE LEAF DOORS, SIGNS SHALL BE PLACED ON THE NEAREST ADJACENT WALL. MOUNT TOP OF SIGN 60" ABOVE FINISH FLOOR. BRING ANY DISCREPANCIES TO THE ATTENTION OF THE ARCHITECT.



SIGN TYPE II - TOILET ROOM

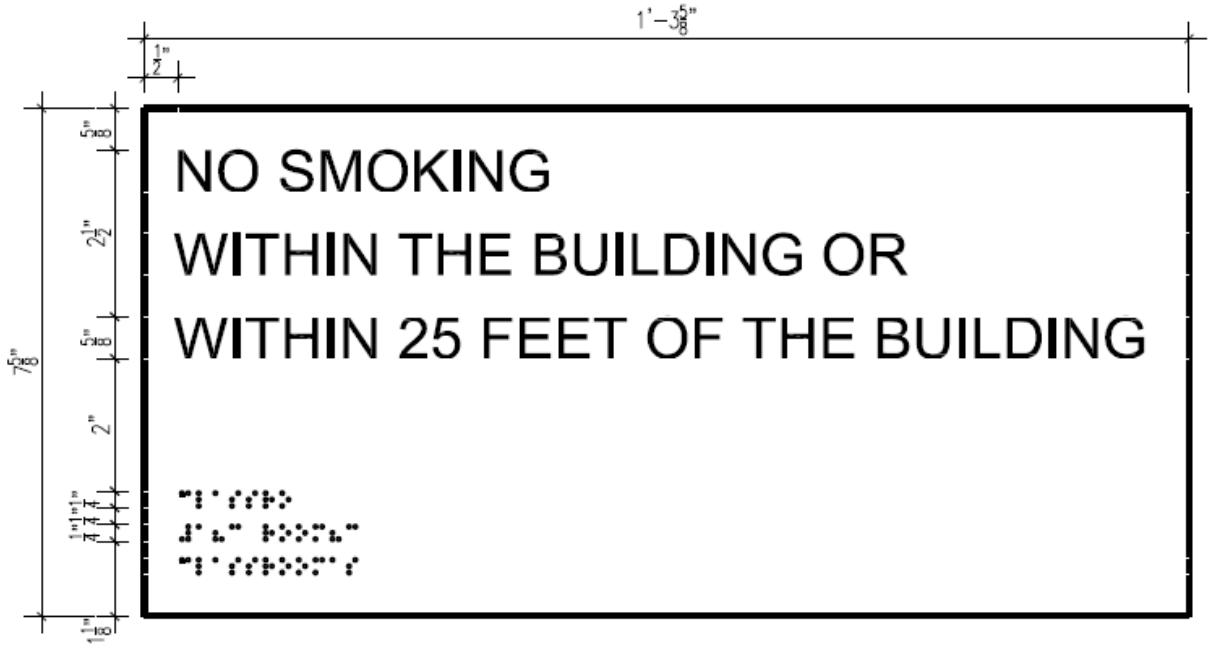
SIGN COLOR: UNIVERSITY STANDARD
COPY COLOR: UNIVERSITY STANDARD
COPY STYLE: 1/32" RAISED ADA TACTILE GRAPHICS AND TEXT/BRAILLE

NOTES:

1. LETTERS AND NUMBERS ON SIGNS SHALL HAVE A WIDTH TO HEIGHT RATIO BETWEEN 3:5 AND 1:1 AND A STROKE WIDTH TO HEIGHT RATIO BETWEEN 1:5 AND 1:10

2. FONT STYLE SHALL BE AS NOTED, ALL UPPER CASE, AND SHALL BE ACCOMPANIED WITH GRADE 2 BRAILLE.

4. SIGNS SHALL BE INSTALLED ADJACENT TO THE LATCH SIDE OF THE DOOR. WHERE THERE IS NO WALL SPACE TO THE LATCH SIDE OF THE DOOR, INCLUDING AT DOUBLE LEAF DOORS, SIGNS SHALL BE PLACED ON THE NEAREST ADJACENT WALL. MOUNT TOP OF SIGN 60" ABOVE FINISH FLOOR. BRING ANY DISCREPANCIES TO THE ATTENTION OF THE ARCHITECT.



SIGN TYPE III - LEED ENVIRONMENTAL TOBACCO SMOKE CONTROL

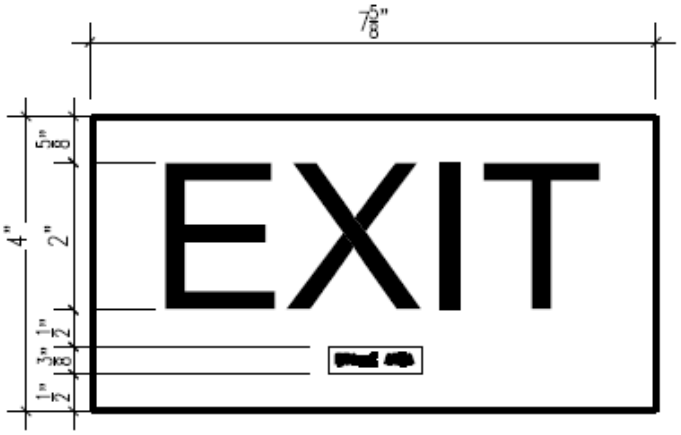
SIGN COLOR: UNIVERSITY STANDARD
COPY COLOR: UNIVERSITY STANDARD
COPY STYLE: 1/32" RAISED ADA TACTILE GRAPHICS AND TEXT/BRAILLE

NOTES:

1. LETTERS AND NUMBERS ON SIGNS SHALL HAVE A WIDTH TO HEIGHT RATIO BETWEEN 3:5 AND 1:1 AND A STROKE WIDTH TO HEIGHT RATIO BETWEEN 1:5 AND 1:10

2. FONT STYLE SHALL BE AS NOTED, ALL UPPER CASE, AND SHALL BE ACCOMPANIED WITH GRADE 2 BRAILLE.

3. SIGNS SHALL BE INSTALLED ADJACENT TO THE LATCH SIDE OF THE DOOR. WHERE THERE IS NO WALL SPACE TO THE LATCH SIDE OF THE DOOR, INCLUDING AT DOUBLE LEAF DOORS, SIGNS SHALL BE PLACED ON THE NEAREST ADJACENT WALL. MOUNT TOP OF SIGN 60" ABOVE FINISH FLOOR. BRING ANY DISCREPANCIES TO THE ATTENTION OF THE ARCHITECT.



SIGN TYPE IV - TACTILE EXIT SIGN

SIGN COLOR: UNIVERSITY STANDARD
COPY COLOR: UNIVERSITY STANDARD
COPY STYLE: 1/32" RAISED ADA TACTILE GRAPHICS AND TEXT/BRAILLE

NOTES:

1. LETTERS AND NUMBERS ON SIGNS SHALL HAVE A WIDTH TO HEIGHT RATIO BETWEEN 3:5 AND 1:1 AND A STROKE WIDTH TO HEIGHT RATIO BETWEEN 1:5 AND 1:10

2. FONT STYLE SHALL BE AS NOTED, ALL UPPER CASE, AND SHALL BE ACCOMPANIED WITH GRADE 2 BRAILLE.

3. SIGNS SHALL BE INSTALLED ADJACENT TO THE LATCH SIDE OF THE DOOR. WHERE THERE IS NO WALL SPACE TO THE LATCH SIDE OF THE DOOR, INCLUDING AT DOUBLE LEAF DOORS, SIGNS SHALL BE PLACED ON THE NEAREST ADJACENT WALL. MOUNT TOP OF SIGN 60" ABOVE FINISH FLOOR. BRING ANY DISCREPANCIES TO THE ATTENTION OF THE ARCHITECT.

SIGN TYPE V - TACTILE EXIT SIGN

SIGN COLOR: UNIVERSITY STANDARD
COPY COLOR: UNIVERSITY STANDARD
COPY STYLE: 1/32" RAISED ADA TACTILE GRAPHICS AND TEXT/BRAILLE

NOTES:

1. LETTERS AND NUMBERS ON SIGNS SHALL HAVE A WIDTH TO HEIGHT RATIO BETWEEN 3:5 AND 1:1 AND A STROKE WIDTH TO HEIGHT RATIO BETWEEN 1:5 AND 1:10

2. FONT STYLE SHALL BE AS NOTED, ALL UPPER CASE, AND SHALL BE ACCOMPANIED WITH GRADE 2 BRAILLE.

3. SIGNS SHALL BE INSTALLED ADJACENT TO THE LATCH SIDE OF THE DOOR. WHERE THERE IS NO WALL SPACE TO THE LATCH SIDE OF THE DOOR, INCLUDING AT DOUBLE LEAF DOORS, SIGNS SHALL BE PLACED ON THE NEAREST ADJACENT WALL. MOUNT TOP OF SIGN 60" ABOVE FINISH FLOOR. BRING ANY DISCREPANCIES TO THE ATTENTION OF THE ARCHITECT.

END OF SECTION 101400

ADDENDUM NUMBER 2
July 8, 2015

The following clarifications are applicable to drawings and specifications for the project referenced above.

DRAWINGS

Item 2-1

CLARIFICATION

The following drawings were missing from the bid set originally posted on UCONN's website:

P001 PLUMBING DETAILS
P101 PLUMBING PLAN
T101 TELECOMMUNICATION
FA101 FIRE ALARM

Drawing P001 PLUMBING DETAILS was issued as SK- P001 in Addendum #1.
Drawing P101 PLUMBING PLAN was issued as SK- P101 in Addendum #1.
Drawing FA101 FIRE ALARM was issued as SK- FA101 in Addendum #1.

Drawing T101 TELE COMM PLAN is issued as part of this Addendum #2.

Item 2-2

CLARIFICATION

C Lot Drive is to remain open and usable by the Owner during the course of construction.

Item 2-3

DRAWING C-2 SITE PLAN

The attached sketch SK-C-6 modifies drawing sheet C-2.

DRAWING C-2 SITE PLAN AND DETAIL 5/C.6

Change chain link fence and gate height from 4' high to 8' high.

Item 2-4

DRAWING C-4 DRAINAGE AND UTILITY PLAN

The attached sketch SK-C-4A modifies drawing sheet C-4.

Item 2-5

DRAWING C-5 PHOTOMETRIC PLAN

The attached sketch SK-C-7 modifies detail 2 on drawing sheet C-5.

Item 2-6

DRAWING C-6 SITE DETAILS

The attached sketch SK-C-5 modifies details 20 and 21 on drawing sheet C-6.

DRAWING C-6 SITE DETAILS

Add the PAVEMENT RESTORATION DETAIL as shown on the attached sketch SK-8 PAVEMENT RESTORATION DETAIL.

DRAWING C-6 SITE DETAILS

The attached sketch SK-9 modifies detail 20 on drawing sheet C-6.

Item 2-7

DRAWING L-1.01 LANDSCAPE PLAN

4/AS and 3/AR located along the service driveway and adjacent to the utility easement are to be relocated elsewhere on site as directed by the Landscape Architect after clearing of the site is complete. Conservation mix to remain.

Item 2-8

DRAWING A1.11 FIRST FLOOR PLAN and A7.01 TOILET PLANS AND ELEVATIONS

Reverse swings of doors RR1AA and RR1BA to open out of the TOILET/SHOWER ROOMS and into the LOCKER ROOMS. See attached sketch SKA-03R DETAIL 1/A7.01 TOILET PLAN REVISIONS.

Item 2-9

DRAWING A11.01 DOOR SCHEDULE, DOOR TYPES AND DETAILS AND DIVISION 08 SPECIFICATIONS

Add an automatic door operator to the active leaf of doors 104B1 and 104B2. Provide electrical system rough-in and wiring, and all items required for a complete installation.

DRAWING A11.01 DOOR SCHEDULE, DOOR TYPES AND DETAILS AND DIVISION 08 SPECIFICATIONS

Add Specification Section 087113 AUTOMATIC DOOR OPERATORS attached to this Addendum.

Item 2-10

DRAWING SK-H001 MECHANICAL SCHEDULE

Drawing SK-H001 (H001) MECHANICAL SCHEDULE is reissued as part of this Addendum #2. Revision 02 dated 7-8-2015.

Item 2-11

DRAWING SK-FP101 (FP101) FIRE PROTECTION PLAN

Drawing SK- FP101 (FP101) FIRE PROTECTION PLAN is reissued as part of this Addendum #2. Revision 02 dated 7-8-2015.

Item 2-12

DRAWING T102

New Drawing T102 TELE COMM DETAILS is issued as part of this Addendum #2. Note that these details are the Owner's standard and some may not be used in this Project.

Item 2-13

DRAWING T103

New Drawing T103 TELE COMM DETAILS is issued as part of this Addendum #2. Note that these details are the Owner's standard and some may not be used in this Project.

Item 2-14

DRAWING T104

New Drawing T104 TELE COMM DETAILS is issued as part of this Addendum #2. Note that these details are the Owner's standard and some may not be used in this Project.

Item 2-15

DRAWING SK-FA101 (FA101) FIRE ALARM

Drawing SK- FA101 (FA101) FIRE ALARM is reissued as part of this Addendum #2. Revision 02 dated 7-8-2015.

Item 2-16

SKETCH SKA—01 ALTERNATING TREAD STAIR DETAIL

Change riser height to 9 ½" maximum.
.

SPECIFICATIONS

Item 2-17

012300 ALTERNATES

Change paragraph 3.1 A to read:

A. Alternate No. 1: Vegetative Roof Pre-Grown Modular System – Provide modules, growing media, plants, and edging; as shown on the drawings and specified in Specification Section 075423. Sedums to be random mix of 4 types equivalent to the following: Sedum Album Supurbum (green foliage, white flowers), Sedum Wienstephaner Gold (green foliage, yellow flowers), Sedum Ruby Mantle (red foliage pink flowers), and Sedum Rupestre Angelina (gold foliage).

Add paragraph 3.1 C:

C. Alternate No. 3: Provide stainless steel in lieu of painted galvanized steel for all exterior hand rails, guard rails, and associated items.

Item 2-18

015000 TEMPORARY FACILITIES AND CONTROLS

Add paragraph 2.1-I:

I. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch thick, galvanized-steel chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts, with 1-5/8-inch (42 mm) OD top and bottom rails. Supporting post shall be driven. Provide dark green reinforced scrim sheeting on all fencing.

Item 2-19

055110 METAL RAILINGS AND GUARDS AND ASSOCIATED DRAWINGS

Change all **interior** handrails and associated items to stainless steel. This change to stainless steel is base bid.

As Alternate No. 3, provide stainless steel in lieu of painted galvanized steel for all **exterior** hand rails, guard rails, and associated items. Base bid is painted galvanized steel.

Item 2-20

099120 PAINTING

Change paragraph 2.7 E to read:

E. Interior EG-SHEL Epoxy Coating: Factory-formulated two component polyamine epoxy top coat for interior/exterior application. Note: Provide number of coats necessary to achieve minimum dry thickness listed.

1. Sherwin-Williams: Pro Industrial Water Based EG-SHEL Epoxy B73-360 Series: Applied at a dry film thickness of not less than 3 mils.

Change paragraph 3.8 A to read:

A. Concrete Walls: Provide the following finish systems over interior concrete wall substrates:

1. Eg-Shel Epoxy Coating: Two finish coats over a primer.

a. Primer: Interior concrete and masonry wall primer.
b. Finish Coats: Interior Eg-Shel Epoxy Coating.

Change paragraph 3.8 B to read:

B. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:

1. Eg-Shel Epoxy Coating: Two finish coats, or primer and one finish coat, over a block filler.

a. Block Filler: Concrete unit masonry block filler for epoxy coating.
b. Primer: Interior concrete and masonry wall primer.
b. Finish Coats: Interior Eg-Shel Epoxy Coating.

Item 2-21

211300 SPRINKLER SYSTEM

Change item 1.1 B. to read:

B. Provide system to NFPA 13 requirements as noted on the drawings.

Item 2-22

230923 BUILDING AUTOMATION SYSTEM

Add the following paragraph 2.1 B.

B. Automated Logic.

Item 2-23

Division 26 ELECTRICAL

Add Section 263623 BUILDING AUTOMATIC TRANSFER SWITCHES, attached to this addendum.

Item 2-24

RFI Log with Responses are attached to this Addendum

ATTACHMENTS

DRAWINGS/SKETCHES

CIVIL

SK-C-4A	DRAINAGE PIPE LENGTH & SLOPE, NOTE 7. DATED 7-6-2015.
SK-C-5	CONCRETE WALK AND PAVEMENT DETAILS, DATED 6-22-2015.
SK-C-6	HANDICAP RAMP RAILINGS & RETAINING WALL, DATED 6-22-2015.
SK-C-7	CONCRETE LAMP POST BASE CHAMFER ABOVE FINISHED GRADE, DATED 6-22-2015.
SK-8	PAVEMENT RESTORATION DETAILS. DATED 7-6-2015.
SK-9	PAVEMENT RESTORATION DETAILS. DATED 7-6-2015.

ARCHITECTURAL

SKA-03R	DETAIL 1/A7.01 TOILET PLAN REVISIONS.

MECHANICAL

SK-H001	(H001) MECHANICAL SCHEDULE Revision 02 dated 7-8-2015.

FIRE PROTECTION

SK- FP101 (FP101) FIRE PROTECTION PLAN Revision 02 dated 7-8-2015.

TELECOMMUNICATIONS

T101 TELE COMM PLAN, DATED 4-06-2015.
T102 TELE COMM DETAILS, DATED 4-06-2015.
T103 TELE COMM DETAILS, DATED 4-06-2015.
T104 TELE COMM DETAILS, DATED 4-06-2015.

FIRE ALARM

SK- FA101 (FA101) FIRE ALARM Revision 02 dated 7-8-2015.

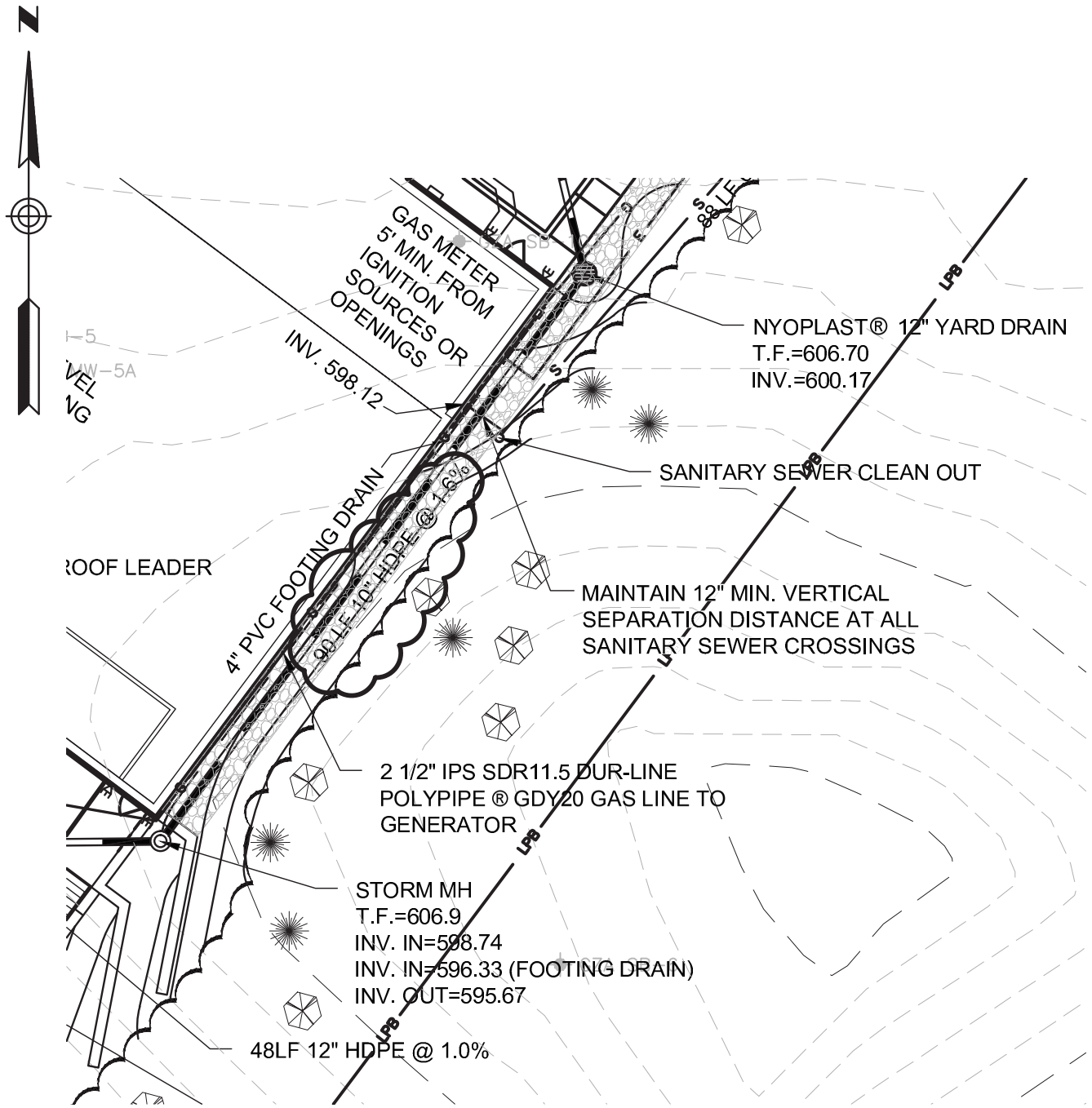
SPECIFICATIONS

Section 087113 AUTOMATIC DOOR OPERATORS.
Section 263623 BUILDING AUTOMATIC TRANSFER SWITCHES.

REQUESTS FOR INFORMATION

RFI Log with Responses and attachment.

END OF ADDENDUM #2



Map Notes:

1. Contractor to verify the location and size of the existing water main at the intersection of North Hillside Road and report any discrepancies to the design engineer.

2. The location of all underground utilities depicted hereon have been compiled, in part, from record mapping supplied by the University and from other sources of information. They are to be considered approximate in nature. Additionally, other such features may exist the existence of which is unknown to Loureiro. The size, location and existence of all such features must be field determined and verified by the appropriate authority prior to construction. Call-Before-You-Dig at 811 or 1-800-922-4455.

3. Typical water service installation with meter located inside utility room. Water services to be constructed in accordance with Rules & Regulations, Connecticut Water Company, July 14, 2010.

4. Typical gas service installation with meter located along exterior southeast wall. Gas service to be installed in accordance with Connecticut Natural Gas Corporation Rules and Regulations, February 1, 2014.

5. Typical telecommunications service installation with connection into the IT room. Telecommunications services to be constructed in accordance with University of Connecticut Telecommunication Design Guide and Standards, April 2011.

6. Typical power service installation with connection into utility room. No external meter required.

7. Trenching in areas off pavement along C Lot Drive to be restored to original condition.

REFERENCE SHEET: #A
REFERENCE ADDENDUM: #1
REFERENCE RFI: #
REFERENCE SUPPLEMENTAL INFORMATION:
REFERENCE CHANGE ORDER PROPOSAL REQUEST:#
REFERENCE SUBMITTAL:

TAI SOO KIM PARTNERS 146 Wyllys Street Hartford, Connecticut Tel: (860) 547-1970 Fax: (860) 249-0695	JOB NAME/NUMBER UNIVERSITY OF CONNECTICUT MAIN ACCUMULATION AREA SCALE: 1"=20' DATE: 6/2/2015 ISSUED: 7/6/2015	TITLE DRAINAGE PIPE LENGTH & SLOPE NOTE 7	DRAWING NO. SK - C-4A

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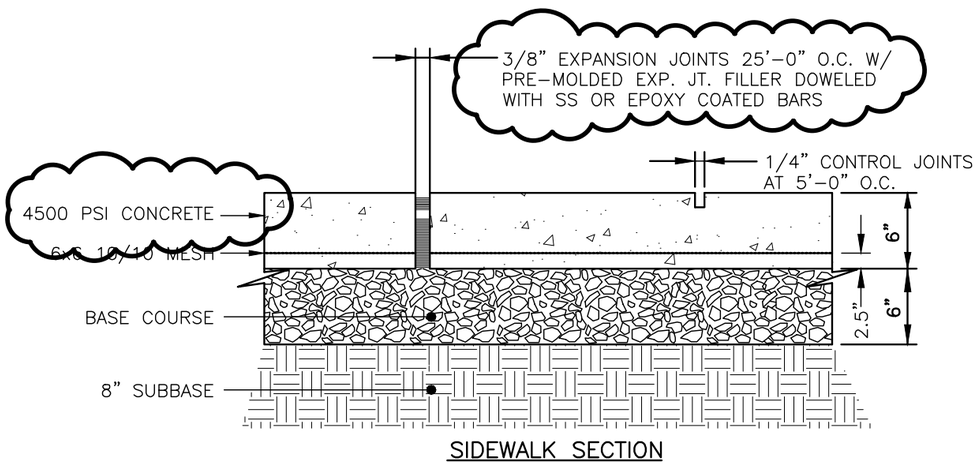
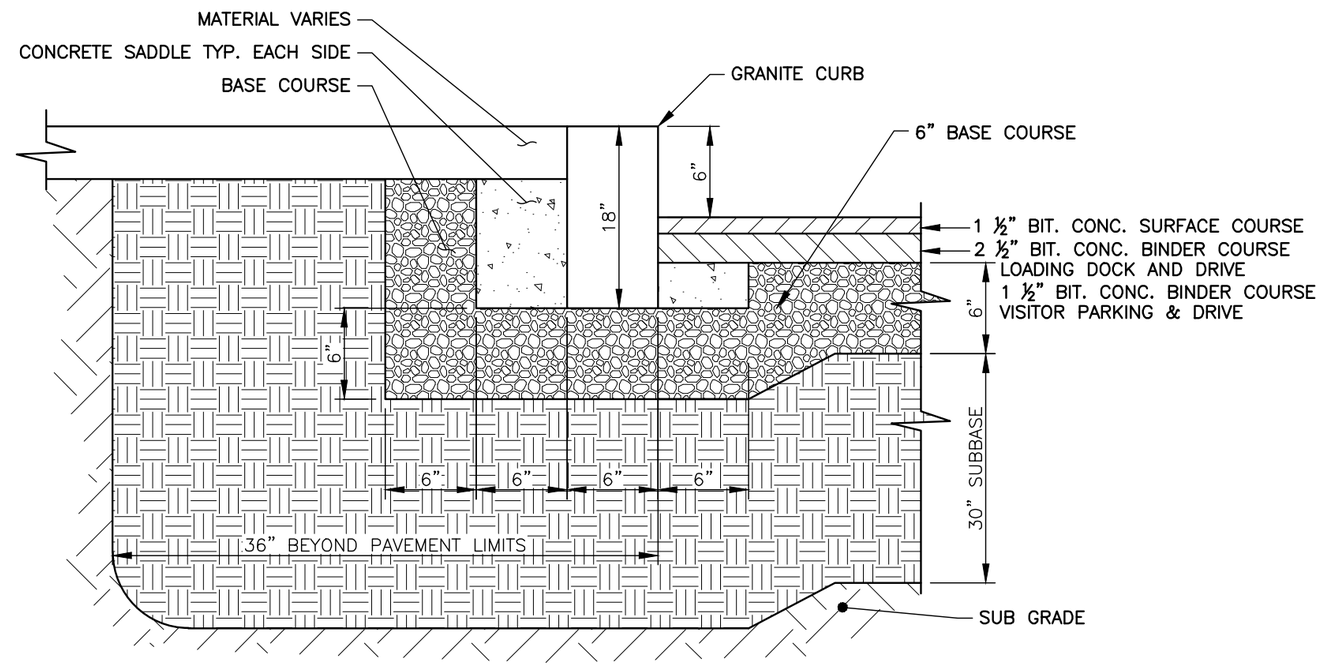
Engineering • Construction • EH&S • Energy • Waste



21 C-6 CONCRETE WALK DETAIL

SCALE: NONE



20 C-6 GRANITE CURB & ASPHALT PAVEMENT DETAIL

SCALE: NONE

NOTE: SUBGRADES SHALL BE SUBJECT TO PROOF COMPACTION WITH A MINIMUM OF 6 PASSES OF A VIBRATORY ROLLER HAVING A MINIMUM DYNAMIC FORCE OF 5,000 POUND PER FOOT OF DRUM WIDTH.

REFERENCE SHEET: #A
REFERENCE ADDENDUM: #
REFERENCE RFI: #
REFERENCE SUPPLEMENTAL INFORMATION:
REFERENCE CHANGE ORDER PROPOSAL REQUEST:#
REFERENCE SUBMITTAL:

TAI SOO KIM PARTNERS 146 Wyllys Street Hartford, Connecticut Tel: (860) 547-1970 Fax: (860) 249-0695	JOB NAME/NUMBER UNIVERSITY OF CONNECTICUT MAIN ACCUMULATION AREA SCALE: AS NOTED DATE: 6/22/2015 ISSUED: 6/22/2015	TITLE CONCRETE WALK & PAVEMENT DETAILS	DRAWING NO. SK - C-5

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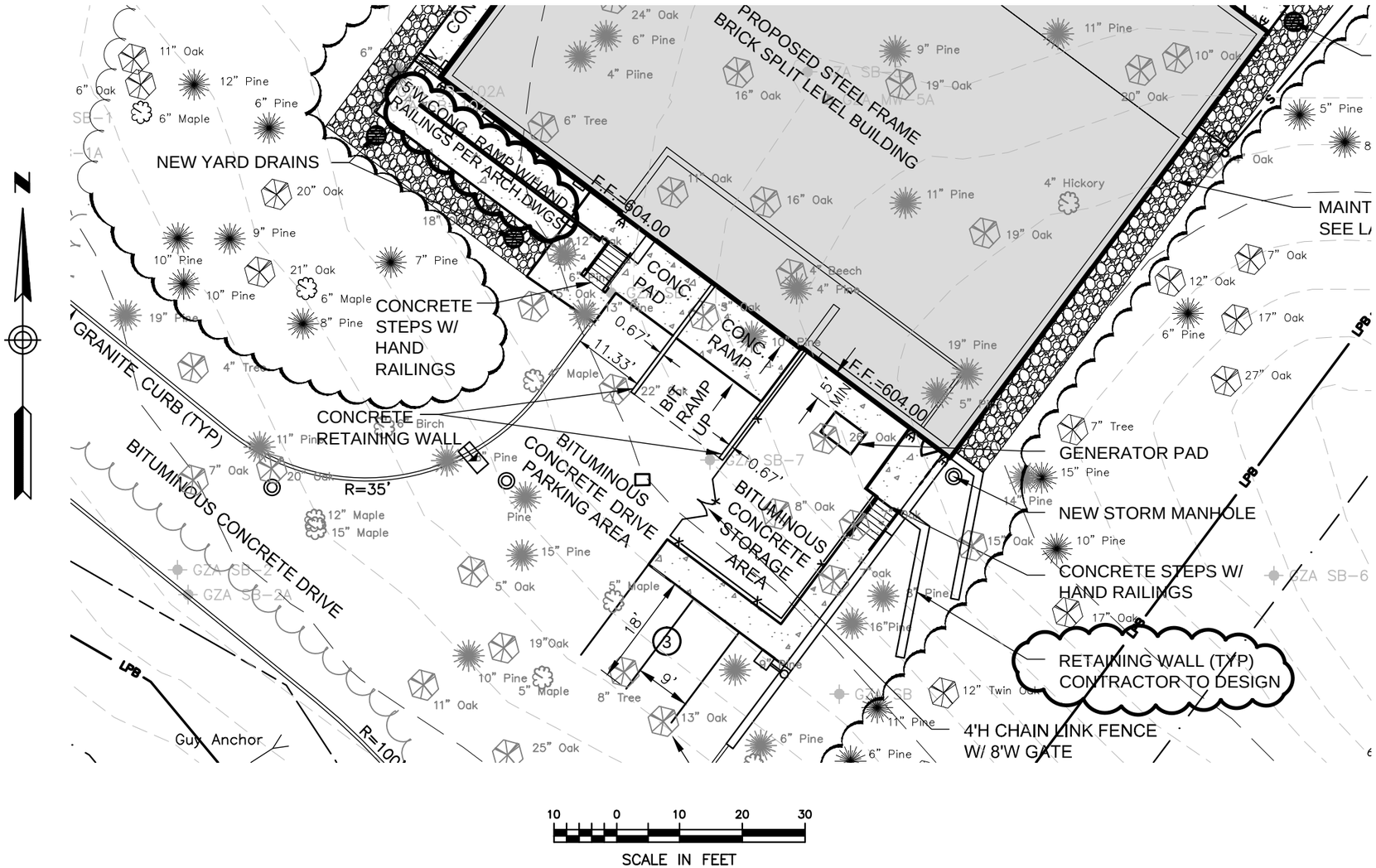

REFERENCE SHEET: #A
REFERENCE ADDENDUM: #
REFERENCE RFI: #
REFERENCE SUPPLEMENTAL INFORMATION:
REFERENCE CHANGE ORDER PROPOSAL REQUEST:#
REFERENCE SUBMITTAL:

TAI SOO KIM PARTNERS 146 Wyllys Street Hartford, Connecticut Tel: (860) 547-1970 Fax: (860) 249-0695	JOB NAME/NUMBER UNIVERSITY OF CONNECTICUT MAIN ACCUMULATION AREA SCALE: 1"=20' DATE: 6/22/2015 ISSUED: 6/22/2015	TITLE HANDICAP RAMP RAILINGS & RETAINING WALL	DRAWING NO. SK - C-6

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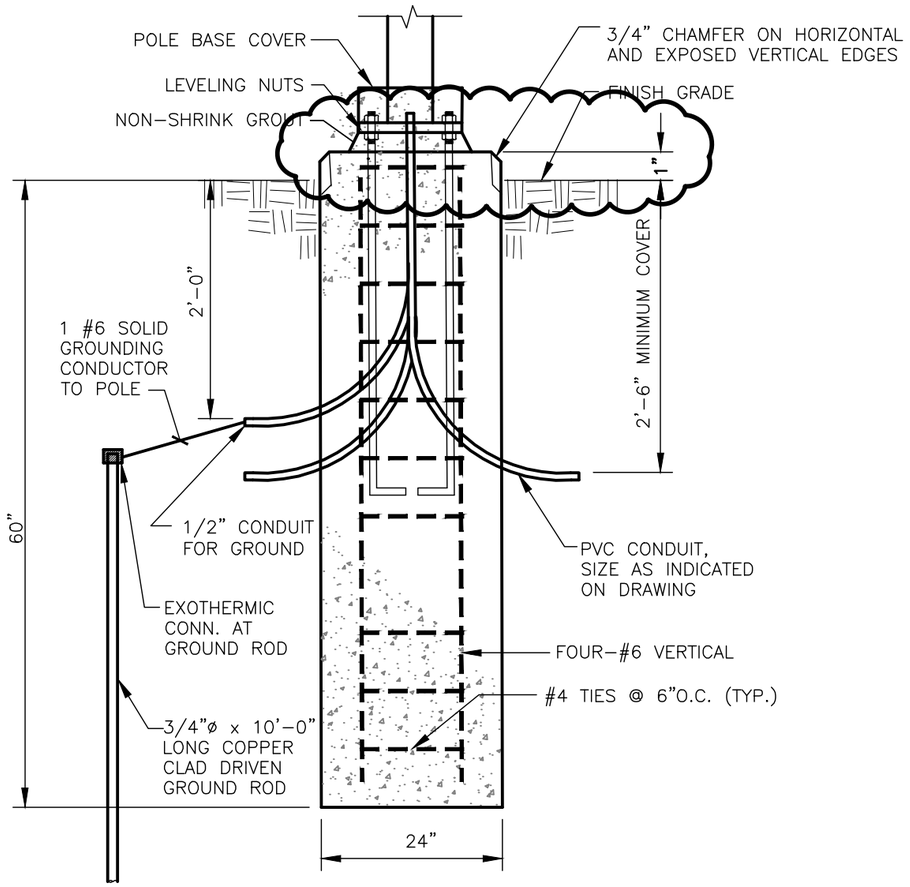

NOTES

1. CONCRETE SHALL BE 3000 PSI COMPRESSIVE STRENGTH AT 28 DAYS.
2. REINFORCING STEEL SHALL BE ASTM A615 GRADE 60.
3. LAP ALL BARS 36 BAR DIAMETERS.
4. GRIND AND GROUT CLEAN ALL EXPOSED CONCRETE SURFACES TO OBTAIN UNIFORM FINISH APPEARANCE.
5. BASE CAN BE CAST-IN-PLACE OR PRECAST AT CONTRACTOR'S OPTION.

2 / C-5 TYPICAL LIGHT POLE BASE DETAIL

SCALE: NONE

REFERENCE SHEET: #A
REFERENCE ADDENDUM: #
REFERENCE RFI: #
REFERENCE SUPPLEMENTAL INFORMATION:
REFERENCE CHANGE ORDER PROPOSAL REQUEST:#
REFERENCE SUBMITTAL:

TAI SOO KIM PARTNERS
146 Wyllys Street
Hartford, Connecticut
Tel: (860) 547-1970
Fax: (860) 249-0695

JOB NAME/NUMBER	TITLE	DRAWING NO.
UNIVERSITY OF CONNECTICUT MAIN ACCUMULATION AREA	CONCRETE LAMP POST BASE CHAMFER ABOVE FINISHED GRADE	SK - C-7
SCALE: AS NOTED		
DATE: 6/22/2015 ISSUED: 6/22/2015		

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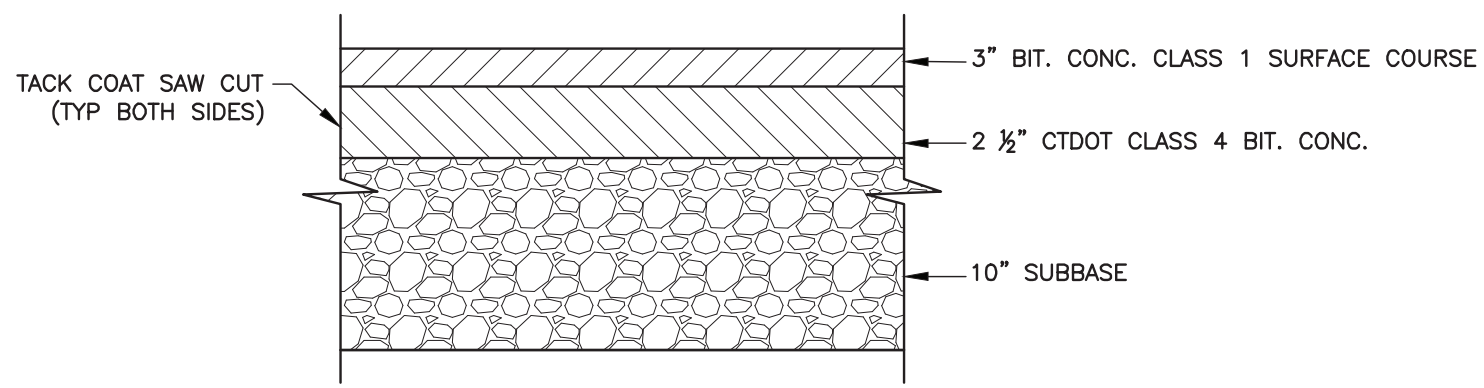

PAVEMENT RESTORATION

SCALE: NONE

CONTRACTOR TO VERIFY EXISTING CONDITIONS FOR NORTH HILLSIDE ROAD AND LOT C DRIVE
PAVEMENT RESTORATION MAY VARY TO MATCH EXISTING CONDITIONS

REFERENCE SHEET: #A
REFERENCE ADDENDUM: #
REFERENCE RFI: #
REFERENCE SUPPLEMENTAL INFORMATION:
REFERENCE CHANGE ORDER PROPOSAL REQUEST:#
REFERENCE SUBMITTAL:

TAI SOO KIM PARTNERS
146 Wyllys Street
Hartford, Connecticut
Tel: (860) 547-1970
Fax: (860) 249-0695

JOB NAME/NUMBER		TITLE	DRAWING NO.
UNIVERSITY OF CONNECTICUT MAIN ACCUMULATION AREA		PAVEMENT RESTORATION DETAILS	SK - 8
SCALE: AS NOTED			
DATE: 6/22/2015	ISSUED: 7/6/2015		

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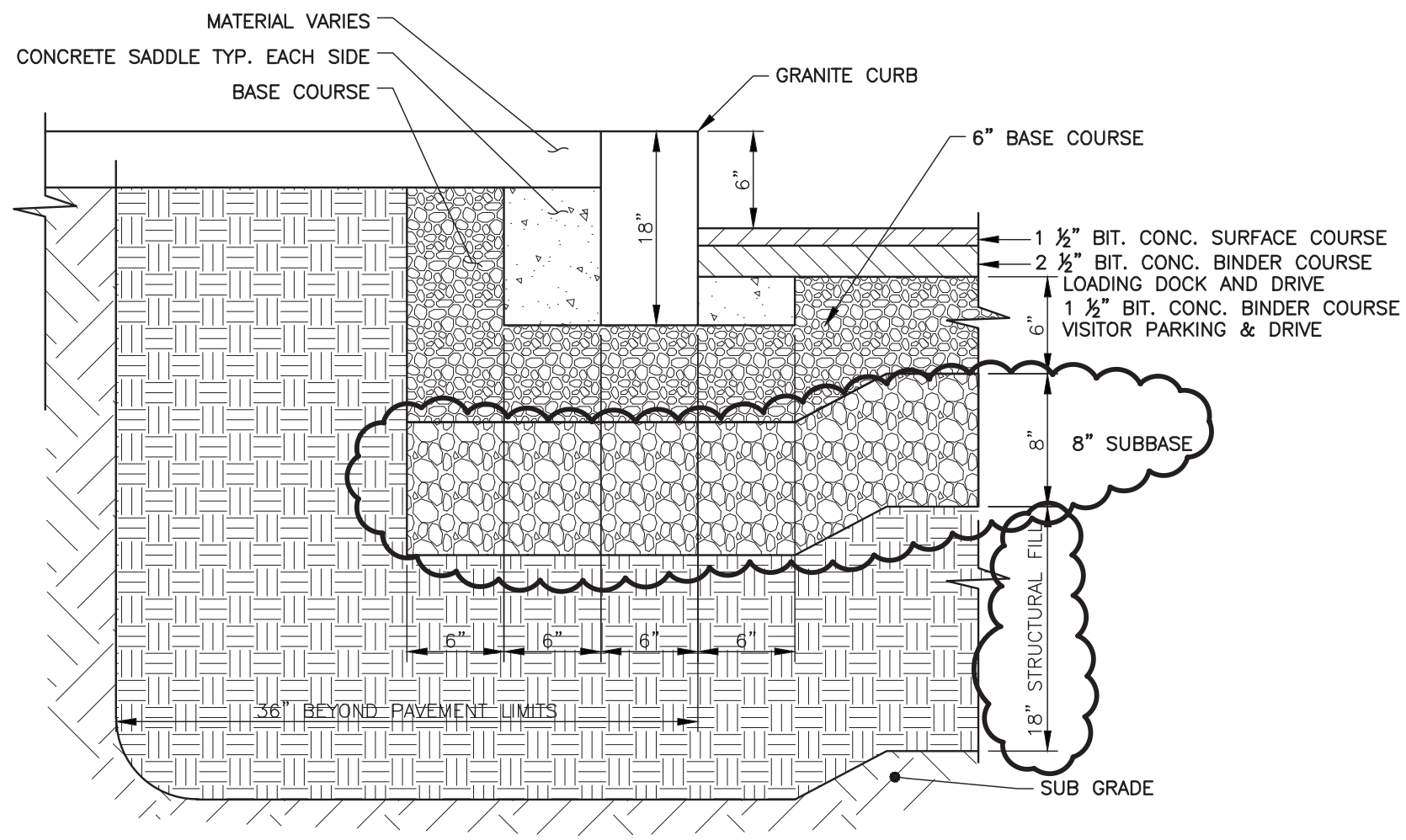

20
C-6

GRANITE CURB & ASPHALT PAVEMENT DETAIL

SCALE: NONE

REFERENCE SHEET: #A
REFERENCE ADDENDUM: #
REFERENCE RFI: #
REFERENCE SUPPLEMENTAL INFORMATION:
REFERENCE CHANGE ORDER PROPOSAL REQUEST:#
REFERENCE SUBMITTAL:

TAI SOO KIM PARTNERS
146 Wyllys Street
Hartford, Connecticut
Tel: (860) 547-1970
Fax: (860) 249-0695

JOB NAME/NUMBER		TITLE	DRAWING NO.
UNIVERSITY OF CONNECTICUT MAIN ACCUMULATION AREA		PAVEMENT RESTORATION DETAILS	SK - 9
SCALE: AS NOTED			
DATE: 6/22/2015	ISSUED: 7/6/2015		

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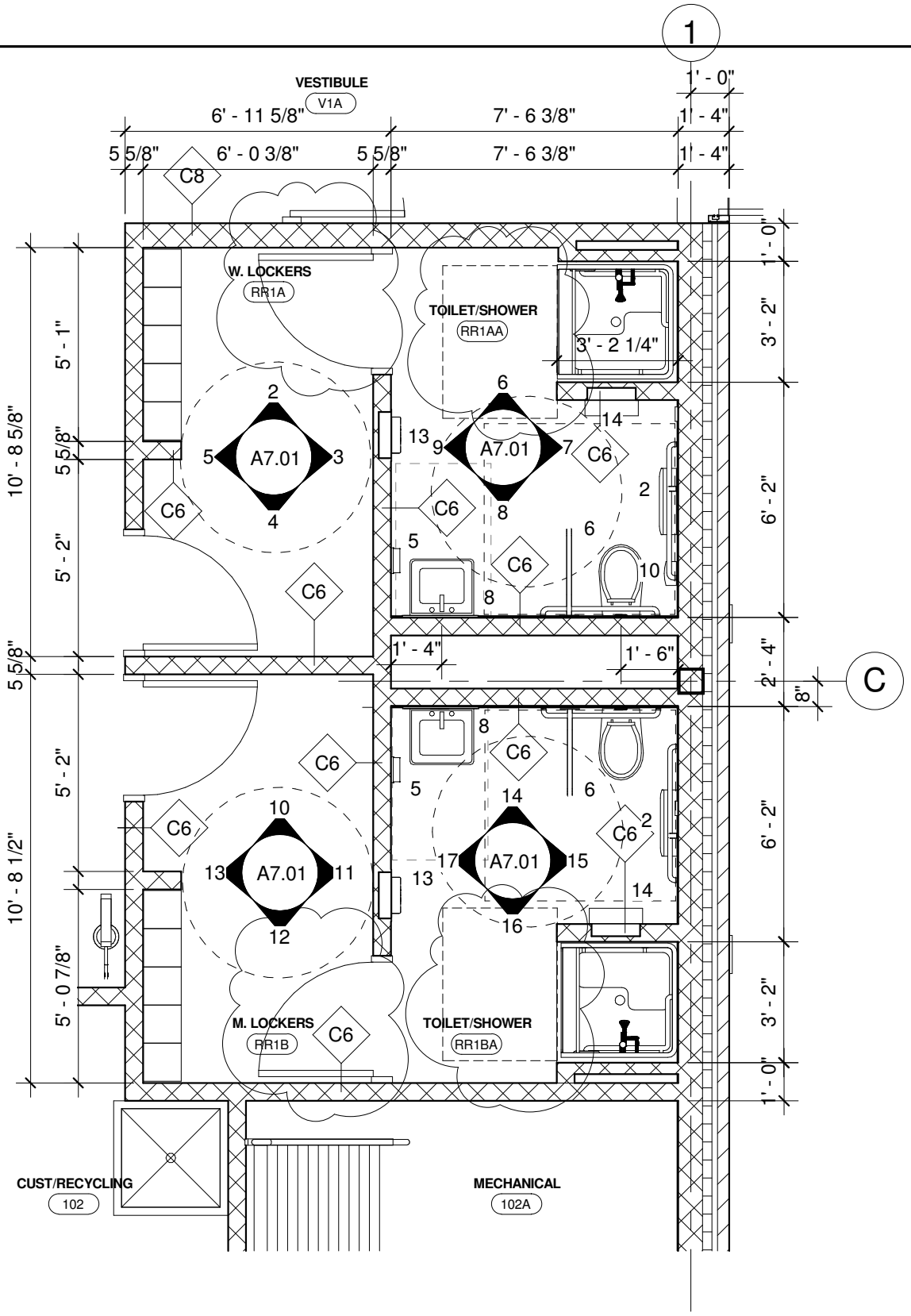


REFERENCE SHEET: A7.01

REFERENCE ADDENDUM: 1

REFERENCE RFI:

REFERENCE SUPPLEMENTAL INFORMATION:

REFERENCE CHANGE ORDER PROPOSAL REQUEST:

REFERENCE SUBMITTAL:

1 TOILET & LOCKERS PLANS-RR1A&RR1B REVISED

1/4" = 1'-0"

TAI SOO KIM PARTNERS 146 Wyllys St Hartford, Connecticut Tel: (860) 547-1970 Fax: (860) 249-0695	JOB NAME / NUMBER: MAIN ACCUMULATION AREA SCALE: 1/4" = 1'-0" DATE: 06/04/15, REV 7/07/15 ISSUED BY: Author	TITLE: DETAIL 1/A7.01TOILET PLAN REVISIONS	DRAWING NO: SKA-03R

MECHANICAL SYMBOL LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
S/A	SUPPLY AIR		SUPPLY AIR OR OUTSIDE AIR FLOW	UD	UNDERCUT DOOR
R/A	RETURN AIR		RETURN AIR OR EXHAUST AIR FLOW	CUH	CABINET UNIT HEATER
O/A	OUTSIDE AIR		VOLUME DAMPER (VD)	ESP	EXTERNAL STATIC PRESSURE
EXH	EXHAUST AIR		REGISTER OR GRILLE		PIPE ELBOW TURNED UP
EF	EXHAUST FAN		DIFFUSER		PIPE ELBOW TURNED DOWN
AFF	ABOVE FINISHED FLOOR		R/A RECTANGULAR DUCT RISER		PIPE TEE UP
BOD	BOTTOM OF DUCT ELEVATION		S/A RECTANGULAR DUCT RISER		PIPE TEE DN
HX	HEAT EXCHANGER		EXH RECTANGULAR DUCT RISER		PIPE CAP
FD	FIRE DAMPER		R/A ROUND DUCT RISER		GATE VALVE
CFM	CUBIC FEET PER MINUTE		S/A ROUND DUCT RISER		BALL VALVE
C	COLD WATER (DOMESTIC)		EXH ROUND DUCT RISER		PRESSURE GAUGE W/SHUTOFF COCK
ACC	AIR-COOLED CONDENSER	T	THERMOSTAT		CHECK VALVE
RTU	PACKAGED ROOF TOP AC UNIT	M	MOTORIZED DAMPER		BLIND FLANGE
VD	VOLUME DAMPER	TS	TEMPERATURE SENSOR		CONTROL VALVE
UH	UNIT HEATER		FLEXIBLE CONNECTOR		SOLENOID VALVE
PF	PADDLE TYPE FAN		BALANCE VALVE		STRAINER
AC	AIR CONDITIONING		DRAIN VALVE		MANUAL AIR VENT
MAU	MAKE-UP AIR UNIT		PIPE UNION		PIPE REDUCER
CP	CONTROL PANEL		STRAINER WITH BLOWDOWN		DIRECTION OF FLOW
HWS&R	HOT WATER SUPPLY & RETURN		THERMOMETER		2-WAY CONTROL VALVE
P	PUMP	LD	LOUVERED DOOR		3-WAY CONTROL VALVE
UD	UNDERCUT DOOR	AFM	AIR FLOW MONITORING STATION	SD	SMOKE DETECTOR

1

ROOFTOP AIR CONDITIONING UNIT SCHEDULE

NUMBER	EVAPORATOR FAN CFM	EVAPORATOR FAN TESP	EVAPORATOR FAN RPM	EVAPORATOR FAN HP	COMPRESSOR/CONDENSER FAN NO.	FAN HP	FAN RPM	COMP MOTOR	COND EAT	ELEC	DX COOLING COIL EVAP EAT DB	EVAP EAT WB	COOLING CAPACITY TOTAL	COOLING CAPACITY SENSIBLE	HEATING (GAS-FIRED) EAT	LAT	CAPACITY INPUT	CAPACITY OUTPUT	STAGES	POWER EXHAUST FAN CFM	FAN NO.	FAN HP	MIN EER	UNIT WEIGHT (lbs)	MIN. OUTSIDE AIR %	MANU/ MODEL	REMARKS
RTU-1	1000	1.75"	1128	1.0	1	0.2	1075	2.62 KW	95F	208/3PH	83.8F	68.3F	38.3 MBH	25.82 MBH	40F	128.9F	120 MBH	96 MBH	MODULATING	-	1	-	13	750	30	TRANE YHC036	PROVIDE WITH POWER EXHAUST
RTU-2	2400	1.75"	1192	5.0	1	0.75	1075	6.02 KW	95F	208/3PH	84.2F	68.5F	90.27 MBH	65.29 MBH	40F	96.5F	150 MBH	120 MBH	MODULATING	-	SEE NOTES	-	11	1300	100	TRANE YHC092	PROVIDE WITH G SERIES 5 CORE ERV WITH POWER EXHAUST
RTU-3	3400	1.75"	1439	5.0	1	0.75	1075	7.60 KW	95F	208/3PH	83.9F	68.3F	117.34 MBH	86.92 MBH	40F	94.7F	250 MBH	200 MBH	MODULATING	-	SEE NOTES	-	11	1700	100	TRANE YHC120	PROVIDE WITH D SERIES 6 CORE ERV WITH POWER EXHAUST

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE UNITS WITH THRU-THE-CURB POWER AND GAS, POWER EXHAUST, CONV OUTLET, COMPARATIVE ENTHALPY ECON, ROOF CURB, DISC SWITCH AND INTEGRATED CONTROLS.
3) PROVIDE UNITS WITH 4" DISPOSABLE, PLEATED, MERV13 PARTICULATE FILTERS.
4) PROVIDE UNITS WITH STAINLESS STEEL HEAT EXCHANGERS.

2

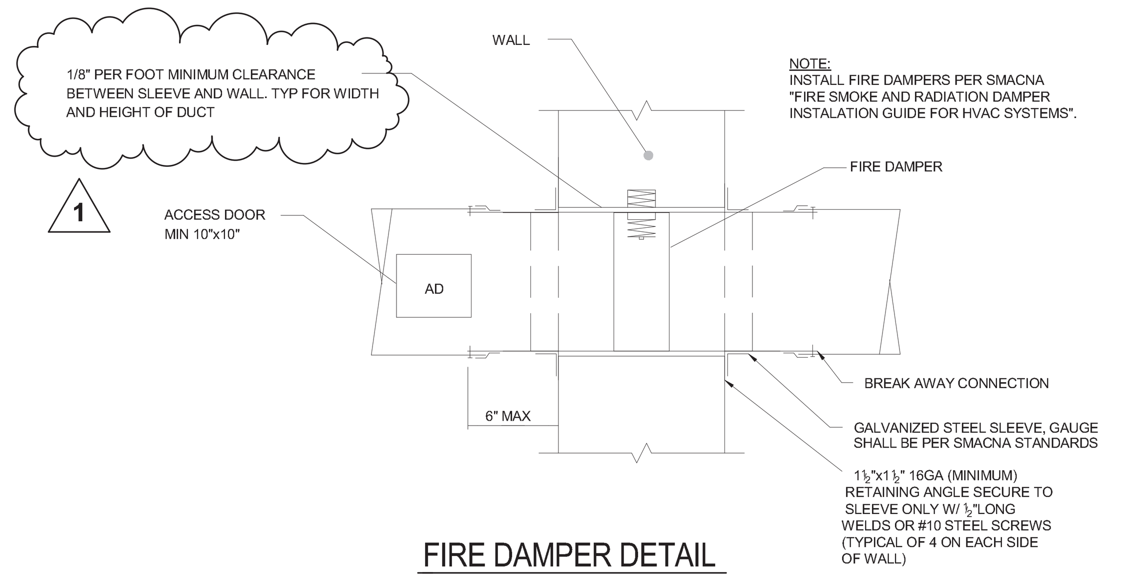
SPLIT AIR CONDITIONING SYSTEM SCHEDULE (DATA CLOSET)

NUMBER	EVAPORATOR UNIT CFM	ESP	RPM	HP	ELEC	COMPRESSOR/CONDENSER UNIT FAN NO.	FAN HP	FAN RPM	COMP MOTOR	COND EAT	ELEC	DX COOLING EVAP EAT DB	EVAP EAT WB	COOLING CAPACITY TOTAL	COOLING CAPACITY SENSIBLE	DX HEATING EVAP EAT DB	EVAP EAT WB	HEATING CAPACITY	ELEC HEATING COIL KW	ELEC	STAGES	MIN SEER	MANU/MODEL	REMARKS
AHU-2/ACC-2	400	0" W.G.	-	-	208V/1PH	1	-	-	12 RLA	95F	208V/1PH	80F	67F	18 .0 MBH	12.0 MBH	70F	60F	19.0 MBH @47F	-	-	-		15MITSUBISHI PKA-A18HA4/PUZ-A18NHA4	SEE NOTES 2, 3 & 4

2

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PERFORMANCE NOTED IS WITH FAN AT HIGH SPEED.
3) PROVIDE ALL UNITS WITH DISCONNECT SWITCHES AND CONDENSATE PUMPS.
4) INSIDE AHU-X IS WIRED TO OUTSIDE ACC-X.

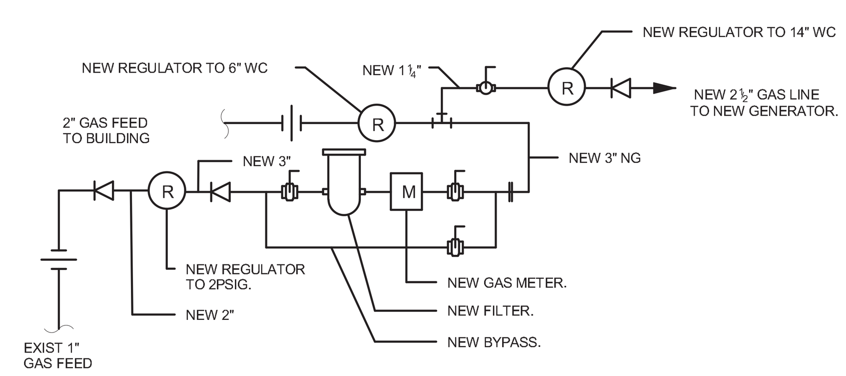
2



NOTE:
INSTALL FIRE DAMPERS PER SMACNA "FIRE SMOKE AND RADIATION DAMPER INSTALATION GUIDE FOR HVAC SYSTEMS".

FIRE DAMPER DETAIL

SCALE: NONE

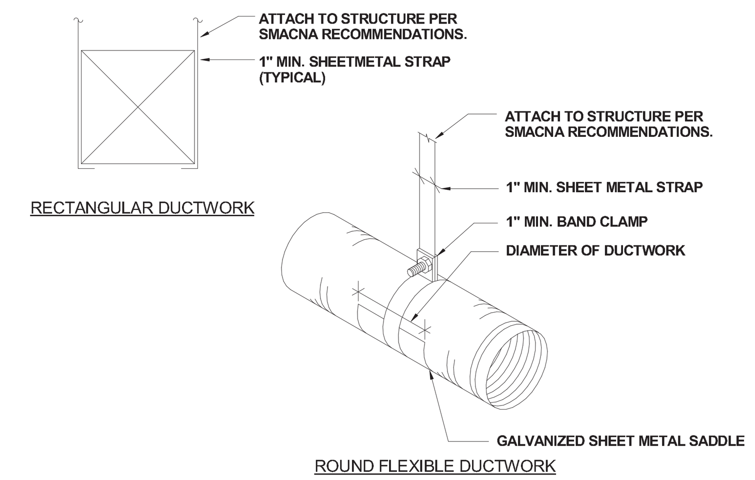


GAS MAIN SCHEMATIC DIAGRAM

SCALE: NONE

NOTES:
1. THIS CONTRACTOR TO PROVIDE ALL MATERIAL AND LABOR TO UPGRADE THE EXISTING GAS SERVICE AS REQUIRED, PER THE NATURAL GAS UTILITY.

2. ALL PIPING SHALL BE WELDED CARBON STEEL WITH FLANGED COMPONENTS. TEST PER NFPA S4.



NOTES:

1. DO NOT USE POWDER POWERED FASTENING SYSTEMS TO ATTACH SUPPORTS TO STRUCTURE.
2. ALL CHANNEL SECTIONS SHALL BE HOT DIPPED GALVANIZED.
3. SUPPORT SYSTEM MUST NOT DAMAGE DUCT, INSULATION, OR CAUSE DUCT SHAPE DEFORMATION.
4. HANGER SIZES SHALL BE IN ACCORDANCE WITH SMACNA, LATEST EDITION.

DUCTWORK SUPPORT DETAIL

NTS

GAS FIRED UNIT HEATER SCHEDULE

UNIT NO.	TYPE	HEATING SECTION TOTAL INPUT/ OUTPUT	ENT. AIR (F)	TEMP. RISE (F)	FAN MOTOR DATA CFM	HP	VOLTS	PH	HZ	MANUFACTURER MODEL	REMARKS
GUH-1	NAT. GAS	100/80 MBH	60	50	1480	1/20	115	1	60	TRANE MODEL GAND	SEE NOTES 2 & 3

NOTE:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE ALL UH HEATERS WITH REMOTE LINE-VOLTAGE THERMOSTATS AND TAMPER PROOF CONSTRUCTION.
3) ONE STAGE, SEPARATED COMBUSTION UNIT, PROVIDE WITH CONCENTRIC ADAPTER.

EXHAUST FAN SCHEDULE

NUMBER	AIR FLOW (CFM)	STATIC PRESSURE	MOTOR SPEED	FAN SPEED	HP	ELEC	AREA SERVING	TYPE	MAX dbA	MANU/MODEL	REMARKS
EF-1	1370	0.75"W.G.	1725 RPM	XXX RPM	X	208V/3PH	RAD LAB HOOD	ROOF UPBLAST	X	GREENHECK VEKTOR H-10	SEE NOTES 1, 2 & 3
EF-2	1370	0.75"W.G.	1725 RPM	XXX RPM	X	208V/3PH	CHEM LAB HOOD	ROOF UPBLAST	X	GREENHECK VEKTOR H-10	SEE NOTES 1, 2 & 3
EF-3	200	0.50"W.G.	1725 RPM	XXX RPM	X	120V/1PH	TOILET ROOM	ROOF CENTRIFUGAL	X	GREENHECK XX-XX	SEE NOTES 1 & 2
EF-4	5650	1.20"W.G.	1725 RPM	XXX RPM	X	208V/3PH	WALK IN HOOD	ROOF UPBLAST	X	GREENHECK VEKTOR H-16	SEE NOTES 1, 2 & 3
EF-5	75	0.30"W.G.	1725 RPM	XXX RPM	X	120V/1PH	JAN CLOSET	INLINE	X	GREENHECK XX-XX	SEE NOTES 1 & 2
EF-6	500	0.30"W.G.	1725 RPM	XXX RPM	X	208V/1PH	MECH ROOM	SIDEWALL	X	GREENHECK XX-XX	SEE NOTES 1 & 2

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE ALL FANS WITH DISCONNECT SWITCHES, AND BACKDRAFT DAMPERS.
3) EF-1, 2,&4 SHALL BE EXPLOSION PROOF MODELS.

Energy Recovery Units - Fan Performance

Tag	ConsERV Model	Supply Airstream CFM	esp	Total SP	rpm	BHP	HP	Blower	Exhaust Airstream CFM	esp	Total SP	rpm	BHP	HP	Blower	Electrical Voltage	FLA	MCA	MOP	MERV8 Filters	Unit Weight
	G06R-FSE-C	3000	1.00	3.10	1471	2.8	5	A12-9AT	2900	1.00	3.00	1446	2.7	5	A12-9AT	208/3/60	27.7	34.7	40	12 - 12X16X2	687
	D09R-FSE-C	5000	1.00	2.70	1427	4.9	7.5	A12-12AT	4800	1.00	2.60	1395	4.4	7.5	A12-12AT	208/3/60	45.1	56.4	70	8- 20X25X2 & 2- 12X20X2	1106

Notes:
Aluminum Frame and Panel Construction
1" Double Wall Panels with R5.7 Foam Insulation
Corrosion Resistant Siliconized Acrylic Finish
MERV 8 , 2" Pleated Filters in both airstreams
AHRI 1060 Certified Fixed Plate Energy Exchanger
Single Point Electrical Connection (not wired for use with VFD's)
Belt Drive Forward Curved Blowers with adjustable sheaves
Fully Removable Access Panels with Safety Switches
Unit motor starter(s), contact(s) & 24V transformer
TEFC premium efficiency motor(s) (Inverter ready)

2

ConsERV by MULTISTACK

Project: UCONN-MAA
Contact:
Date: 2/5/2015
Notes:

Version 6.81 (2/25/2013)

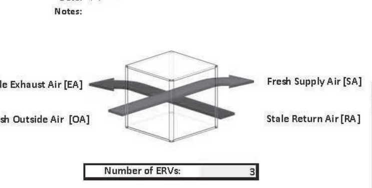
Fresh Outside Air [OA] Temp	Dry-Bulb [F]	Wet-Bulb [F]
Summer	93	72
Winter	0	-1

Summer: Moisture Content = 84.1 grains/lb; Relative Humidity = 36.3 %; Enthalpy = 35.6 Btu/lb
Winter: Moisture Content = 3.8 grains/lb; Relative Humidity = 69.8 %; Enthalpy = 0.6 Btu/lb

Stale Return Air [RA] Temp	Dry-Bulb [F]	Wet-Bulb [F]
Summer	79	66
Winter	68	57

Summer: Moisture Content = 74.8 grains/lb; Relative Humidity = 50.5 %; Enthalpy = 30.7 Btu/lb
Winter: Moisture Content = 51.6 grains/lb; Relative Humidity = 50.8 %; Enthalpy = 24.4 Btu/lb

Altitude [ft]: 0
Units: English



Number of ERVs: 3

System Information	
SEER of Linked Air-Conditioning Unit	13
Heat Source	Electric
Heater Efficiency (Normally 1.0)	1

System Performance	Summer	Winter
	Total Cooling Tons Saved: 9.0	Total Heating kW Saved: 110.0
	Total Cooling Btu/hr Saved: 108,000	Sensible Btu/hr Saved: 375,320
	Summer Moisture Removed: 26.2 lb/hr	Winter Moisture Recovered: 126 lb/hr
	CO2 emissions avoided [lb/hr]: 11.3	CO2 emissions avoided [lb/hr]: 150.0

ERV #	Season	Total Fresh Air [SCFM]	Total Exhaust Air [SCFM]	Unit Type	# of Cores	Max FA / EA CFM / Core	Fresh Supply Air [SA] Dry-Bulb [F]	Wet-Bulb [F]	Moisture Content [grains/lb]	Relative Humidity [%]	Enthalpy [Btu/lb]	Core Performance Fresh DP [in. H20] Core only*	Exhaust DP [in. H20] Core only*	Sensible Effectiveness	Latent Effectiveness	Total Effectiveness	Savings Summer = Total / Latent Winter = Total / Sensible		Moisture Removed or Recovered [lb/hr]
RTU-2	Summer	3000	2900	G Series	6	500.0	84.3	68.5	79.3	45.1	32.7	1.09	1.05	64.4%	53.3%	61.1%	3.3 Tons	10782 BTUH	9.2
	Winter						42.3	38.2	27.4	68.9	14.4	1.09	1.05	64.4%	50.9%	60.0%	40.2 kW	40.2 kW	45.4
RTU-3	Summer	5000	4800	D Series	9	555.6	83.9	68.3	78.8	45.3	32.5	0.92	0.88	67.6%	59.0%	65.1%	5.7 Tons	19709 BTUH	17.0
	Winter						44.1	39.7	28.9	68.0	15.1	0.92	0.88	67.6%	54.7%	63.4%	69.8 kW	69.8 kW	80.7
	Summer																		
	Winter																		

Flow rates should be entered in standard cubic feet per minute (SCFM). Standard conditions are dry air at 70 F (standard density = .075 lb/ft3).
* Pressure drop values include core ONLY and do not include filters, cabinets, or ductwork.

Proper calculation requires macros be enabled. Please check the Trust Center settings within Excel to ensure macros have been enabled if you experience any difficulty or if cells read #Name? instead of showing a value.

ELECTRIC CABINET AND UNIT HEATER SCHEDULE

TYPE	KW	BTUH	ELEC	MANU/MODEL	REMARKS
CUH1	2.0/6.0	20,470	208V/3PH	TRANE FF-HB030	VERTICAL, RECESSED CABINET HEATER, PROVIDE WITH TWO-STAGE HEAT.
CUH2	2.0/6.0	20,470	208V/3PH	TRANE FF-FB030	VERTICAL, SURFACE MOUNTED HEATER, PROVIDE WITH TWO-STAGE HEAT.

NOTE:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE ALL UH HEATERS WITH BUILT-IN THERMOSTATS AND TAMPER PROOF CONSTRUCTION.

AIR OUTLET AND INLET SCHEDULE

TYPE	SIZE	MAX CFM	NECK	MAX NC	DESCRIPTION	MANU/MODEL	REMARKS
A	12x12	175	6"	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
B	12x12	250	8"	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
C	24x24	340	8"	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
D	24x24	500	10"	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
E	24x24	600	12"	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
F	24x24	800	14"	30	4-WAY SUPPLY AIR DIFFUSER	TITUS TMSA	PROVIDE WITH OPPOSED BLADE DAMPER
G	18x10	1000	-	35	4-WAY SUPPLY AIR DIFFUSER	TITUS 272RS	PROVIDE WITH OPPOSED BLADE DAMPER
H	24x18	1200	-	35	SIDEWALL SUPPLY AIR REGISTER	TITUS 272RS	PROVIDE WITH OPPOSED BLADE DAMPER
N	6x6	190	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
O	8x8	400	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
P	12x12	900	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
Q	18x12	1100	-	35		TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
R	18x18	1900	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
S	24x24	3300	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER
T	30x12	2000	-	35	EGGCRATE RETURN/EXHAUST REGISTER	TITUS 50F	PROVIDE WITH OPPOSED BLADE DAMPER

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) SUPPLY AIR DIFFUSERS SHALL BE 4-WAY THROW UNLESS NOTED OTHERWISE BY A SECOND DIGIT NOTATION (I.E. A3 INDICATES A THREE-WAY THROW TYPE A DIFFUSER). THE DIFFUSER AIR FLOW PATTERN SHALL BE AS NOTED ON THE PLAN DRAWING
3) PROVIDE WITH OPPOSED BLADE DAMPER AND FRAME COMPATIABLE WITH CEILING.

TAI SOO KIM PARTNERS ARCHITECTS
146 WYLLYS STREET
HARTFORD, CONNECTICUT
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UNIVERSITY OF CONNECTICUT

STORRS, CT

TITLE

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100%DD
2	1/16/2015	30%CD
3	3/23/2015	90%CD
4	6/3/2015	REV 01
5	7/8/15	REV 02

DATE: 4/06/15
SCALE:
DRAWN BY: JTF
CHECKED BY: JPT

PROJECT: MAIN ACCUMULATION AREA
UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO:
OFFICE PROJECT NO: Project Number
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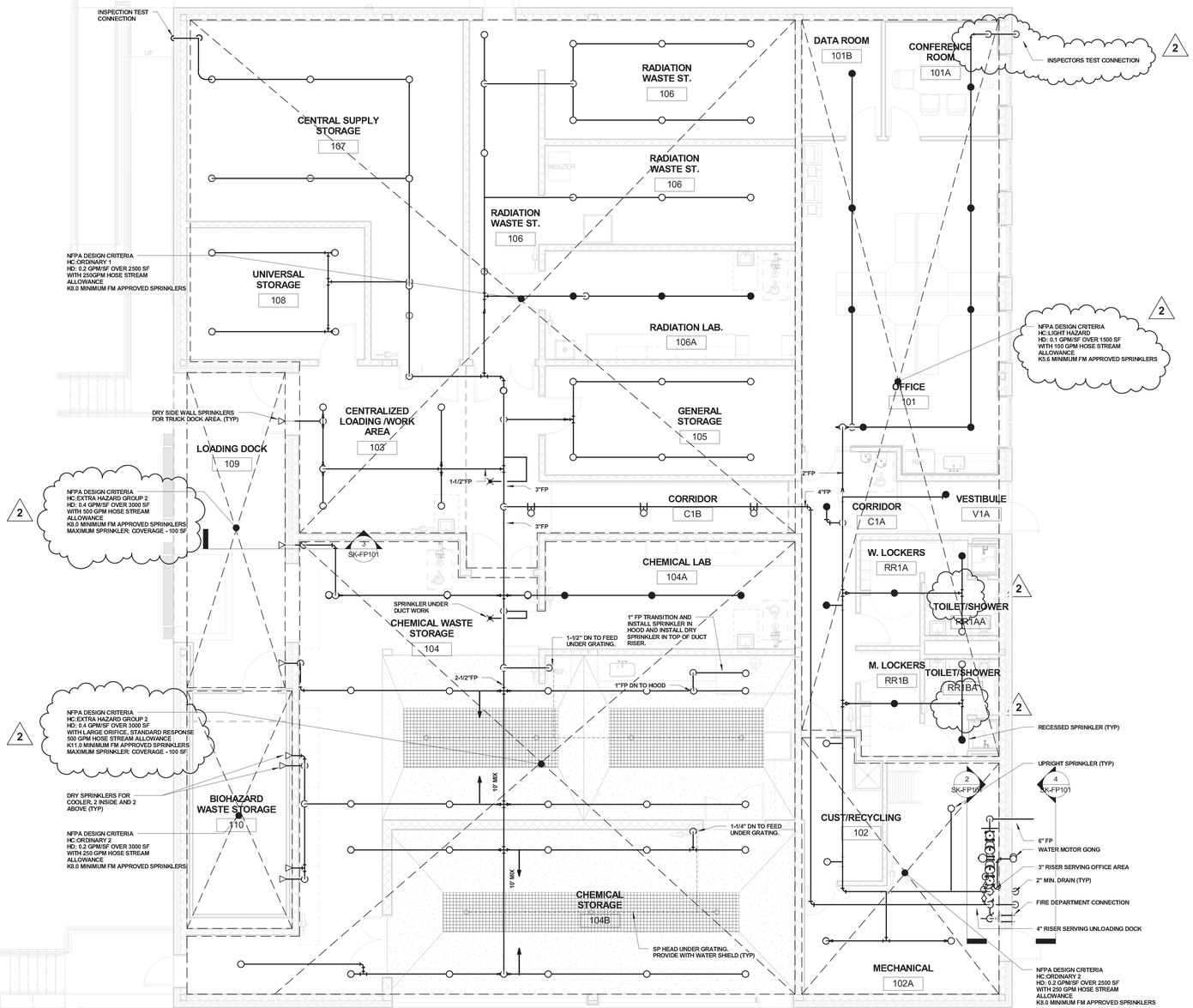

1 FIRE PROTECTION
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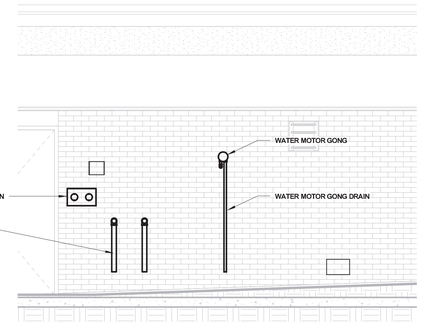

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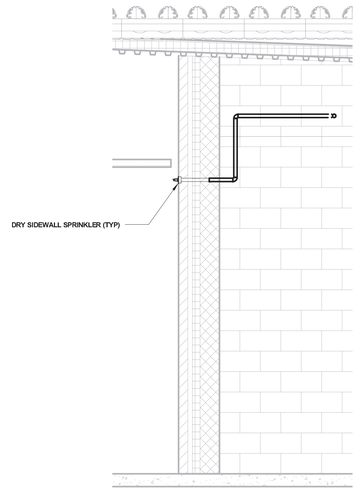

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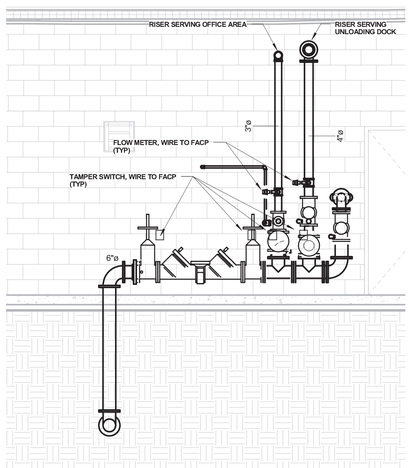

2 Section 1
3/8" = 1'-0"

LEGEND

- PENDANT
- UPRIGHT
- PENDANT RECESSED
- SIDEWALL DRY

TAI SOO KIM PARTNERS ARCHITECTS
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Loureiro

STATE OF CONNECTICUT JOHN P. TWARDY No. 10823 LICENSED PROFESSIONAL ENGINEER

TITLE

FIRE PROTECTION PLAN

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
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2	1/16/2015	30%CD
3	3/23/2015	90%CD
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UNIVERSITY OF CONNECTICUT

STORRS, CT

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
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STATE PROJECT NO:

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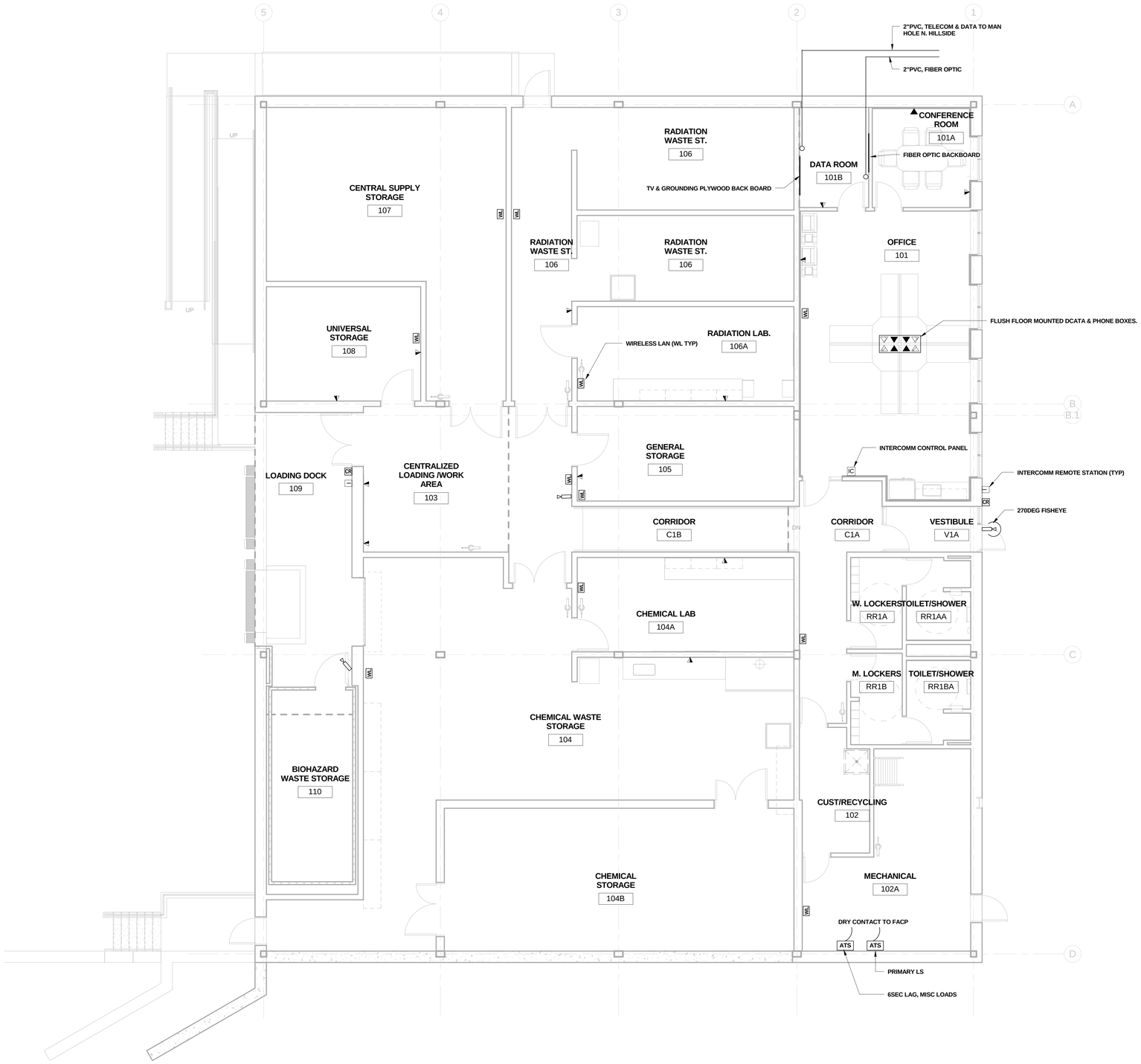

1 TELE COMM
3/16" = 1'-0"

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TITLE
TELE COMM PLAN

ISSUE DATES		
NO.	ISSUE DATE	PURPOSE

UNIVERSITY OF CONNECTICUT

STORRS, CT

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO:
OFFICE PROJECT NO: Project Number

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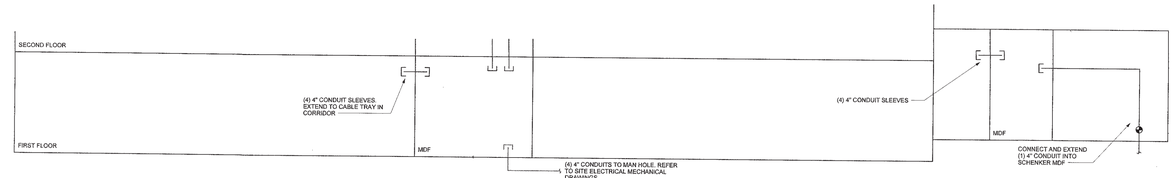

1 / TC-400 COMMUNICATIONS RISER DIAGRAM (CONDUIT)
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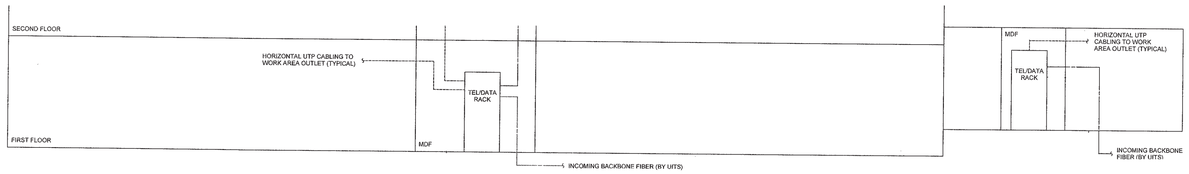

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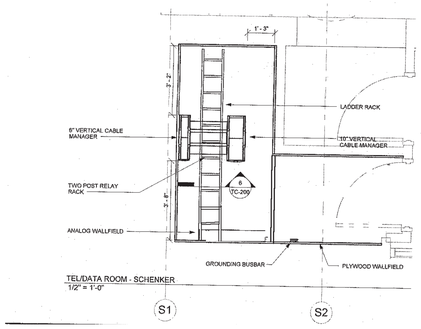

TEL/DATA ROOM - SCHENKER
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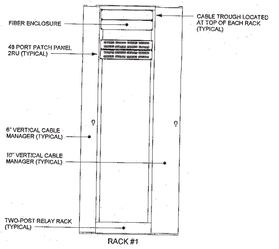

RACK ELEVATION - TEL/DATA SCHENKER
NOT TO SCALE

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CHECKED BY: JKH

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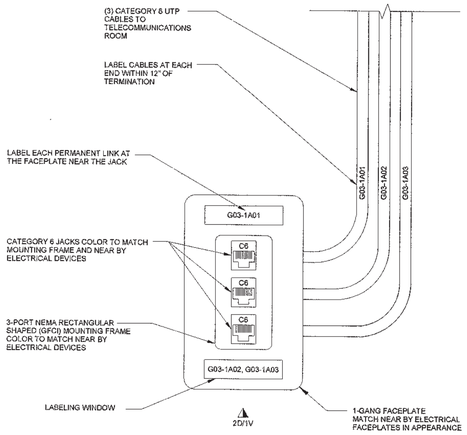

TEST EACH PERMANENT LINK AS A COMPLETE HORIZONTAL CABLING SYSTEM, WITH JACKS AND FACEPLATES COMPLETELY ASSEMBLED AND PROPERLY MOUNTED. PERFORM PERMANENT LINK FIELD TESTS WITH A LEVEL III FIELD TESTER; IN ACCORDANCE TO TEST UNIT MANUFACTURER INSTRUCTIONS.

THE TOPMOST JACK IS TYPICALLY RESERVED FOR VOICE APPLICATIONS AND THE REMAINING JACKS FOR DATA.

STANDARD WORK AREA OUTLET DETAIL
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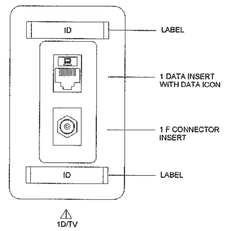

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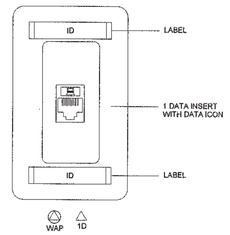

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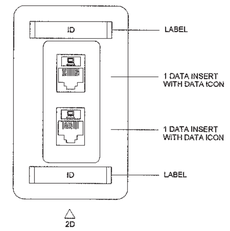

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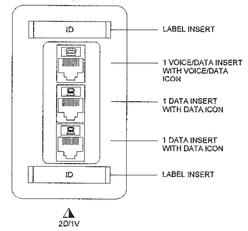

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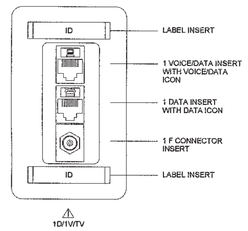

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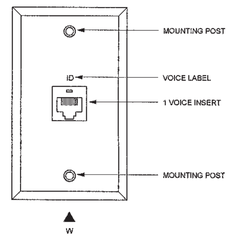

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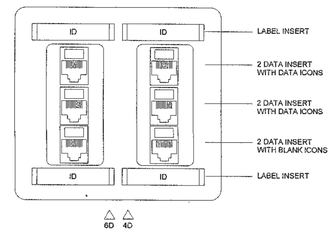
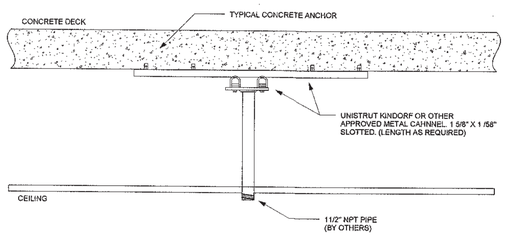
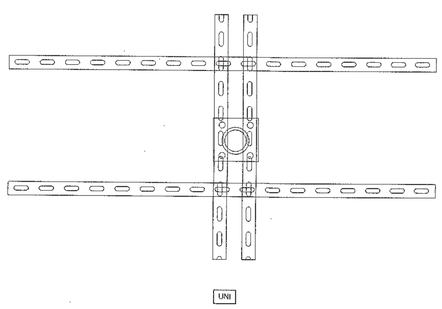
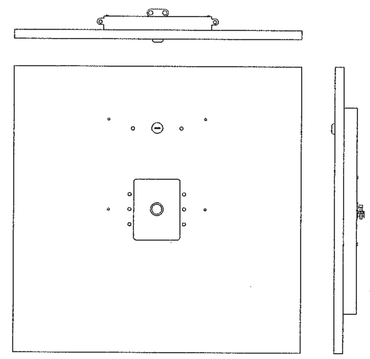


UC - TYPICAL 6 DATA RECESSED OUTLET
NOT TO SCALE

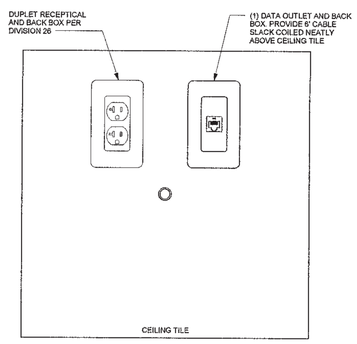




UNISTRUT MOUNTING DETAIL
NOT TO SCALE

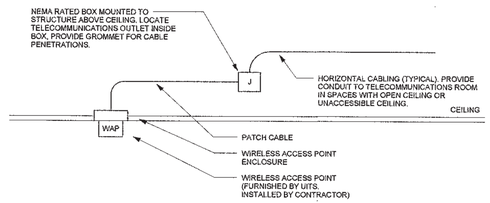


WIRELESS ACCESS POINT ENCLOSURE DETAIL
NOT TO SCALE



GENERAL NOTE:
PROVIDE UNISTRUT MOUNTING DETAIL DIRECTLY ABOVE CEILING TILE. COORDINATE WITH AV CONTRACTOR FOR EXACT LOCATION.

CEILING MOUNTED POWER AND DATA OUTLET INSTALLATION DETIAL
NOT TO SCALE



GENERAL NOTE:
1. PROVIDE DETAIL SHOWN WHEREVER WIRELESS ACCESS POINTS ARE SHOWN ON FLOOR PLANS.
2. INSTALL OWNERS FURNISHED WIRELESS ACCESS POINT. PROVIDE UITS WITH MARKED UP DRAWING SHOWING ALL WAP LOCATIONS AND CORRESPONDING MAC ADDRESSES.

FLOOR

WAP

WIRELESS ACCESS POINT DETAIL
NOT TO SCALE

TAI SOO KIM PARTNERS ARCHITECTS
148 WYLLYS STREET
HARTFORD, CONNECTICUT
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FAX: (860) 249-0695

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Email: info@loureiro.com
Loureiro

UNIVERSITY OF CONNECTICUT

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ISSUE DATES

NO.	ISSUE DATE	PURPOSE

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

STATE PROJECT NO:
OFFICE PROJECT NO: Project Number

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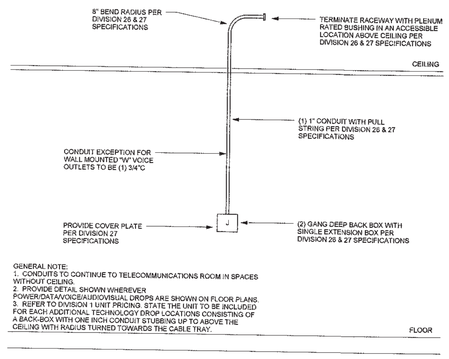
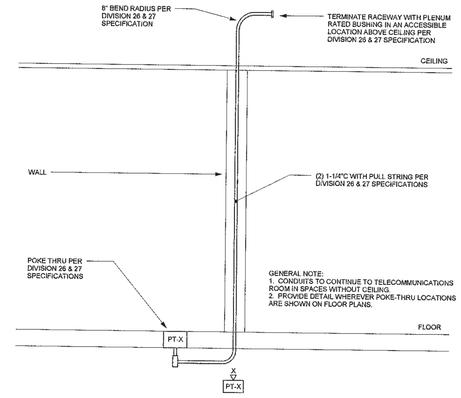
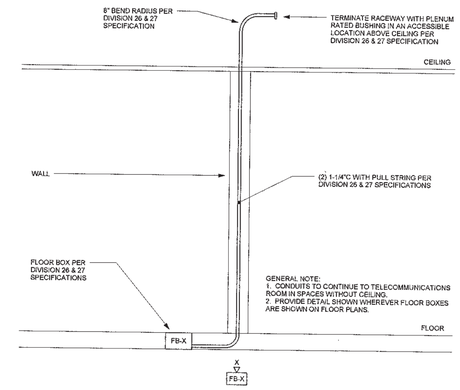


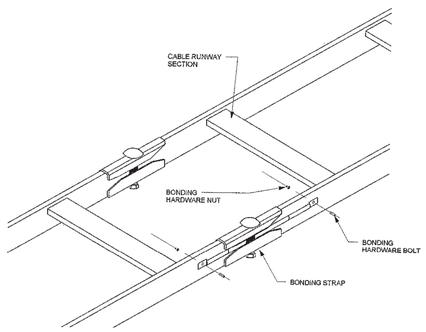
VOICE / DATA / AUDIO / VIDEO RECESSED OUTLET DETAIL
NOT TO SCALE



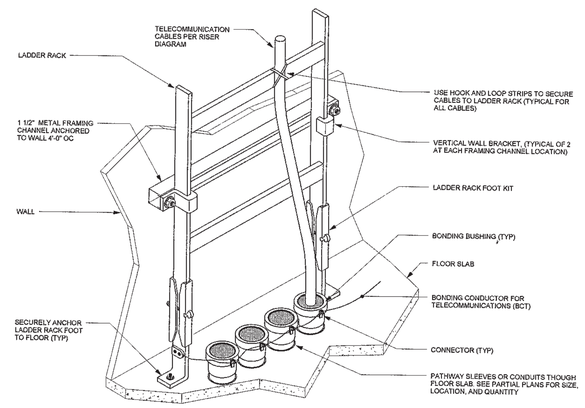
VOICE / DATA / AUDIO / VIDEO POKE THRU OUTLET DETAIL
NOT TO SCALE



VOICE / DATA / AUDIO / VIDEO FLOOR BOX OUTLET DETAIL
NOT TO SCALE



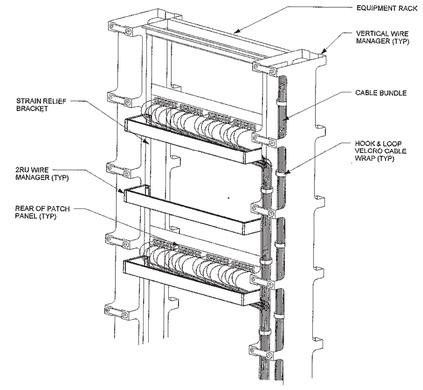
TYPICAL CABLE RUNWAY INLINE AND GROUND STRAP
NOT TO SCALE



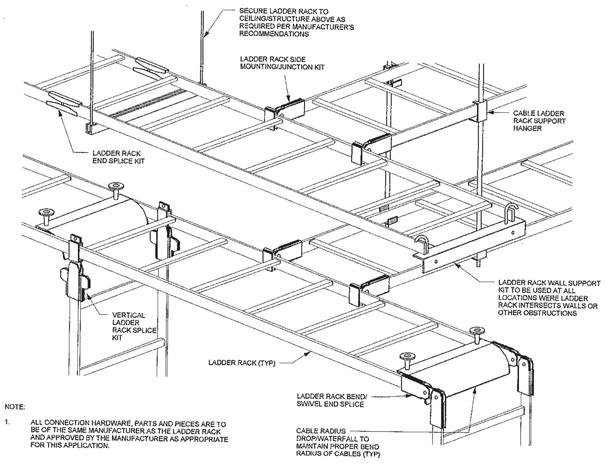
VERTICAL LADDER RACK INSTALLATION DETAIL
NOT TO SCALE

NOTES:

1. PROVIDE VELCRO CABLE WRAPS MINIMUM 12" CENTERS IN VERTICAL WIRE MANAGERS.
2. CABLES SHALL BE BUNDLED INTO LOGICAL GROUPS. CABLES SHALL BE SECURED TO STRAIN RELIEF BRACKET.
3. ATTACH CABLE LABEL BETWEEN STRAIN RELIEF BRACKET AND PATCH PANEL SO THAT LABEL CAN BE READ AND CORRELATED TO PATCH PANEL PORT WITHOUT UNBUNDLING ADJACENT CABLES.
4. ROUTE ALL CABLE BUNDLES TO AVOID SHARP BENDS AND PINCH POINTS. ALLOW LATCH OPERATION ON VERTICAL WIRE MANAGERS.
5. STRAIN RELIEF BRACKET SHALL BE A MINIMUM OF 6" BEHIND PATCH PANEL.
6. FIRE STOP ALL PENETRATIONS PER DIVISION 07 SPECIFICATIONS.



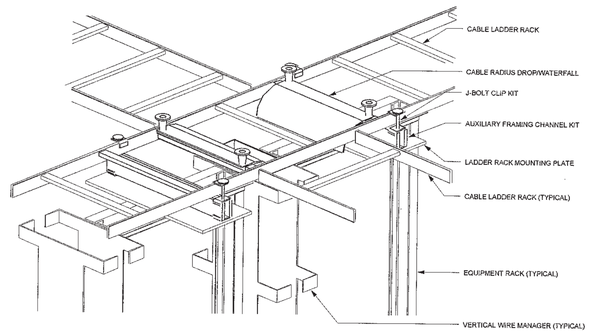
CABLE STRAIN RELIEF DETAIL
12" = 1'-0"



NOTE:

1. ALL CONNECTION HARDWARE, PARTS AND PIECES ARE TO BE OF THE SAME MANUFACTURER AS THE LADDER RACK AND APPROVED BY THE MANUFACTURER AS APPROPRIATE FOR THIS APPLICATION.

TYPICAL LADDER RACK CONNECTION DETAIL
NOT TO SCALE



TYPICAL LADDER RACK INSTALLED ABOVE EQUIPMENT RACKS DETAIL
NOT TO SCALE

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UNIVERSITY OF CONNECTICUT

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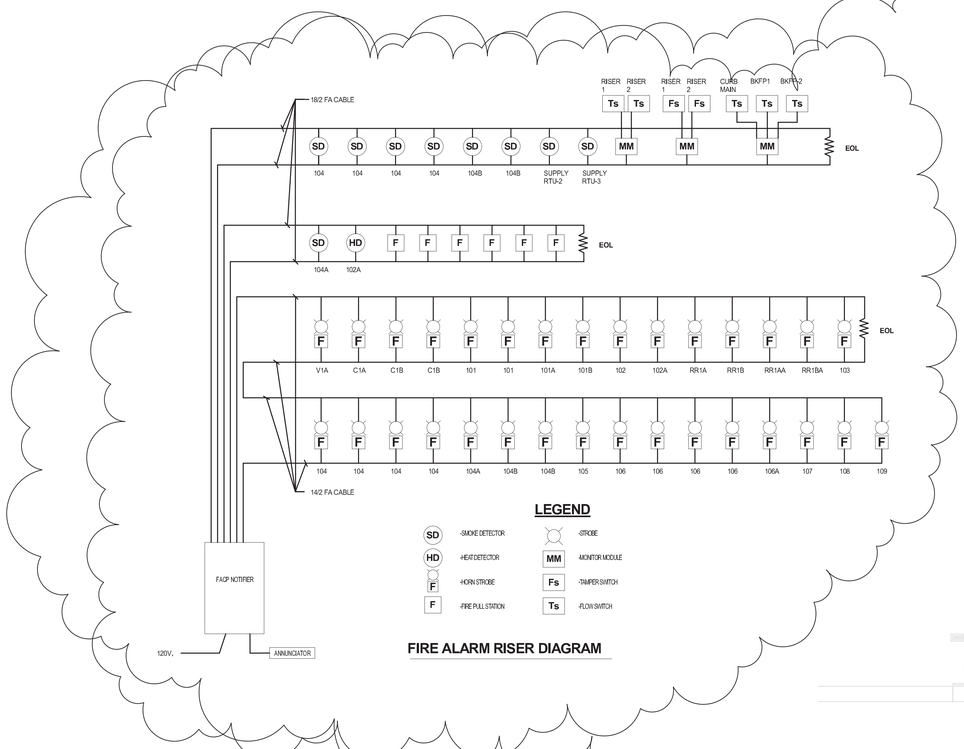
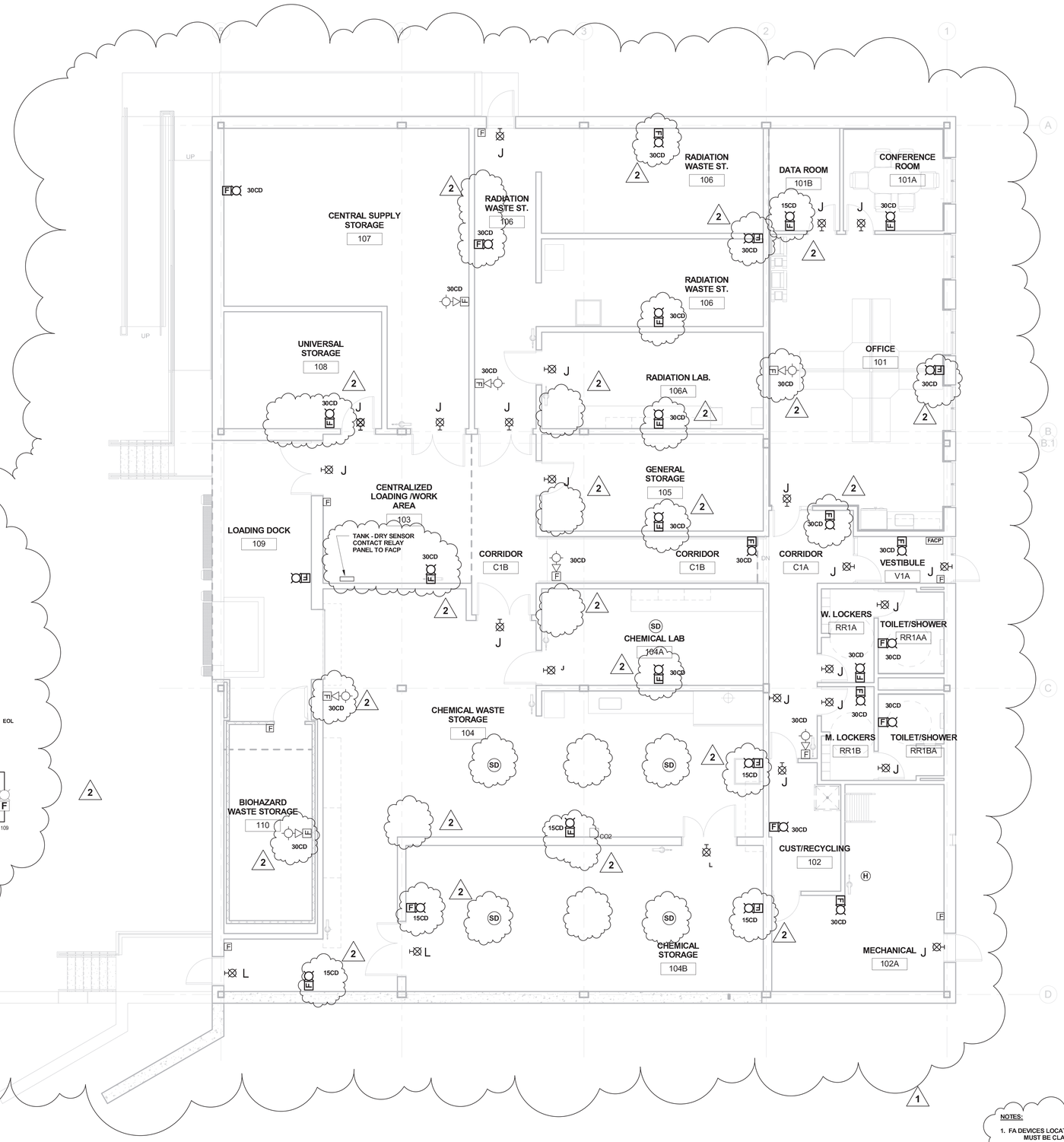


LEGEND

SD	-SMOKE DETECTOR		-STROBE
HD	-HEAT DETECTOR	MM	-MONITOR MODULE
F	-HORN STROBE	Fs	-TAMPER SWITCH
F	-FIRE PULL STATION	Ts	-FLOW SWITCH

FIRE ALARM RISER DIAGRAM



REFER TO LEGEND ON DWG E001 FOR SYMBOLS.

1 FIRE ALARM
3/16" = 1'-0"

NOTES:

1. FA DEVICES LOCATED IN ROOMS 104, 104A 7 104B MUST BE CLASS 1 DIV 2, ALONG WITH THEIR CONDUIT & WIRING CONNECTIONS
2. FOLLOW MANUFACTURES RECOMMENDED INSTALLATION INSTRUCTIONS FOR SMOKE DETECTORS.

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TITLE
FIRE ALARM

ISSUE DATES

NO.	ISSUE DATE	PURPOSE
1	9/12/2014	100%DD
2	1/16/2015	30%CD
3	3/23/2015	90%CD
4	6/3/2015	REV 01
5	7/8/15	REV 02

UNIVERSITY OF CONNECTICUT

STORRS, CT

PROJECT: MAIN ACCUMULATION AREA

UNIVERSITY OF CONNECTICUT
STORRS, CT

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SECTION 087113 - AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the CT High Performance Building Standard Mandatory Requirements and LEED Green Building Rating System, of the United States Green Building Council. Refer to Section 018113.13 – SUSTAINABLE DESIGN REQUIREMENTS for certification level and certification requirements.

B. Section Includes:

1. Power door operators for swinging doors.

C. Related Requirements:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED/CT High Performance Buildings requirements.
2. Division 01 Section "Construction Waste Management and Disposal" for salvaging, re-cycling, and disposing of non hazardous waste.
3. Section 087100 "Door Hardware".

1.3 DEFINITIONS

A. AAADM: American Association of Automatic Door Manufacturers.

B. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.

C. Double-Egress (Doors): A pair of doors that simultaneously swing with the two doors moving in opposite directions with no mullion between them.

D. Double-Swing (Doors): A pair of doors that swing with the two doors moving in opposite directions with a mullion between them; each door functioning as a single-swing door.

E. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.

F. For automatic door terminology, see BHMA A156.10 and BHMA A156.19 for definitions of terms.

1.4 COORDINATION

A. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing automatic door operators.

B. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.

C. Electrical System Roughing-in: Coordinate layout and installation of automatic door operators with connections to power supplies.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 LEED SUBMITTALS

A. MRc4: "Product data for Credit MRc4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content and cost."

B. MRc5: "Product Certification for Credit MRc5: For products and materials required to comply with requirements for Regional Materials including location and distance to Project from point of material manufacture and extraction, harvest or recovery for each raw material. Include statement indicating cost of each regional material and the fraction by weight that is considered regional."

C. IEQc4.1: "Product Data for adhesives and sealants used on the interior of the building indicating VOC content of each product used. List each product including manufacturer's name, product name, specific VOC data and corresponding allowable VOC from list identified in 018113.13."

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For automatic door operators.

1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Indicate locations of activation and safety devices.
4. Include diagrams for power, signal, and control wiring.
5. Include plans, elevations, sections, and attachment details for guide rails.

C. Samples: For each exposed product and for each color and texture specified,

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of automatic door operator.

C. Field quality-control reports.

D. Sample Warranties: For manufacturer's special warranties.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance Data: For automatic door operators, safety devices, and control systems, to include in maintenance manuals.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation and maintenance of units required for this Project and who employs a Certified Inspector.

1. Maintenance Proximity: Not more than one hours' normal travel time from Installer's place of business to Project site.

B. Certified Inspector Qualifications: Certified by AAADM.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of automatic door operators that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty or sporadic operation of automatic door operator, including controls.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.

2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide Stanley Magic-Force Door Operators by Stanley Access Technologies, LLC; Division of Stanley Security Solutions.

B. Source Limitations: Obtain automatic door operators, including activation and safety devices, from single source from single manufacturer**.**

2.2 AUTOMATIC DOOR OPERATORS, GENERAL

A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated; and according to UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.

B. Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation- and safety-device wiring, and manual operation including spring closing when power is off.

C. Hinges: See Section 087100 "Door Hardware" for hinge type for each door that door operator shall accommodate.

D. Cover for Surface-Mounted Operators: Fabricated from 0.125-inch- thick, extruded or formed aluminum; manufacturer's standard width, with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.

E. Brackets and Reinforcements: Fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 LOW ENERGY POWER DOOR OPERATORS

A. Standard: BHMA A156.10.

B. Performance Requirements:

1. Opening Force:

a. Power-Operated Doors: Not more than 50 lbf required to manually set door in motion if power fails; not more than 15 lbf required to open door to minimum required width.
b. Power-Operated Swinging Doors: Not more than 30 lbf required to manually open door if power fails.

2. Entrapment-Prevention Force: Not more than 40 lbf required to prevent stopped door in the last 10 degrees of opening from moving in the direction of opening; not more than 30 lbf required to prevent stopped door from moving in direction of closing.

C. Configuration: See Drawings.

1. Traffic Pattern: See drawings.
2. Operator Mounting: Surface.

D. Operation: Power opening and power-assisted spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.

E. Operating System: Electromechanical.

F. Microprocessor Control Unit: Solid-state controller.

G. Features:

1. Adjustable opening and closing speed.
2. Adjustable opening and closing force.
3. Adjustable backcheck.
4. Adjustable hold-open time from zero to 30 seconds.
5. Adjustable time delay.
6. Adjustable acceleration.
7. Adjustable limit switch.
8. Obstruction recycle.
9. Automatic door re-open if stopped while closing.
10. On-off/hold-open switch to control electric power to operator.

H. Controls: Activation and safety devices according to BHMA standards.

1. Activation Device: 4 ½” round wall mounted, or 1 ¾” wide mullion mounted, Push-plate switch, tied into the building’s security system, to activate door operator.
2. Safety Device: Manufacturer’s standard device to detect pedestrians in presence zone and to prevent door from closing.

I. Exposed Finish: Finish matching door hardware.

2.4 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extrusions: ASTM B 221.
2. Sheet: ASTM B 209.

B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, **Type 304** stretcher-leveled standard of flatness, in manufacturer's standard thickness.

C. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.5 CONTROLS

A. General: Provide controls, including activation and safety devices, according to BHMA standards; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.

B. Electrical Interlocks: Provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.6 FABRICATION

A. Factory fabricate automatic door operators to comply with indicated standards.

B. Form aluminum shapes before finishing.

C. Fabricate exterior components to drain condensation and water passing joints within operator enclosure to the exterior.

D. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.

2.7 ACCESSORIES

A. Signage: As required by cited BHMA standard for type of door and its operation.

1. Application Process: Operator manufacturer's standard process.
2. Provide sign materials with instructions for field application when operators are installed.

2.8 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.

B. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.

B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install automatic door operators according to manufacturer's written instructions and cited BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.

1. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
2. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.

B. Controls: Install activation and safety devices according to manufacturer's written instructions and cited BHMA standard for operator type and direction of pedestrian travel. Connect control wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.

3.3 FIELD QUALITY CONTROL

A. Certified Inspector: Engage a Certified Inspector to test and inspect components, assemblies, and installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Test and inspect each automatic door operator installation, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.

C. Automatic door operators will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.

B. After completing installation of automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.

C. Readjust automatic door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

D. Occupancy Adjustment: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to four (4) visits to Project during other-than-normal occupancy hours for this purpose.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of automatic door operator Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Engage a Certified Inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Owner.
2. Perform maintenance, including emergency callback service, during normal working hours.
3. Include 24-hour-per-day, 7-day-per-week, emergency callback service.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators.

END OF SECTION 087113

SECTION 263623 – AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes automatic transfer switches rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
2. Single-Line Diagram: Show connections between transfer switch, power sources, and load.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For transfer switches, accessories, and components, from manufacturer.

B. Source quality control reports.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 12 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA ICS 1.

C. Comply with NFPA 99.

D. Comply with NFPA 110.

E. Comply with UL 1008 unless requirements of these Specifications are stricter.

F. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

G. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
2. Short-time withstand capability for three cycles.

H. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

I. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

J. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.

K. Service-Rated Transfer Switch:

1. Comply with UL 869A and UL 489.
2. Provide terminals for bonding the grounding electrode conductor to the grounded service conductor.
3. In systems with a neutral, the bonding connection shall be on the neutral bus.
4. Provide removable link for temporary separation of the service and load grounded conductors.
5. Surge Protective Device: Service rated.
6. Ground-Fault Protection: Comply with UL 1008 for normal bus.
7. Service Disconnecting Means: Externally operated, manual actuated.

L. Neutral Switching: Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

M. Neutral Terminal: Solid and fully rated unless otherwise indicated.

N. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.

O. Battery Charger: For generator starting batteries.

1. Float type, rated 2 A.
2. Ammeter to display charging current.
3. Fused ac inputs and dc outputs.

P. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, by color-code or by numbered or lettered wire and cable with printed markers at terminations. Color-coding and wire and cable markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.
4. Accessible via [**rear**] [**front**] access.

Q. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.2 CONTACTOR-TYPE AUTOMATIC TRANSFER SWITCHES

A. UCONN preferred ASCO 7000 series open transition for life safety and open transition delayed operation for non-life safety

B. Comply with Level 1 equipment according to NFPA 110.

C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are unacceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Contactor-style automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.
4. Conductor Connectors: Suitable for use with conductor material and sizes.
5. Material: Hard-drawn copper, 98 percent conductivity.
6. Main and Neutral Lugs: Compression type.
7. Ground Lugs and Bus-Configured Terminators: Compression type.
8. Ground bar.

9. Connectors shall be marked for conductor size and type according to UL 1008.

D. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.

1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.

E. Automatic Delayed-Transition Transfer Switches: Pauses or stops in intermediate position to momentarily disconnect both sources, with transition controlled by programming in the automatic transfer-switch controller. Interlocked to prevent the load from being closed on both sources at the same time.

1. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals for alternative source. Adjustable from zero to six seconds, and factory set for one second.
2. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.
3. Fully automatic break-before-make operation with center off position.
4. Fully automatic break-before-make operation with transfer when two sources have near zero phase difference.

F. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval shall be adjustable from 1 to 30 seconds.

G. Automatic Transfer-Switch Controller Features:

1. Controller operates through a period of loss of control power.
2. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

   a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
   b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.

9. Transfer Override Switch: Overrides automatic retransfer control so transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is unavailable.

H. Large-Motor-Load Power Transfer:

1. In-Phase Monitor: Factory-wired, internal relay controls transfer so contacts close only when the two sources are synchronized in phase and frequency. Relay shall compare phase relationship and frequency difference between normal and emergency sources and initiate transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer shall be initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.
2. Motor Disconnect and Timing Relay Controls: Designated starters in loss of power scenario shall disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters shall be through wiring external to automatic transfer switch. Provide adjustable time delay between 1 and 60 seconds for reconnecting individual motor loads. Provide relay contacts rated for motor-control circuit inrush and for actual seal currents to be encountered.
3. Programmed Neutral Switch Position: Switch operator with programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Adjustable pause from 0.5 to 30 seconds minimum, and factory set for 0.5 second unless otherwise indicated. Time delay occurs for both transfer directions. Disable pause unless both sources are live.

2.3 MOLDED-CASE-TYPE AUTOMATIC TRANSFER SWITCHES

A. Preferred vendor ASCO specified

B. Comply with Level 1 equipment according to NFPA 110.

C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using contactor-based components are unacceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching.
4. Conductor Connectors: Suitable for use with conductor material and sizes.
5. Material: Hard-drawn copper, 98 percent conductivity.
6. Main and Neutral Lugs: Compression type.
7. Ground Lugs and Bus-Configured Terminators: Compression type.
8. Ground bar.
9. Connectors shall be marked for conductor size and type according to UL 1008.

D. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.

1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.

E. Automatic Delayed-Transition Transfer Switches: Pauses or stops in intermediate position to momentarily disconnect both sources, with transition controlled by programming in the automatic transfer-switch controller. Interlocked to prevent the load from being closed on both sources at the same time.

1. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals for alternative source. Adjustable from zero to six seconds, and factory set for one second.
2. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.
3. Fully automatic break-before-make operation with center off position.
4. Fully automatic break-before-make operation with transfer when two sources have near zero phase difference.

F. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval shall be adjustable from 1 to 30 seconds.

G. Transfer Switches Based on Molded-Case-Switch Components: Comply with UL 489 and UL 869A.

H. Automatic Transfer-Switch Controller Features:

1. Controller operates through a period of loss of control power.
2. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is unavailable.

I. Large-Motor-Load Power Transfer:

1. In-Phase Monitor: Factory-wired, internal relay controls transfer so contacts close only when the two sources are synchronized in phase and frequency. Relay shall compare phase relationship and frequency difference between normal and emergency sources and initiate transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer shall be initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.
2. Motor Disconnect and Timing Relay Controls: Designated starters in loss of power scenario shall disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters shall be through wiring external to automatic transfer switch. Provide adjustable time delay

between 1 and 60 seconds for reconnecting individual motor loads. Provide relay contacts rated for motor-control circuit inrush and for actual seal currents to be encountered.

3. Programmed Neutral Switch Position: Switch operator with programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Adjustable pause from 0.5 to 30 seconds minimum, and factory set for 0.5 second unless otherwise indicated. Time delay occurs for both transfer directions. Disable pause unless both sources are live.

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect components, assembled switches, and associated equipment according to UL 1008. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

B. Prepare test and inspection reports.

1. For each of the tests required by UL 1008, performed on representative devices, for emergency systems. Include results of test for the following conditions:

a. Overvoltage.
b. Undervoltage.
c. Loss of supply voltage.
d. Reduction of supply voltage.
e. Alternative supply voltage or frequency is at minimum acceptable values.
f. Temperature rise.
g. Dielectric voltage-withstand; before and after short-circuit test.
h. Overload.
i. Contact opening.
j. Endurance.
k. Short circuit.
l. Short-time current capability.
m. Receptacle withstand capability.
n. Insulating base and supports damage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.

1. Install transfer switches on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete Retain first subparagraph below if seismic controls are a project requirement. Coordinate with Drawings.
2. Comply with requirements for seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
3. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.

4. Provide workspace and clearances required by NFPA 70.

B. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.

C. Identify components according to Section 260553 "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

E. Comply with NECA 1.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Wiring Method: Install cables in raceways and cable trays except within electrical enclosures. Conceal raceway and cables except in unfinished spaces.

1. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 271500 "Communications Horizontal Cabling."

F. Route and brace conductors according to manufacturer's written instructions. Do not obscure manufacturer's markings and labels.

G. Brace and support equipment according to Section 260548.16 "Seismic Controls for Electrical Systems."

H. Final connections to equipment shall be made with liquidtight, flexible metallic conduit no more than 18 inches (457 mm) in length.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visual and Mechanical Inspection:

a. Compare equipment nameplate data with Drawings and Specifications.
b. Inspect physical and mechanical condition.

c. Inspect anchorage, alignment, grounding, and required clearances.
d. Verify that the unit is clean.
e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
f. Verify that manual transfer warnings are attached and visible.
g. Verify tightness of all control connections.
h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:

    1) Use of low-resistance ohmmeter.
    2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.

i. Perform manual transfer operation.
j. Verify positive mechanical interlocking between normal and alternate sources.
k. Perform visual and mechanical inspection of surge arresters.
l. Inspect control power transformers.

    1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
    2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
    3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.

2. Electrical Tests:

    a. Perform insulation-resistance tests on all control wiring with respect to ground.
    b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
    c. Verify settings and operation of control devices.
    d. Calibrate and set all relays and timers.
    e. Verify phase rotation, phasing, and synchronized operation.
    f. Perform automatic transfer tests.
    g. Verify correct operation and timing of the following functions:

        1) Normal source voltage-sensing and frequency-sensing relays.
        2) Engine start sequence.
        3) Time delay on transfer.
        4) Alternative source voltage-sensing and frequency-sensing relays.
        5) Automatic transfer operation.
        6) Interlocks and limit switch function.
        7) Time delay and retransfer on normal power restoration.
        8) Engine cool-down and shutdown feature.

3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.

b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
c. Verify that manual transfer warnings are properly placed.
d. Perform manual transfer operation.

4. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.

   a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
   b. Simulate loss of phase-to-ground voltage for each phase of normal source.
   c. Verify time-delay settings.
   d. Verify pickup and dropout voltages by data readout or inspection of control settings.
   e. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for one pole deviating by more than 50 percent from other poles.
   f. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

   a. Verify grounding connections and locations and ratings of sensors.

B. Coordinate tests with tests of generator and run them concurrently.

C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

D. Transfer switches will be considered defective if they do not pass tests and inspections.

E. Remove and replace malfunctioning units and retest as specified above.

F. Prepare test and inspection reports.

G. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
2. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
3. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

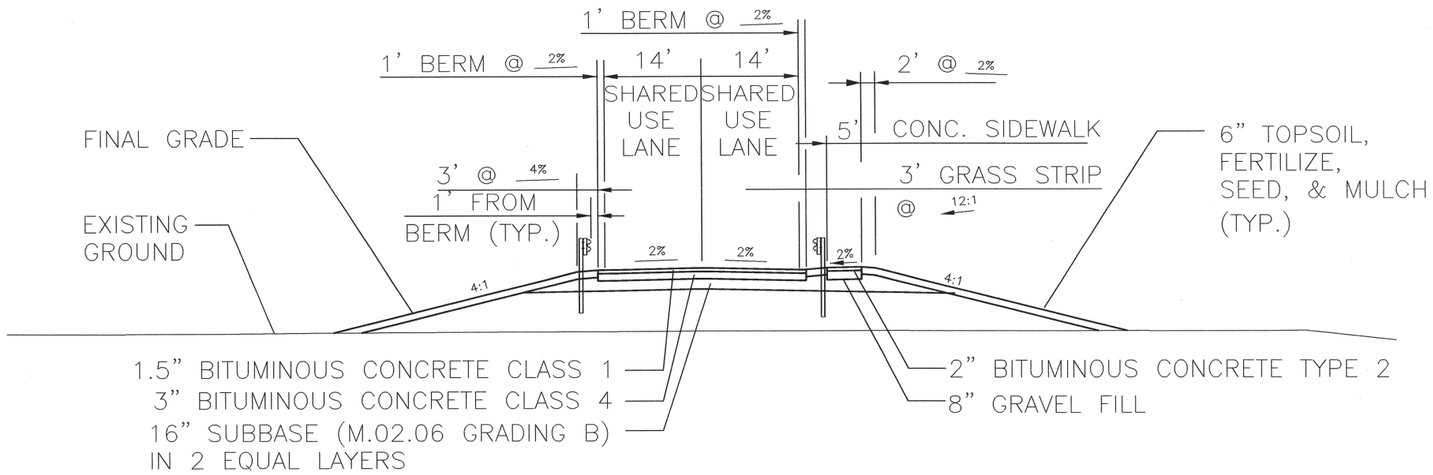
3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.

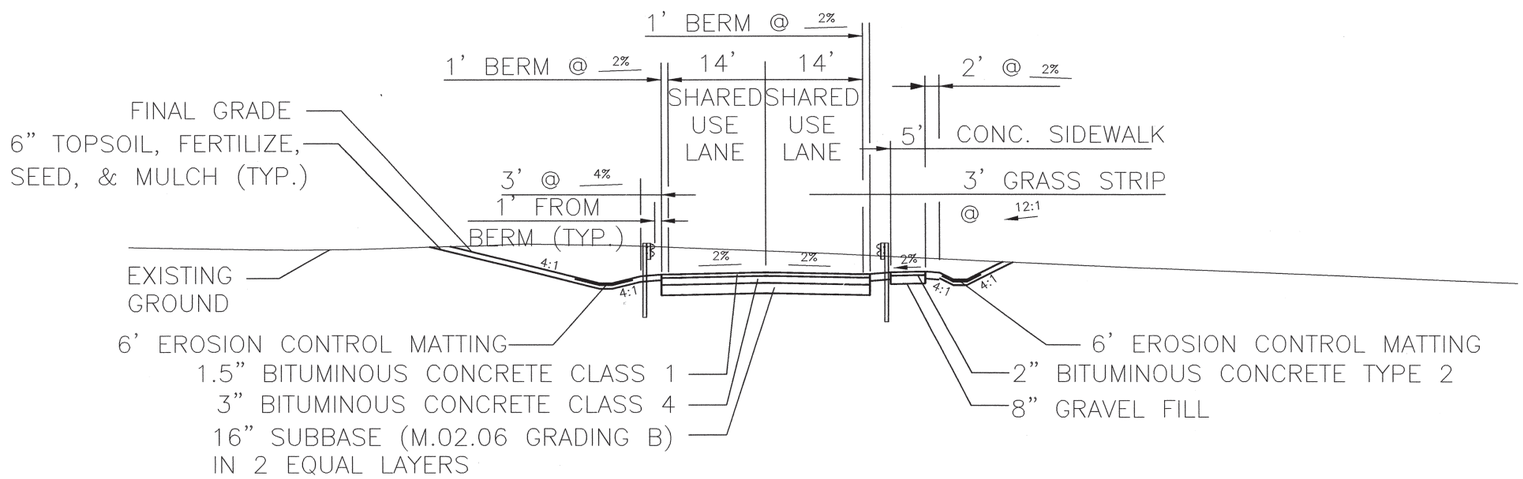
B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.

C. Coordinate this training with that for generator equipment.

END OF SECTION 263600

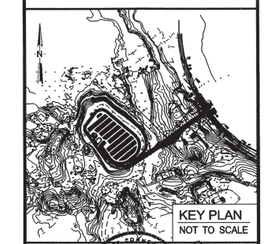


TYPICAL FILL SECTION



TYPICAL CUT SECTION

EarthTech
A Tyco International Ltd. Company
655 WINDING BROOK DR.
GLASTONBURY, CT 06033
(860) 657-1200
Fax: (860) - 657- 1205
Website : www.Earthtech.com



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Date:	07/05/05
Autocad File:	C-22.dgn
Drawn By:	VRK
Designed By:	VRK
Checked By:	JFS
Approved By:	JFS

ISSUED FOR CONSTRUCTION

Rev.	Description	By	Date

REMEDIAL ACTION PLAN IMPLEMENTATION

LANDFILL AND FORMER CHEMICAL PITS

PROJECT NO. 900748

STORRS, CONNECTICUT

ACCESS ROADWAY TYPICAL SECTIONS

C-22

ADDENDUM NUMBER 3
July 23, 2015

The following clarifications are applicable to drawings and specifications for the project referenced above.

DRAWINGS

Item 3-1

CIVIL and LANDSCAPE PLANS

Delete 44'-8" lineal feet of sidewalk at east side of building, north of building entrance. Provide perennial ground cover.

Item 3-2

CIVIL and LANDSCAPE PLANS

Delete all maintenance strips. Provide conservation seed mix.

Item 3-3

CIVIL and LANDSCAPE PLANS

Delete bituminous concrete paving at Outdoor Storage Area. Provide 4" deep ¾" crushed stone.

Item 3-4

CIVIL and LANDSCAPE PLANS

Delete 7 trees, 4-AS and 3-AR, shown east of the Eversource Right of Way.

Item 3-5

CIVIL and LANDSCAPE PLANS

Delete 6 trees; 3-QP, 1-AS and 2-AR, shown east side of the site, adjacent to the tennis courts.

Item 3-6

ARCHITECTURAL PLANS AND ELEVATIONS

Delete residential appliances (refrigerator and microwave oven). Utilities for these items are to remain in the project. Owner will furnish residential appliances as part of FF&E.

Item 3-7

ARCHITECTURAL PLANS AND ELEVATIONS

Delete tackboards and whiteboards. Blocking for these items is to remain in the project. Owner will furnish tackboards and whiteboards as part of FF&E.

Item 3-8

ARCHITECTURAL PLANS AND ELEVATION
Delete fire extinguishers. Owner will furnish these items as part of FF&E.

Item 3-9

DRAWING SK-H001

Replace ELECTRIC CABINET AND UNIT HEATER SCHEDULE with the following:

ELECTRIC CABINET UNIT HEATER/AIR CURTAIN SCHEDULE					
TYPE	KW	BTUH	ELEC	MANU/MODEL	REMARKS
CUH1	3.0	10,240	460V/3PH	TRANE UHWA	VERTICAL, RECESSED CABINET HEATER, TAMPER RESISTANT

NOTE:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE ALL UH HEATERS WITH BUILT-IN THERMOSTATS AND TAMPER PROOF CONSTRUCTION.

Item 3-10

DRAWING SK-H001

Replace EXHAUST FAN SCHEDULE with the following:

EXHAUST FAN SCHEDULE											
NUMBER	AIR FLOW (CFM)	STATIC PRESSURE	MOTOR SPEED	FAN SPEED	HP	ELEC	AREA SERVING	TYPE	MAX dbA	MANU/MODEL	REMARKS
EF-1	1370	2"W.G.	3274 RPM	2758 RPM	2	460V/3PH	RADIATION LAB	ROOF UPBLAST	73	GREENHECK VKH-12-9	SEE NOTES 1, 2 & 3
EF-2	1370	2"W.G.	3274 RPM	2758 RPM	2	460V/3PH	CHEM LAB	ROOF UPBLAST	73	GREENHECK VKH-12-9	SEE NOTES 1, 2 & 3
EF-3	300	0.30"W.G.	1300 RPM	1300 RPM	1/30	120V/1PH	TOILET ROOMS	ROOF CENTRIFUGAL	5.4 SONES	GREENHECK CUE 085	SEE NOTES 1 & 2
EF-4	150	0.30"W.G.	1550 RPM	1550 RPM	1/30	120V/1PH	JANITORS CLOSET	ROOF CENTRIFUGAL	4.3 SONES	GREENHECK CUE 065	SEE NOTES 1 & 2
EF-5	3250	2"W.G.	2431 RPM	2204 RPM	5	460V/3PH	CHEM STORAGE	ROOF UPBLAST	75	GREENHECK VKH-16-14	SEE NOTES 1, 2 & 3
EF-6	500	0.125"W.G.	-	1350 RPM	1/20	120V/1PH	MECH ROOM	SIDEWALL	4.9 SONES	GREENHECK S1-10	SEE NOTES 1, 2 & 4

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE ALL FANS WITH DISCONNECT SWITCHES, AND BACKDRAFT DAMPERS.
3) PROVIDE WITH MOTORIZED BYPASS DAMPER, FAN TO BE OF SPARK RESISTANT CONSTRUCTION.
4) PROVIDE WITH WALL HOUSING, GUARDS AND WEATHERHOOD.

Item 3-11

DRAWING SK-H001

Replace GAS FIRED UNIT HEATER SCHEDULE with the following:

GAS FIRED UNIT HEATER SCHEDULE											
UNIT NO.	TYPE	HEATING SECTION			FAN MOTOR DATA					MANUFACTURER MODEL	REMARKS
		TOTAL INPUT/ OUTPUT	ENT. AIR (F)	TEMP. RISE (F)	CFM	HP	VOLTS	PH	HZ		
GUH-1	NAT. GAS	30/24MBH	50	44	500	1/15	115	1	60	MODINE MODEL HDS	SEE NOTES

NOTE:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE ALL UH HEATERS WITH REMOTE LINE-VOLTAGE THERMOSTATS AND TAMPER PROOF CONSTRUCTION.
3) ONE STAGE, SEPARATED COMBUSTION UNIT, PROVIDE WITH CONCENTRIC ADAPTER.

Item 3-12

DRAWING SK-H001

Replace the SPLIT AIR CONDITIONING SYSTEM SCHEDULE with the following:

SPLIT AIR CONDITIONING SYSTEM SCHEDULE

DX HEATING			ELEC HEATING COIL			MIN SEER	MANU/MODEL	REMARKS
EVAP EAT		HEATING CAPACITY	KW	ELEC	STAGES			
DB	WB							
-	-	-	-	-	-	-	BALLY	SEE NOTES
70°F	60°F	13,000 BTUH	-	-	-	15.3	MITSUBISHI PKAA18/PUZA18	SEE NOTES

SPLIT AIR CONDITIONING SYSTEM SCHEDULE

NUMBER	EVAPORATOR UNIT					COMPRESSOR/CONDENSER UNIT						DX COOLING			
	CFM	ESP	RPM	HP	ELEC	FAN			COMP MOTOR	COND EAT	ELEC	EVAP EAT		COOLING CAPACITY	
						NO.	HP	RPM				DB	WB	TOTAL	SENSIBLE
AHU-1/ACC-1	1800	0" W.G.	-	.07	115V/1PH	1	-	-	11 A	95°F	208V/3PH	-	-	14.1 MBH	-
AHU-2/ACC-2	380	0" W.G.	-	-	208V/1PH	1	-	-	13 A	95°F	208V/1PH	80°F	67°F	18.0 MBH	12.0 MBH

NOTES:

1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PERFORMANCE NOTED IS WITH FAN AT HIGH SPEED.
3) PROVIDE ALL UNITS WITH DISCONNECT SWITCHES AND CONDENSATE PUMPS.
4) INSIDE AHU-2 IS WIRED TO OUTSIDE ACC-2.
5) AHU-1 BALLY MODEL BLP214MA-S1B_ECM, ACC-2 BALLY MODEL BQZA011H8-HT3A. BOX TEMP 35f.
6) PROVIDE BALLY AC UNIT WITH HEATED AND INSULATED RECEIVER, FILTER AND SIGHT GLASS, WIND GUARD, TXV, LLSV, SMARTVAPII CONTROLLER, R404A REFRIGERANT.
7) EQUIPMENT TO BE ENERGY STAR RATED.

Item 3-13

DRAWING SK-H001

Replace the ROOFTOP AIR CONDITIONING SYSTEM SCHEDULE with the following:

ROOFTOP AIR CONDITIONING UNIT SCHEDULE								
STAGES	POWER EXHAUST FAN			MIN EER	UNIT WEIGHT (lbs)	MIN. OUTSIDE AIR %	MANU/ MODEL	REMARKS
	CFM	NO.	HP					
MODULATING	-	1	-	17	920	35	TRANE YHC067	NOMINAL 5 TONS, SEE NOTES
MODULATING	-	-	-	12.6	1200	70	TRANE YHC092	NOMINAL 7.5 TONS, SEE NOTES
MODULATING	-	-	-	12.1	2600	95	TRANE YHD150	NOMINAL 12.50 TONS, SEE NOTES

ROOFTOP AIR CONDITIONING UNIT SCHEDULE																		
NUMBER	EVAPORATOR FAN				COMPRESSOR/CONDENSER					ELEC	DX COOLING COIL				HEATING (GAS-FIRED)			
	CFM	TESP	RPM	HP	FAN			COMP MOTOR	COND EAT		EVAP EAT		COOLING CAPACITY		EAT	LAT	CAPACITY	
					NO.	HP	RPM				DB	WB	TOTAL	SENSIBLE			INPUT	OUTPUT
RTU-1	1950	1.0"	995	1	1	2.5	-	16.2 A	95°F	480/3PH	82.4°F	69.1°F	61.1 MBH	41.5 MBH	40°F	93.7°F	160 MBH	130 MBH
RTU-2	3000	1.0"	1218	2	1	3.5	-	25.9 A	95°F	480/3PH	86.4°F	73.9°F	102.3 MBH	62.3 MBH	40°F	89.6°F	200 MBH	160 MBH
RTU-3	4975	1.0"	693	3	2	3.2	-	39.5 A	95°F	480/3PH	88.9°F	75.7°F	167.2 MBH	95.3 MBH	0°F	90°F	500 MBH	400 MBH

NOTES:
1) MANU/MODEL LISTED ARE ONLY USED AS THE BASIS FOR DESIGN. REFER TO SPECIFICATIONS FOR LIST OF ACCEPTABLE MANU/MODELS.
2) PROVIDE UNITS WITH THRU-THE-CURB POWER AND GAS, POWER EXHAUST, CONV OUTLET, COMPARATIVE ENTHALPY ECON (RTU-1 ONLY), INSULATED ROOF CURB, DISC SWITCH AND INTEGRATED CONTROLS.
3) PROVIDE UNITS WITH HIGH EFFICIENCY, 2" DISPOSABLE, PLEATED, MERV8 PARTICULATE FILTERS.
4) PROVIDE RTU #2 AND #3 WITH INTEGRAL DUAL FAN POWERED ERVS, G SERIES 6 CORE AND D SERIES 9 CORE RESPECTIVELY. PROVIDE WITH INSULATED ROOF CURBS. REFER TO ERV SCHEDULE. EXHAUST FAN ON ERV FOR RTU#3 TO BE OF SPARK RESISTANT CONSTRUCTION WITH AIR STREAM COMPONENTS RATED FOR CLASS 1 DIV 1 SERVICE.
5.)PROVIDE UNITS WITH STAINLESS STEEL HEAT EXCHANGERS.

Item 3-14

DRAWING SK-E102 LIGHTING PLAN

Delete 5 type D light fixtures at east facade where sidewalk has been removed. See item 3-1.

Add 1 type D light fixture at north façade between column lines 4 and 5.

Item 3-15

DRAWING T101 TELE COMM PLAN

Reduce number of Wireless Lan to 4. The 4 to be kept are in the following locations; 101 Office, C1A Corridor, 104A Chemical Lab, and 106A Radiation Lab.

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SPECIFICATIONS

Item 3-16

012300 ALTERNATES

Add paragraph 3.1 D:

D. Alternate No. 4: Delete granite curbs. Provide concrete curbs where paving abuts sidewalks. All other driveway and parking lot edges to be curbless.

Add paragraph 3.1 E:

E. Alternate No. 5: Reduce height of architectural rooftop screen and structural supports from 8'-0" to 6'-0".

Add paragraph 3.1 F:

F. Alternate No. 6: Delete architectural rooftop screen entirely, including structural supports.

Add paragraph 3.1 G:

G. Delete automatic door operators at Doors 104B1 and 104B2.

END OF ADDENDUM #3