Dannel P. Malloy
Governor

STATE OF CONNECTICUT
DEPARTMENT OF HOUSING

Evonne M. Klein
Commissioner

Community Development Block Grant Disaster Recovery Program (CDBG-DR)

Owner Occupied Rehabilitation and Rebuilding Program (OORR)

BID PACKAGE

For

Rehabilitation/Reconstruction work for:

Jennifer Wendy Safrye

23 Caroline Street

Milford, CT 06460

Prepared By:

Martinez Couch & Associates, LLC

1084 Cromwell Avenue Suite A-2

Rocky Hill, CT 06067

860-436-4364

Project #: 2503 – 23 Caroline Street

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Section 1 **ADVERTISEMENT FOR BIDS**

Project #___2503 – 23 Caroline Street_____

DOH: _____

The State of Connecticut Department of Housing (DOH) is seeking proposals through a Request for Proposal (RFP) process for the rehabilitation, reconstruction and/or mitigation of residential structures damaged by Superstorm Sandy in compliance with all applicable local, federal, and state statutory requirements with special attention paid to requirements for Community Development Block Grants under the United States Department of Housing and Urban Development ("HUD") Disaster Recovery grant program.

Separated sealed bids for 2503 – 23 Caroline Street will be received by Martinez, Couch and Associates LLC until 4 PM on July 7th, 2016, and then at said office publicly opened and read aloud.

The Information to Bidders, Form of Bid, Form of Contract, Plans, Specifications, and Form of Bid Bond, Performance and Payment Bond, and other contract documents may be examined on the Department of Housing Hurricane Sandy Recover website at www.ct.gov/doh/ and click on the "Hurricane Sandy" link.

Copies of plans may be downloaded directly from the Department of Housing website under bid notices or obtained at the office of Martinez, Couch and Associates LLC located at 1084 Cromwell Avenue Suite A-2, Rocky Hill, CT 06067 upon payment of $50 for each set. Requests for copies of plans shall provide 2 business days notice to Martinez, Couch and Associates, LLC.

DOH reserves the right to waive any informalities or to reject any or all bids.

Each bidder must deposit with his bid, security in the amount, form and subject to the conditions provided in the Information to Bidders.

Attention to bidders is particularly called to the requirements as to conditions of employment to be observed and minimum wages rates to be paid under the contract (if applicable), Section 3, Segregated Facilities, Section 109 and E. O. 11246.

No bidder may withdraw his bid within 30 calendar days after the actual date of the bid opening thereof. Submitted bid values are allowed three percent (3) per annum increase for award by the DOH made beyond ninety calendar (90) days. Cost increases for such periods shall be prorated monthly and calculated by the DOH.

INFORMATION FOR BIDDERS

Receipt and Opening of Bids:

The State of Connecticut Department of Housing (herein called the "DOH"), invites bids on the form attached hereto, all blanks of which must be appropriately filled. Bids will be received by DOH at the office of Martinez, Couch and Associates, LLC until 4 PM on July 7th, 2016 and then at said office publicly opened and read aloud. The envelopes containing the bids must be sealed, addressed to Mr. Richard Couch, P.E. at Martinez, Couch and Associates, LLC and designated as bid for Project 2503 – 23 Caroline Street, Milford, CT.

DOH may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement there considered. NO bidder may withdraw a bid within 30 days after the actual date of the opening thereof. Submitted bid values are allowed three percent (3) per annum increase for award by the DOH made beyond ninety calendar (90) days. Cost increases for such periods shall be prorated monthly and calculated by the DOH.

Mandatory Walk Through: All bidders must attend a mandatory walk through of the property designated above. The date and time of the walk through is set for 2 PM on June 21st, 2016.

Preparation of Bids:

Each bid must be submitted on the prescribed form and accompanied by Certification by Bidder Regarding Equal Employment Opportunity, Form HUD-950.1, and Certification of Bidder Regarding Section 3 and Segregated Facilities. All blank spaces for bid process must be filled in, in ink or typewritten, in both words and figures, and the foregoing Certifications must be fully completed and executed when submitted.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his/her address, and the name of the project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in the bid form.

Subcontracts: The bidder is specifically advised that any person, for, or other party to whom it is proposed to award a subcontract under this contract:

1. Must be acceptable to the DOH after verification by the State of the current eligibility status; and,
2. Must submit Form HUD-950.2, Certification by Proposed Subcontractor Regarding Equal Employment Opportunity and Certification of Proposed Subcontractor Regarding Section 3 and Segregated Facilities. Approval of the proposed subcontractor award cannot be given by the DOH unless and until the proposed subcontractor has submitted the Certifications and/or other evidence showing that it has fully complied with any reporting requirements to which it is or was subject. Although the bidder is not required to attach such Certifications by proposed subcontractors to his/her bid, the bidder is here advised of this requirement so that appropriate action can be taken to prevent subsequent delay in subcontract awards.

Method of Bidding: DOH invites the following bid(s):

Qualifications of Bidder: The DOH may make such investigations as he/she deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the DOH all such information and date for this purpose as the DOH may request. The DOH reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the DOH that such bidder is property qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted. The State's set Contractor Prequalifications are listed in Exhibit G and also are available at the Department of Housing's Hurricane Sandy Recovers website www.ct.gov/doh/ and click on the "Hurricane Sandy" link.

Bid Security: Each bid must be accompanied by an irrevocable letter of credit from the bank, certified check, or bank cashier's check in the amount not less than five percent (5%) of the bid. Bid bonds may be accepted as bid security. Such checks will be returned to all except the three lowest bidders within three days after the opening of bids, and the remaining cash, or checks will be returned promptly after DOH and the accepted bidder have executed the contract, or opening of bids, upon demand or the bidder at any time thereafter, so long as he/she has been notified of the acceptance of his/her bid.

Conditions of Work: Each bidder must inform him/herself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his/her obligation to furnish all material and labor necessary to carry out the provision of his/her contract. Insofar as possible the contractor, in carrying out the work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.

Addenda and Interpretations: No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally.

Every request for such interpretation should be in writing addressed to: Mr. Richard Couch, P.E. at Martinez, Couch and Associates, LLC and to be given consideration must be received at least seven days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instruction will be in the form of written addenda to the specifications which, if issued, will be forwarded by electronic mail and posted on DOH's Hurricane Sandy website to all prospective bidders (at the respective email addresses furnished for such purposes), not later than three days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his/her bid as submitted. All addenda so issued shall become part of the contract documents.

Security for Faithful Performance: Simultaneously with his/her delivery of the executed contract, the Contractor shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract, as specified in the General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the DOH.

Performance and Payment Bonds: A performance and payment bond will be required of the successful bidder (contractor) for 100 percent of the contract price on contracts over $100,000.

Contract Progress Schedule: Each bid shall be accompanied by a Contract Progress Schedule. Such Schedule shall list the bidder's timetable for completion of the contract.

Power of Attorney: Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

Notice of Special Conditions: Attention is particularly called to those parts of the contract documents and specifications which deal with the following:

1. Inspection and testing of materials
2. Insurance requirements
3. Wage rates (if applicable)
4. State allowances

Laws and Regulations: The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

Method of Award-Lowest Qualified Bidder: If at the time this contract is to be awarded, the lowest base bid submitted by a responsible bidder does not exceed the amount of funds then estimated by the DOH as available to finance the contract; the contract will be awarded on the base bid only. If such bid exceeds such amount, the DOH may reject all bids or may award the contract on the base bid combined with such deductible alternatives applied in numerical order in which they are listed in the Form of Bids, as produces a net amount which is within the available funds.

Submitted bid values are allowed three percent (3) per annum increase for award by the DOH made beyond ninety calendar (90) days. Cost increases for such periods shall be prorated monthly and calculated by the DOH.

If the homeowner wishes to select a prequalified bidding contractor other than the lowest and most responsible bidder, said owner is responsible for paying the difference between the lowest bidder and their chosen bidder from their own financing.

Obligation of Bidder: At the time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect to his/her bid.

Safety Standards and Accident Prevention: With respect to all work performed under this contract, the contractor shall:

1. Comply with the safety standards provision of applicable laws, building and construction codes and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, the requirements of the Occupational Safety and Health Act of 1970 (Public Law 91-596), and the requirements of Title 29 of the Code of Federal Regulations, Section 1518 as published in the "Federal Register," Volume 36, No 75, Saturday, April 17, 1971.
2. Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) who may be injured on the job site before the employer has made a standing arrangement for removal of injured persons to a hospital or a doctor's care.

BID FORM

The undersigned, being familiarized with the local conditions affecting the cost of the work and with the Drawings, Specifications, Invitation to Bidders, Instructions to Bidders, General Conditions, Bid Form, Form of Contract and Form of Bonds for Project No. 2503 – 23 Caroline Street, Milford, CT and Addenda No._____and_____ thereto, as prepared by Martinez, Couch and Associates, LLC, Connecticut, and on file in the office of DOH, hereby proposes to furnish all permits, labor, materials, tools, equipment, and related items required for the rehabilitation and reconstruction for said Project No. 2503 – 23 Caroline Street, Milford, CT located at 23 Caroline Street in Milford, CT, State of Connecticut, all in accordance with the Drawings and Specifications, for the sum of:

BASE BID :		Lump Sum Price ($)
Div. 1	General Requirements & Temporary Facilities	
	Fulltime Work Superintendent	
02 41 19	Selective Demolition	
02 82 13	Asbestos Abatement	
03 30 00	Cast in Place Concrete	
05 12 00	Structural Steel	
06 10 00	Rough Carpentry	
06 10 63 06 15 33	Exterior Rough Carpentry/ Wood Decking	
06 18 00	Glue Laminated Construction	
06 20 13	Exterior Finish Carpentry	
06 20 23	Interior Finish Carpentry	
06 61 16	Solid Surface Fabrications	
Div. 07	Thermal and Moisture Protection	
Div. 08	Openings	
Div. 09	Finishes	
Div. 13	Special Construction	
14 41 16	Stairway Chair Lift	
Div. 22	Plumbing	
Div. 23	H.V.A.C	
Div. 26	Electrical	
31 10 00/ 31 20 00	Site Clearing/Earth Moving	
31 25 13	Erosion Controls	
31 66 15	Timber Piles	
31 66 15	Timber Pile Static Load Test	
31 23 19	Dewatering	
32 31 13	Temporary Chain Link Fencing	

Base Bid Total Lump Sum _____

_____Dollars ($)

ADD ALTERNATE 1:	**Lump Sum ($)**
See Alternate 1 in Section 01 23 00 – Alternates. Add/Deduct from Base Bid_____ _____(Dollars)	

ADD ALTERNATE 2:	**Lump Sum ($)**
See Alternate 2 in Section 01 23 00 – Alternates. Add/Deduct from Base Bid_____ _____(Dollars)	

UNIT PRICES:

Unit Prices	**Rate ($/Per)**
Unit Price 1: Authorized Additional Excavation and Replacement	/C.Y.
Unit Price 2: Rock excavation and replacement with satisfactory soil material.	/C.Y.
Unit Price 3: Timber Pile depths beyond length indicated on Sheet S-3	/L.F.

The undersigned agrees to commence the work on a date to be specified in the contract and to complete such work within **150** consecutive calendar days.

The undersigned agrees that if within the period of thirty (30) calendar days after the opening of bids, or when extended to the next work day immediately following said period, notice of the acceptance of this bid shall be mailed, or delivered to him/her at the business address given below, or at any time thereafter before this bid is withdrawn,_____, will within fifteen (15) calendar days thereafter deliver to DOH, where directed, a contract properly executed in such number of counterparts as may be required by said DOH, on the forms annexed, with such changes therein as shall have been made by the DOH, prior to the time named for delivery of this proposal, together with a 100% Performance Bond of a Surety Company, which Surety must be authorized to transact business in the State of Connecticut, and duly qualified therefore, and in the form constituting part of the Specification and a letter indicating those Small/Minority Business Enterprises that will perform work and/or provide materials, equipment or services as part of the contract.

In submitting this bid, it is understood that the right is reserved by the abovementioned DOH to reject any and all bids; and it is agreed that this bid may not be withdrawn for a period of thirty calendar (30) days from the date of bid opening or until the next work day immediately following said period if such period ends on weekend or a State holiday.

Submitted bid values are allowed three percent (3) per annum increase for award by the DOH made beyond ninety calendar (90) days. Cost increases for such periods shall be prorated monthly and calculated by the DOH.

Security in the sum of _____ Dollars ($_____)

in the form of _____is submitted herewith in accordance with the Specifications.

The undersigned bidder agrees to comply with the Section 3 plan included herein and all Federal requirements pertaining to conditions of employment to be observed and minimum wage rates to be paid under the contract, Segregated Facilities, Section 109 and Executive Order 11246.

Attached hereto is an affidavit, in proof that the undersigned has not entered into any collusion with any person in respect to this proposal, or any other proposal, or the submitting of proposals for the above Project. Also attached is a statement of contractor's qualifications, Certification of Bidder Regarding Equal Employment Opportunity, Certification of Bidder Regarding Section 3 and Segregated Facilities.

_____

Date

_____

Firm Name

_____

Address

By: _____

Title: _____

(Bank Letterhead)

BID SECURITY

IRREVOCABLE LETTER OF CREDIT

Dear _____:

We hereby authorize you to draw on us to the aggregate amount of $_____ (five percent of the amount of the bid) in the event _____ withdraws its bid within the bid holding period, or upon being awarded a contract, fails to provide adequate performance and payment security as required by the Contract documents.

Such drafts must be accompanied by the following document:

A written certification by you that the proceeds of any draft drawn on this Letter of Credit will be used solely to indemnify the DOH against loss or damage suffered by it resulting from any act or omission described in the above paragraph.

We warrant to you that all drafts drawn in compliance with the terms of this Letter of Credit will be unconditionally and duly honored upon delivery of the documentation specified and presented to this office.

This Letter of Credit is irrevocable and shall be in full force and effect until notification in writing is received from you that a contract for Project 2503 – 23 Caroline Street, Milford, CT has been awarded and executed, whereupon this Letter of Credit shall automatically be canceled.

This Letter of Credit shall not be modified or amended except upon the written agreement of this Bank and the DOH.

Sincerely yours,

President

FORM OF NON-COLLUSIVE AFFIDAVIT

AFFIDAVIT

State of _____)

County of _____)

_____, being first duly sworn, deposes and says:

That he/she is,_____ the party making the foregoing proposal for bid, that such proposal or bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived or agreed, directly or indirectly, with any bidder or person, to put in a sham bid or to refrain from bidding, and has not, in any manner, directly or indirectly, sought by agreement or collusion, or communication or conference, with any person, to fix the bid price of affiant or of any other bidder, or to fix any overhead, profit or cost element of said bid price, or of that of any other bidder, or to secure any advantage against DOH or any person interested in the proposed contract, and that all statements in said proposal for bid are true.

Project No. 2503 – 23 Caroline Street, Milford, CT

Location 23 Caroline Street, Milford, CT

_____

Signature

_____

Name and Title

_____

Date

(Signature should be notarized.)

BIDDER'S CERTIFICATION OF ELIGIBILITY

By the submission of this bid, the bidder certifies that to the best of its knowledge and belief, neither it, nor any person or firm which has an interest in the bidder's firm, nor any of the bidder's subcontractors, is ineligible to:

(1) Be awarded contracts by any agency of the United States Government or HUD; or,

(2) Participate in HUD programs pursuant to 24 CFR part 24.

_____

(Name of Bidder)

_____

(Address)

BY: _____

Title: _____

NOTE: This certification is a material representation of fact upon which reliance is placed when making award. If it is later determined that the bidder knowingly rendered an erroneous certification, the contract may be terminated for default, and the bidder may be debarred or suspended from participation in HUD programs and other Federal programs.

CERTIFICATION OF GENERAL BIDDERS ON CDBG-DR CONSTRUCTION PROJECTS

I. CERTIFICATION REGARDING HEALTH AND SAFETY

The undersigned hereby certifies that he/she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least ten hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

II. CERTIFICATION REGARDING NON-COLLUSION AND DEBARMENT

The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies that neither he/she nor any firm, corporation, partnership or association in which he/she has a substantial interest is designated as an ineligible contractor by the Comptroller General of the United States pursuant to Section 5.6 (b) of the Regulations of the Secretary of Labor, Part 5 (29 CFR, Part 5), or pursuant to Section 3 (a) of the Davis-Bacon Act, as amended (40 USC 276a). The undersigned further certifies that said undersigned is not presently debarred from doing public construction work in the State of Connecticut.

Date: _____

_____

Name of General Bidder

By _____

Signature

_____

Print name and Title

_____

Business Address

_____

Street, Address City and State

OSHA-10 OSHA-10

CERTIFICATION OF SUB- BIDDERS (IF ANY) ON CDBG-DR CONSTRUCTION PROJECTS

I. CERTIFICATION REGARDING HEALTH AND SAFETY

The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupation Safety and Health Administration that is at least ten hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards of subcontracts subject to section 44F.

II. CERTIFICATION REGARDING NON-COLLUSION AND DEBARMENT

The undersigned further certifies under penalties of perjury that this subbid is in all responses bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies that neither he/she nor any firm, corporation, partnership or association in which he/she has a substantial interest is designated as an ineligible contractor by the Comptroller General of the United States pursuant to Section 5.6 (b) of the Regulations of the Secretary of Labor, Part 5 (29 CFR, Part 5), or pursuant to Section 3 (a) of the Davis-Bacon Act, as amended (40 USC 276a). The undersigned further certifies that said undersigned is not presently debarred from doing public construction work in the State of Connecticut.

Date _____

_____

Name of Sub-bidder

By _____

Signature

_____

Print Name and Title

_____

Business Name

_____

Street Address, City and State

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned,
_____ _____as Principal,
and _____Surety, are hereby held and firmly bound unto
_____ as DOH in the penal sum of
_____ , for the payment of which, well and truly be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns. Signed this _____ day of _____, 2015.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted to _____ a certain Bid, attached hereto and hereby made a part hereof to enter into a contract in writing, for the _____

_____

NOW, THEREFORE,

1. If said Bid shall be rejected, or in the alternate,
2. If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with the Bid) and shall furnish a bond for this faithful performance of said contract, and for the payment of all person performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid,

Then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any or all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time which the DOH may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

_____ (L.S)
Principal

_____
Surety

SEAL By: _____

PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: THAT we,
_____, as

PRINCIPAL, and_____ , as SURETY,

are held firmly bound unto_____

_____hereinafter called the DOH, in the penal sum of_____

_____ ($_____), for the payment

of which sum we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally.

WHEREAS, Principal has entered into a certain Contract with DOH, dated _____, a copy of which is hereto attached and made a part hereof.

NOW, THEREFORE, the condition of this obligation is such that if the Principal shall in all respects fully perform the Contract and all duly authorized modifications thereof, during its original term and any extensions thereof that may be granted and during any guaranty period for which the Contract provides, and if the Principal shall fully satisfy all claims arising out of the prosecution of the work under the Contract and shall fully indemnify DOH for all expenses which it may incur by reason of such claims, including its attorney's fees and court costs, and if the Principal shall make full payment to all persons supplying labor, services, materials, or equipment in the prosecution of the work under the Contract, in default of which such persons shall have a direct right of action hereupon; and if the Principal shall pay or cause to be paid all sales and use taxes payable as a result of the performance of the Contract as well as payment of gasoline and special motor fuel taxes in the performance of the Contract and all motor vehicle fees required for commercial motor vehicles used in connection with the performance of the Contract, then this obligation shall be void; otherwise, it shall remain in full force and effect. No modification of the Contract or extension of the term thereof, nor any forbearance on the part of DOH shall in any way release the Principal or the Surety from liability hereunder. Notice to the Surety of any such modification, extension, or forbearance is hereby waived.

IN WITNESS WHEREOF, the aforesaid Principal and Surety have executed this instrument and affixed their seals hereto, this _____ day of _____.

_____ _____

Principal Surety

_____ _____

Name and Title

(Signatures must be notarized.)

(Power-of-Attorney for person signing for Surety Company must be attached to bond.)

The rate of premium on this bond is $_____ per thousand.

The total amount of premium charge is $_____.

(The above is to be filled in by Surety Company.)

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the

_____ Secretary of the corporation

named as Principal in the foregoing bond; that _____, who signed the bond on behalf of the Principal, was then _____ of said corporation; that I know his/her signature thereto is genuine; and that said bond was fully signed, sealed, and attested for and in behalf of said corporation by authority of its governing body.

SUBCONTRACTOR IDENTIFICATION

(Provide additional forms for more subcontractors, as needed prior to execution.)

This form is a part of your bid package and must be submitted along with the itemized and formal bid forms at the time of the bid opening. Failure to submit a completed document could result in the disqualification of your bid.

Name of Subcontractor: _____

Address: _____
Trade: _____
Hourly Wage: _$_____ Full Contract Price: _$_____
Federal Tax# or SSN #: _____
Male Owned Business _____ Female Owned Business_____
Is he/she of Hispanic or Latino ethnicity? Yes_____ No_____
Race: (Please check one)
____White ____American Indian/Alaskan Native
____Black/African American ____Hasidic Jew
____Asian/Pacific American

Name of Subcontractor: _____
Address: _____
Trade: _____
Hourly Wage: _$_____ Full Contract Price: _$_____
Federal Tax# or SSN #: _____
Male Owned Business _____ Female Owned Business_____
Is he/she of Hispanic or Latino ethnicity? Yes_____ No_____
Race: (Please check one)
____White ____American Indian/Alaskan Native
____Black/African American ____Hasidic Jew
____Asian/Pacific American

Name of Subcontractor: _____
Address: _____
Trade: _____
Hourly Wage: _$_____ Full Contract Price: _$_____
Federal Tax# or SSN #: _____
Male Owned Business _____ Female Owned Business_____
Is he/she of Hispanic or Latino ethnicity? Yes_____ No_____
Race: (Please check one)
____White ____American Indian/Alaskan Native
____Black/African American ____Hasidic Jew
____Asian/Pacific American

_____ _____
Contractor's Signature Date

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY

INSTRUCTIONS

This certification is required pursuant to Executive Order 11246 (30 F R 12319-25). The implementing rules and regulations provide that any bidder or prospective contractor, or any of their proposed subcontractors shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicates that the bidder has not filed a compliance report due under applicable instructions, such bidder shall be required to submit a compliance report within seven calendar days after bid opening. No contract shall be awarded unless such report is submitted.

CERTIFICATION OF BIDDER

Name and address of Bidder (include zip code)

---

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause.
   ( ) YES ( ) NO

2. Compliance reports were required to be filed in connection with such contract or subcontract.
   ( ) YES ( ) NO

3. Bidder has filed all compliance reports due under applicable instructions, including SF.100.
   ( ) YES ( ) NO ( ) NOT REQUIRED

4. Have you ever seen or are you being considered for sanction due to violation of Executive Order 11246, as amended?
   ( ) YES ( ) NO

NAME AND TITLE OF SIGNER (Please type.)

_____ _____

SIGNATURE DATE

CERTIFICATION OF BIDDERS REGARDING SECTION 3 AND SEGREGATED FACILITIES

Project Name:

Project No:

Name of Prime Contractor:

The undersigned hereby certifies that:

1. Section 3 provisions are included in the Contract
2. A written Section 3 plan was prepared and submitted as part of the bid proceedings (if bid equals or exceeds $100,000.00)
3. No segregated facilities will be maintained.

_____

Name and Title of Signer (Print or Type)

_____ _____

Signature Date

CONTRACTOR

Section 3 Plan Format

_____ agrees to implement the following specific affirmative action steps directed at increasing the utilization of lower income residents and business within the _____.

A. To ascertain from the DOH the exact boundaries of the Section 3 covered project area and where advantageous, seek the assistance of local officials in preparing and implementing the affirmative action plans.
B. To attempt to recruit from within the city the necessary number of lower income residents through: local advertising media, signs placed at the proposed site for the project, and community organizations and public or private institutions operating within or serving the project area such as Service Employment and Redevelopment (SER), Opportunities Industrialization Center (OIC), Urban League, Concentrated Employment Program, Hometown Plan, or the U. S. Employment Service.
C. To maintain a list of all lower income residents who have applied either on their own or on referral from any source, and to employ such persons, if otherwise eligible and if a vacancy exists.
D. To insert this Section 3 plan in all bid documents, and to require all bidders on subcontracts to submit a Section 3 Affirmative Action Plan including utilization goals and the specific steps planned to accomplish these goals.
E. To insure that contracts which are typically let on a negotiated rather than a bid basis in areas other than Section 3 covered project areas, are also let on a negotiated basis, wherever feasible, when let in a Section 3 covered project area.
F. To formally contact unions, subcontractors and trade associations to secure their cooperation for this program.
G. To insure that all appropriated project area business concerns are notified or pending subcontractural opportunities
H. To maintain records, including copies of correspondence, memoranda, etc., that document all above affirmative action steps have been taken.
I. To appoint or recruit an executive official of the company or agency as Equal Opportunity Officer to coordinate the implementation of the Section 3 plan.
J. To list on Table A, information related to subcontracts to be awarded.
K. To list on Table B, all projected workforce needs for all phases of this project by occupation, trade, skill level and number of positions.

As officers and representatives of _____

We, the undersigned, have read and fully agree to this Affirmative Action Plan, and become a party to the full implementation of this program.

_____	_____	_____
Signature	Title	Date

Loans, grants, contracts and subsidies for less than $100,000.00 will be exempt.

Table A

Proposed Subcontracts Breakdown

For Period Covering _____, 20____ Through _____, 20____
(Duration of CDBG-DR OORR Assisted Project)

Column 1	*Column 2*	*Column3*	*Column 4*	*Column 5*
Type of Contract (Business of Profession)	Total Number of Contracts	Total Approximate Dollar Amount	Estimated Number of Contracts to Project Area Businesses*	Estimated Dollar Amount to Project Area Businesses*

*The Project Area is defined as the Town/City boundaries in which the assisted project resides.

_____
Company

_____ _____
Project Name/Residence Project Number

_____ _____
EEO Officer or Designee's Signature Date

Table B

Estimated Project Workforce Breakdown

Column 1	*Column 2*	*Column 3*	*Column 4*	*Column 5*
Job Category	Total Estimated Population	No. Positions Currently Occupied by Permanent Employees	No. Positions Not Currently Occupied	No. Positions to be filled with LIPAR*
Officers/Supervisors				
Professionals				
Technicians				
Housing Sales/Rental Management				
Office Clerical				
Service Workers				
Others				
TRADE:				
Journeymen				
Helpers				
Apprentices				
Maximum No. of Trainees				
Others				
TRADE:				
Journeymen				
Helpers				
Apprentices				
Maximum No. of Trainees				
Others				
TRADE:				
Journeymen				
Helpers				
Apprentices				
Maximum No. of Trainees				
Others				
Total				

**Lower Income Project Area Residents. Individuals residing within the project area whose family income does not exceed 80% of the area median income in the SMSA.*

_____

Company

Green Building Standards Checklist

HUD CPD Green Building Retrofit Checklist

The CPD Green Retrofit Checklist promotes energy efficiency and green building practices for residential retrofit projects. Grantees must follow the checklist in its entirety and apply all measures within the Checklist to the extent applicable to the particular building type being retrofitted. The phrase "when replacing" in the Checklist refers to the mandatory replacement with specified green improvements, products, and fixtures only when replacing those systems during the normal course of the retrofit.

WATER AND ENERGY CONSERVATION MEASURES

X

Water-Conserving Fixtures
Install or retrofit water conserving fixtures in any unit and common facility, use the following specifications: Toilets-- 1.28 gpf; Urinals-- 0.5 gpf; Showerheads-- 2.0 gpm; Kitchen faucets-- 2.0 gpm; and Bathroom faucets-- 1.5gpm. [gpf = gallons per flush; gpm = gallons per minute]

N/A

ENERGY STAR Appliances
Install ENERGY STAR-labeled clothes washers, dishwashers, and refrigerators, if these appliance categories are provided in units or common areas.

x

Air Sealing: Building Envelope
Seal all accessible gaps and penetrations in the building envelope. If applicable, use low VOC caulk or foam.

X

Insulation: Attic (if applicable to building type)
For attics with closed floor cavities directly above the conditioned space, blow in insulation per manufacturer's specifications to a minimum density of 3.5 Lbs. per cubic foot (CF). For attics with open floor cavities directly above the conditioned space, install insulation to meet or exceed IECC levels.

N/A

Insulation: Flooring (if applicable to building type)
Install ≥ R-19 insulation in contact with the subfloor in buildings with floor systems over vented crawl spaces. Install a 6-mil vapor barrier in contact with 100% of the floor of the crawl space (the ground), overlapping seams and piers at least 6 inches.

X

Duct Sealing (if applicable to building type)
In buildings with ducted forced-air heating and cooling systems, seal all penetrations of the air distribution system to reduce leakage in order to meet or exceed ENERGY STAR for Homes' duct leakage standard.

X

Air Barrier System
Ensure continuous unbroken air barrier surrounding all conditioned space and dwelling units. Align insulation completely and continuously with the air barrier.

N/A

Radiant Barriers: Roofing
When replacing or making a substantial repair to the roof, use radiant barrier sheathing or other radiant barrier material; if economically feasible, also use cool roofing materials.

X	**Windows** When replacing windows, install geographically appropriate ENERGY STAR rated windows.
X	**Sizing of Heating and Cooling Equipment** When replacing, size heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manuals, Parts J and S, or 2012 ASHRAE Handbook--HVAC Systems and Equipment or most recent edition.
X	**Domestic Hot Water Systems** When replacing domestic water heating system(s), ensure the system(s) meet or exceed the efficiency requirements of ENERGY STAR for Homes' Reference Design. Insulate pipes by at least R-4.
X	**Efficient Lighting: Interior Units** Follow the guidance appropriate for the project type: install the ENERGY STAR Advanced Lighting Package (ALP); ***OR*** follow the ENERGY STAR MFHR program guidelines, which require that 80% of installed lighting fixtures within units must be ENERGY STAR-qualified or have ENERGY STAR-qualified lamps installed; ***OR*** when replacing, new fixtures and ceiling fans must meet or exceed ENERGY STAR efficiency levels.
N/A	**Efficient Lighting: Common Areas and Emergency Lighting** (if applicable to building type) Follow the guidance appropriate for the project type: use ENERGY STAR-labeled fixtures or any equivalent high-performance lighting fixtures and bulbs in all common areas; ***OR*** when replacing, new common space and emergency lighting fixtures must meet or exceed ENERGY STAR efficiency levels. For emergency lighting, if installing new or replacing, all exist signs shall meet or exceed LED efficiency levels and conform to local building codes.
X	**Efficient Lighting: Exterior** Follow the guidance appropriate for the project type: install ENERGY STAR-qualified fixtures or LEDs with a minimum efficacy of 45 lumens/watt; ***OR*** follow the ENERGY STAR MFHR program guidelines, which require that 80% of outdoor lighting fixtures must be ENERGY STAR-qualified or have ENERGY STAR-qualified lamps installed; ***OR*** when replacing, install ENERGY STAR compact fluorescents or LEDs with a minimum efficacy of 45 lumens/watt.

INDOOR AIR QUALITY

N/A	**Air Ventilation: Single Family and Multifamily** (three stories or fewer) Install an in-unit ventilation system capable of providing adequate fresh air per ASHRAE 62.2 requirements.
N/A	**Air Ventilation: Multifamily** (four stories or more) Install apartment ventilation systems that satisfy ASHRAE 62.2 for all dwelling units and common area ventilation systems that satisfy ASHRAE 62.1 requirements. If economically feasible, consider heat/energy recovery for 100% of corridor air supply.
N/A	**Composite Wood Products that Emit Low/No Formaldehyde**

Composite wood products must be certified compliant with California 93120. If using a composite wood product that does not comply with California 93120, all exposed edges and sides must be sealed with low-VOC sealants.

N/A **Environmentally Preferable Flooring**
When replacing flooring, use environmentally preferable flooring, including the FloorScore certification. Any carpet products used must meet the Carpet and Rug Institute's Green Label or Green Label Plus certification for carpet, pad, and carpet adhesives.

X **Low/No VOC Paints and Primers**
All interior paints and primers must be less than or equal to the following VOC levels: Flats--50 g/L; Non-flats--50 g/L; Floor--100 g/L. [g/L = grams per liter; levels are based on a combination of the Master Painters Institute (MPI) and GreenSeal standards.]

X **Low/No VOC Adhesives and Sealants**
All adhesives must comply with Rule 1168 of the South Coast Air Quality Management District. All caulks and sealants must comply with regulation 8, rule 51, of the Bay Area Air Quality Management District.

X **Clothes Dryer Exhaust**
Vent clothes dryers directly to the outdoors using rigid-type duct work.

X **Mold Inspection and Remediation**
Inspect the interior and exterior of the building for evidence of moisture problems. Document the extent and location of the problems, and implement the proposed repairs according to the Moisture section of the EPA Healthy Indoor Environment Protocols for Home Energy Upgrades.

X **Combustion Equipment**
When installing new space and water-heating equipment, specify power-vented or direct vent combustion equipment.

X **Mold Prevention: Water Heaters**
Provide adequate drainage for water heaters that includes drains or catch pans with drains piped to the exterior of the dwelling.

X **Mold Prevention: Surfaces**
When replacing or repairing bathrooms, kitchens, and laundry rooms, use materials that have durable, cleanable surfaces.

N/A **Mold Prevention: Tub and Shower Enclosures**
When replacing or repairing tub and/or shower enclosures, use non-paper-faced backing materials such as cement board, fiber cement board, or equivalent in bathrooms.

N/A **Integrated Pest Management**
Seal all wall, floor, and joint penetrations with low-VOC caulking or other appropriate sealing methods to prevent pest entry. [If applicable, provide training to multifamily buildings staff.]

X **Lead-Safe Work Practices**

For properties built before 1978, if the project will involve disturbing painted surfaces or cleaning up lead contaminated dust or soil, use certified renovation or lead abatement contractors and workers using lead-safe work practices and clearance examinations consistent with the more stringent of EPA's Renovation, Repair, and Painting Rule and HUD's Lead Safe Housing Rule.

N/A

Radon Testing and Mitigation (if applicable based on building location)
For buildings in EPA Radon Zone 1 or 2, test for radon using the current edition of American Association of Radon Scientists and Technologists (AARST)'s Protocols for Radon Measurement in Homes Standard for Single-Family Housing or Duplexes, or AARST's Protocol for Conducting Radon and Radon Decay Product Measurements in Multifamily Buildings. To install radon mitigation systems in buildings with radon level of 4 pCi/L or more, use ASTM E 2121 for single-family housing or duplexes, or AARST's Radon Mitigation Standards for Multifamily Buildings. For new construction, use AARST's Reducing Radon in New Construction of 1 & 2 Family Dwellings and Townhouses, or ASTM E 1465.

Section 2: General Conditions for Construction Contracts

Based on HUD form 5370

Applicability. This form is applicable to any construction/development contract greater than $100,000.

This form includes those clauses required by OMB's common rule on grantee procurement, implemented at HUD in 24 CFR 85.36, and those requirements set forth in Section 3 of the Housing and Urban Development Act of 1968 and its amendment by the Housing and Community Development Act of 1992, implemented by HUD at 24 CFR Part 135.

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1. Definitions

(a) "Architect" means the person or other entity engaged by DOH to perform architectural, engineering, design, and other services related to the work as provided for in the contract. When DOH uses an engineer to act in this capacity, the terms "architect" and "engineer" shall be synonymous. The Architect shall serve as a technical representative of the Contracting Officer. The Architect's authority is as set forth elsewhere in this contract.

(b) "Contract" means the contract entered into between DOH and the Contractor. It includes the forms of Bid, the Bid Bond, the Performance and Payment Bond or Bonds or other assurance of completion, the Certifications, Representations, and Other Statements of Bidders (form HUD-5370), these General Conditions of the Contract for Construction (form HUD-5370), the applicable wage rate determinations from the U.S. Department of Labor (when applicable), any special conditions included elsewhere in the contract, the specifications, and drawings. It includes all formal changes to any of those documents by addendum, change order, or other modification.

(c) "Contracting Officer" means the person delegated the authority by DOH to enter into, administer, and/or terminate this contract and designated as such in writing to the Contractor. The term includes any successor Contracting Officer and any duly authorized representative of the Contracting Officer also designated in writing. The Contracting Officer shall be deemed the authorized agent of DOH in all dealings with the Contractor.

(d) "Contractor" means the person or other entity entering into the contract with DOH to perform all of the work required under the contract.

(e) "Drawings" means the drawings enumerated in the schedule of drawings contained in the Specifications and as described in the contract clause entitled Specifications and Drawings for Construction herein.

(f) "DOH" means the State Department of Housing including the Commissioner, or any other person designated to act on its behalf.

(g) "HUD" means the United States of America acting through the Department of Housing and Urban Development including the Secretary, or any other person designated to act on its behalf. HUD has agreed, subject to the provisions of an Annual Contributions Contract (ACC), to provide financial assistance to DOH, which includes assistance in financing the work to be performed under this contract. As defined elsewhere in these General Conditions or the contract documents, the determination of HUD may be required to authorize changes in the work or for release of funds to DOH for payment to the Contractor. Notwithstanding HUD's role, nothing in this contract shall be construed to create any contractual relationship between the Contractor and HUD.

(h) "Grantee" means the State of Connecticut Department of Housing (DOH).

(i) "Homeowner" means the owner(s) of the real property for which project is taking place and is a party to the contract.

(j) "Project" means the entire project, whether construction or rehabilitation, the work for which is provided for in whole or in part under this contract.

(k) "Specifications" means the written description of the technical requirements for construction and includes the criteria and tests for determining whether the requirements are met.

(l) "Work" means materials, workmanship, and manufacture and fabrication of components.

2. Contractor's Responsibility for Work

(a) The Contractor shall furnish all necessary labor, materials, tools, equipment, and transportation necessary for performance of the work. The Contractor shall also furnish all necessary water, heat, light, and power not made available to the Contractor by the Homeowner pursuant to the clause entitled Access to the Premises Section 5.3 of Homeowner Rehabilitation Agreement herein.

(b) The Contractor shall perform on the site, and with its own organization, work equivalent to at least 15 percent of the total amount of work to be performed under the order. This percentage may be reduced by a supplemental agreement to this order if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of DOH.

(c) At all times during performance of this contract and until the work is completed and accepted, the

Contractor shall directly superintend the work or assign and have on the work site a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

(d) The Contractor shall be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. The Contractor shall hold and save DOH, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

(e) The Contractor shall lay out the work from base lines and bench marks indicated on the drawings and be responsible for all lines, levels, and measurements of all work executed under the contract. The Contractor shall verify the figures before laying out the work and will be held responsible for any error resulting from its failure to do so.

(f) The Contractor shall confine all operations (including storage of materials) on Homeowner premises to areas authorized or approved by the Contracting Officer.

(g) The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. After completing the work and before final inspection, the Contractor shall (1) remove from the premises all scaffolding, equipment, tools, and materials (including rejected materials) that are not the property of the Homeowner and all rubbish caused by its work; (2) leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer; (3) perform all specified tests; and, (4) deliver the installation in complete and operating condition.

(h) The Contractor's responsibility will terminate when all work has been completed, the final inspection made, and the work accepted by the Contracting Officer. The Contractor will then be released from further obligation except as required by the warranties specified elsewhere in the contract.

3. Architect's Duties, Responsibilities, and Authority

(a) The Architect for this contract, and any successor, shall be designated in writing by the Contracting Officer.

(b) The Architect shall serve as the Contracting Officer's technical representative with respect to architectural, engineering, and design matters related to the work performed under the contract. The Architect may provide direction on contract performance. Such direction shall be within the scope of the contract and may not be of a nature which: (1) institutes additional work outside the scope of the contract; (2) constitutes a change as defined in the Changes clause herein; (3) causes an increase or decrease in the cost of the contract; (4) alters the Construction Progress Schedule; or (5) changes any of the other express terms or conditions of the contract.

(c) The Architect's duties and responsibilities may include but shall not be limited to:

(1) Making periodic visits to the work site, and on the basis of his/her on-site inspections, issuing written reports to DOH which shall include all observed deficiencies. The Architect shall file a copy of the report with the Contractor's designated representative at the site;

(2) Making modifications in drawings and technical specifications and assisting the Contracting Officer in the preparation of change orders and other contract modifications for issuance by the Contracting Officer;

(3) Reviewing and making recommendations with respect to - (i) the Contractor's construction progress schedules; (ii) the Contractor's shop and detailed drawings; (iii) the machinery, mechanical and other equipment and materials or other articles proposed for use by the Contractor; and, (iv) the Contractor's price breakdown and progress payment estimates; and,

(4) Assisting in inspections, signing Certificates of Completion, and making recommendations with respect to acceptance of work completed under the contract.

4. Other Contracts

DOH may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with DOH employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by DOH employees

5. Pre-construction Conference and Notice to Proceed

(a) Upon scheduling of the contract execution, and prior to the commencement of work, the Contractor shall attend a preconstruction conference with representatives of DOH, its Architect, and other interested parties convened by DOH. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract. DOH or its Architect will provide the Contractor with the date, time, and place of the conference.

(b) The contractor shall begin work upon receipt of a written Notice to Proceed from the Contracting Officer or designee. The Contractor shall not begin work prior to receiving such notice. Such notice shall not be prior to the homeowners three (3) day Notice of Cancellation period.

6. Site Investigation and Conditions Affecting the Work

(a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to, (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads;(3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by DOH, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to DOH.

(b) DOH assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by DOH. Nor does DOH assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in the contract.

7. Differing Site Conditions

(a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site(s), of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.

(b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. Work shall not proceed at the affected site, except at the Contractor's risk, until the Contracting Officer has provided written instructions to the Contractor. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the

work under this contract, whether or not changed as a result of the conditions, the Contractor shall file a claim in writing to DOH within ten days after receipt of such instructions and, in any event, before proceeding with the work. An equitable adjustment in the contract price, the delivery schedule, or both shall be made under this clause and the contract modified in writing accordingly.

(c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.

(d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

8. Specifications and Drawings for Construction

(a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings 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 Contracting Officer 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 Contracting Officer, unless otherwise expressly stated.

(c) 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 drawings 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”.

(d) “Shop drawings” means drawings, submitted to DOH by the Contractor, subcontractor, or any lower tier subcontractor, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials of equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract. DOH may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with other contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor’s approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate DOH’s reasons therefore. Any work done before such approval shall be at the Contractor’s risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Architect approves any such variation and the Contracting Officer concurs, the Contracting Officer shall issue an appropriate modification to the contract, except that, if the variation is minor or does not involve a

change in price or in time of performance, a modification need not be issued.

(g) It shall be the responsibility of the Contractor to make timely requests of DOH for such large scale and full size drawings, color schemes, and other additional information, not already in his possession, which shall be required in the planning and production of the work. Such requests may be submitted as the need arises, but each such request shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay.

(h) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by DOH and one set will be returned to the Contractor. As required by the Contracting Officer, the Contractor, upon completing the work under this contract, shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the work is completed and accepted.

(i) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all shop drawings prepared by subcontractors are submitted to the Contracting Officer.

9. Material and Workmanship

(a) All equipment, material, and articles furnished under this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the contract to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of, and as approved by the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

(b) Approval of equipment and materials.

(1) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

(2) When required by the specifications or the Contracting Officer, the Contractor shall submit appropriately marked samples (and certificates related to them) for approval at the Contractor's expense, with all shipping charges prepaid. The Contractor shall label, or otherwise properly mark on the container, the material or product represented, its place of origin, the name of the producer, the Contractor's name, and the identification of the construction project for which the material or product is intended to be used.

(3) Certificates shall be submitted in triplicate, describing each sample submitted for approval and certifying that the material, equipment or accessory complies with contract requirements. The certificates shall include the name and brand of the product, name of manufacturer, and the location where produced.

(4) Approval of a sample shall not constitute a waiver of DOH right to demand full compliance with contract requirements. Materials, equipment and accessories may be rejected for cause even though samples have been approved.

(5) Wherever materials are required to comply with recognized standards or specifications, such specifications shall be accepted as establishing the technical qualities and testing methods, but

shall not govern the number of tests required to be made nor modify other contract requirements. The Contracting Officer may require laboratory test reports on items submitted for approval or may approve materials on the basis of data submitted in certificates with samples. Check tests will be made on materials delivered for use only as frequently as the Contracting Officer determines necessary to insure compliance of materials with the specifications. The Contractor will assume all costs of retesting materials which fail to meet contract requirements and/or testing materials offered in substitution for those found deficient.

(6) After approval, samples will be kept in the Project office until completion of work. They may be built into the work after a substantial quantity of the materials they represent has been built in and accepted.

(c) Requirements concerning lead-based paint. The Contractor shall comply with the requirements concerning lead-based paint contained in the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4821-4846) as implemented by 24 CFR Part 35, HUD's Lead Safe Housing Rule and EPA's Repair Renovation, and Painting Rule at 40 CFR.80 Subpart E.

10. Permits and Codes

The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules and regulations. Notwithstanding the requirement of the Contractor to comply with the drawings and specifications in the contract, all work installed shall comply with all applicable codes and regulations as amended by any waivers. Before installing the work, the Contractor shall examine the drawings and the specifications for compliance with applicable codes and regulations bearing on the work and shall immediately report any discrepancy it may discover to the Contracting Officer. Where the requirements of the drawings and specifications fail to comply with the applicable code or regulation, the Contracting Officer shall modify the contract by change order pursuant to the clause entitled Changes herein to conform to the code or regulation.

(a) The Contractor shall secure and pay for all permits, fees, and licenses necessary for the proper execution and completion of the work. Where DOH can arrange for the issuance of all or part of these permits, fees and licenses, without cost to the Contractor, the contract amount shall be reduced accordingly.

11. Health, Safety, and Accident Prevention

(a) In performing this contract, the Contractor shall:
   (1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;
   (2) Protect the lives, health, and safety of other persons;
   (3) Prevent damage to property, materials, supplies, and equipment; and,
   (4) Avoid work interruptions.

(b) For these purposes, the Contractor shall:
   (1) Comply with regulations and standards issued by the Secretary of Labor at 29 CFR Part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96), 40 U.S.C. 3701 et seq.; and
   (2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.

(c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29

CFR Part 1904.

(d) The Contracting Officer shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

(e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as DOH, the Secretary of Housing and Urban Development, or the Secretary of Labor shall direct as a means of enforcing such provisions.

12. Temporary Heating

The Contractor shall provide and pay for temporary heating, covering, and enclosures necessary to properly protect all work and materials against damage by dampness and cold, to dry out the work, and to facilitate the completion of the work. Any permanent heating equipment used shall be turned over to the Homeowner in the condition and at the time required by the specifications.

13. Availability and Use of Utility Services

(a) The Homeowner shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. The Contractor shall carefully conserve any utilities furnished without charge.

(b) The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines. Before final acceptance of the work by DOH, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

14. Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed under this contract, and which do not unreasonably interfere with the work required under this contract.

(b) The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during performance of this contract, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(c) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. Prior to disturbing the ground at the construction site, the Contractor shall ensure that all underground utility lines are clearly marked.

(d) The Contractor shall shore up, brace, underpin, secure, and protect as necessary all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be affected by the excavations or other operations connected with the construction of the project.

(e) Any equipment temporarily removed as a result of work under this contract shall be protected, cleaned, and replaced in the same condition as at the time of award of this contract.

(f) New work which connects to existing work shall correspond in all respects with that to which it connects and/or be similar to existing work unless otherwise required by the specifications.

(g) No structural members shall be altered or in any way weakened without the written authorization of the Contracting Officer, unless such work is clearly specified in the plans or specifications.

(h) If the removal of the existing work exposes discolored or unfinished surfaces, or work out of alignment, such surfaces shall be refinished, or the material replaced as necessary to make the continuous work uniform and harmonious. This, however, shall not be construed to require the refinishing or reconstruction of dissimilar finishes previously exposed, or finished surfaces in good condition, but in different planes or on different levels when brought together by the removal of intervening work, unless such refinishing or reconstruction is specified in the plans or specifications.

(i) The Contractor shall give all required notices to any adjoining or adjacent property owner or other party before the commencement of any work.

(j) The Contractor shall indemnify and save harmless DOH from any damages on account of settlement or the loss of lateral support of adjoining property, any damages from changes in topography affecting drainage, and from all loss or expense and all damages for which DOH may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

(k) The Contractor shall repair any damage to vegetation, structures, equipment, utilities, or improvements, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

15. Temporary Buildings and Transportation of Materials

(a) Temporary buildings (e.g., storage sheds, shops, offices, sanitary facilities) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to DOH. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

(b) The Contractor shall, as directed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. 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.

16. Clean Air and Water

The contactor shall comply with the Clean Air Act, as amended, 42 USC 7401 et seq., the Federal Water Pollution Control Water Act, as amended, 33 U.S.C. 1251 et seq., and standards issued pursuant thereto in the facilities in which this contract is to be performed.

17. Energy Efficiency

The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub.L. 94-163) for the State in which the work under the contract is performed.

18. Green Building Standards

DOH will require that all replacement of residential properties, including reconstruction and new construction of substantially damaged properties meet the Enterprise Green Communities Standard.

For those buildings that are non-substantially damaged, DOH will require that they be rehabilitated following the HUD CPD Green Buildings Retrofit Checklist. The requirement for rehabilitation is that to the extent possible strive to meet the checklist standard where there are Energy Star, Water Sense and Federal Management Program-designed products available.

DOH strongly encourages the use of green infrastructure techniques to mitigate against storm water run-off and flooding and incorporate EPA's Green Infrastructure resources to the extent feasible.

19. Inspection and Acceptance of Construction

(a) Definitions. As used in this clause -
   (1) "Acceptance" means the act of an authorized representative of DOH by which DOH approves of the work performed under this contract. Acceptance may be partial or complete.
   (2) "Inspection" means examining and testing the work performed under the contract (including, when appropriate, raw materials, equipment, components, and intermediate assemblies) to determine whether it conforms to contract requirements.
   (3) "Testing" mean that element of inspection that determines the properties or elements, including functional operation of materials, equipment, or their components, by the application of established scientific principles and procedures.

(b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. All work is subject to DOH inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

(c) DOH inspections and tests are for the sole benefit of DOH and do not: (1) relieve the Contractor of responsibility for providing adequate quality control measures; (2) relieve the Contractor of responsibility for loss or damage of the material before acceptance; (3) constitute or imply acceptance; or, (4) affect the continuing rights of DOH after acceptance of the completed work under paragraph (j) below.

(d) The presence or absence of DOH inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specifications without the Contracting Officer's written authorization. All instructions and approvals with respect to the work shall be given to the Contractor by the Contracting Officer.

(e) The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. DOH may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. DOH shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

(f) DOH may conduct routine inspections of the construction site on a daily basis.

(g) The Contractor shall, without charge, replace or correct work found by DOH not to conform to contract requirements, unless DOH decides that it is in its interest to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected

material from the premises.

(h) If the Contractor does not promptly replace or correct rejected work, DOH may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor, or (2) terminate for default the Contractor's right to proceed.

(i) If any work requiring inspection is covered up without ap- proval of DOH, it must, if requested by the Contracting Officer, be uncovered at the expense of the Contractor. If at any time before final acceptance of the entire work, DOH considers it necessary or advisable, to examine work already completed by removing or tearing it out, the Contractor, shall on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray all the expenses of the examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, the Contracting Officer shall make an equitable adjustment to cover the cost of the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.

(j) The Contractor shall notify the Contracting Officer, in writing, as to the date when in its opinion all or a designated portion of the work will be substantially completed and ready for inspection. If the Architect determines that the state of preparedness is as represented, DOH will promptly arrange for the inspection. Unless otherwise specified in the contract, DOH shall accept, as soon as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines and designates can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or DOH's right under any warranty or guarantee.

20. Use and Possession Prior to Completion

(a) If applicable, the Homeowner may have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the Homeowner intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The Homeowner's possession or use shall not be deemed an acceptance of any work under the contract.

(b) While the Homeowner has such possession or use, the Contractor shall be relieved of the responsibility for (1) the loss of or damage to the work resulting from the Homeowner's possession or use, notwithstanding the terms of the clause entitled Permits and Codes herein; (2) all maintenance costs on the areas occupied; and, (3) furnishing heat, light, power, and water used in the areas occupied without proper renuneration therefore. If prior possession or use by the Homeowner delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

21. Warranty of Title

The Contractor warrants good title to all materials, supplies, and equipment incorporated in the work and agrees to deliver the premises together with all improvements thereon free from any claims, liens or charges, and agrees further that neither it nor any other person, firm or corporation shall have any right to a lien upon the premises or anything appurtenant thereto.

22. Warranty of Construction

(a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (j) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or workmanship performed by the Contractor or any subcontractor or supplier at any tier. This warranty shall continue for a period of **one year** from the date of final acceptance of the work. If the Homeowner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of (one year unless otherwise indicated) from the date that the Homeowner takes possession.

(b) The Contractor shall remedy, at the Contractor's expense, any failure to conform, or any defect. In addition, the Contractor shall remedy, at the Contractor's expense, any damage to Homeowner-owned or controlled real or personal property when the damage is the result of—
   (1) The Contractor's failure to conform to contract require- ments; or
   (2) Any defects of equipment, material, workmanship or design furnished by the Contractor.

(c) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for (one year unless otherwise indicated) from the date of repair or replacement.

(d) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect or damage.

(e) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, DOH shall have the right to replace, repair or otherwise remedy the failure, defect, or damage at the Contractor's expense.

(f) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall:
   (1) Obtain all warranties that would be given in normal commercial practice;
   (2) Require all warranties to be executed in writing, for the benefit of the homeowner; and,
   (3) Enforce all warranties for the benefit of the homeowner.

(g) In the event the Contractor's warranty under paragraph(a) of this clause has expired, the homeowner may bring suit at its own expense to enforce a subcontractor's, manufacturer's or supplier's warranty.

(h) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defect of material or design furnished by the homeowner nor for the repair of any damage that results from any defect in DOH furnished material or design.

(i) Notwithstanding any provisions herein to the contrary, the establishment of the time periods in paragraphs (a) and (c) above relate only to the specific obligation of the Contractor to correct the work, and have no relationship to the time within which its obligation to comply with the contract 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 its obligation other than specifically to correct the work.

(j) This warranty shall not limit DOH's/Homeowner's rights under the Inspection and Acceptance of Construction clause of this contract with respect to latent defects, gross mistakes or fraud.

23. Contract Period

The Contractor shall complete all work required under this contract within **150** calendar days of the effective date of the contract, or within the time schedule established in the notice to proceed issued by the Contracting Officer.

24. Order of Provisions

In the event of a conflict between these General Conditions and the Specifications, the General Conditions shall prevail. In the event of a conflict between the contract and any applicable state or local law or regulation, the state or local law or regulation shall prevail; provided that such state or local law or regulation does not conflict with, or is less restrictive than applicable federal law, regulation, or Executive Order. In the event of such a conflict, applicable federal law, regulation, and Executive Order shall prevail.

25. Payments

(a) DOH/Homeowner shall pay the Contractor the price as provided in this contract.

(b) DOH shall make progress payments approximately every 30 days as the work proceeds, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer. DOH may, subject to written determination and approval of the Contracting Officer, make more frequent payments to contractors which are qualified small businesses.

(c) Before the first progress payment under this contract, the Contractor shall furnish, in such detail as requested by the Contracting Officer, a breakdown of the total contract price showing the amount included therein for each principal category of the work, which shall substantiate the payment amount requested in order to provide a basis for determining progress payments. The breakdown shall be approved by the Contracting Officer and must be acceptable to DOH. The values and quantities employed in making up this breakdown are for determining the amount of progress payments and shall not be construed as a basis for additions to or deductions from the contract price. The Contractor shall prorate its overhead and profit over the construction period of the contract.

(d) The Contractor shall submit, on AIA forms provided by DOH, periodic estimates showing the value of the work performed during each period based upon the approved breakdown of the contract price. Such estimates shall be submitted not later than_14_days in advance of the date set for payment and are subject to correction and revision as required. The estimates must be approved by the Contracting Officer with the concurrence of the Architect prior to payment. If the contract covers more than one project, the Contractor shall furnish a separate progress payment estimate for each.

(e) Along with each request for progress payments and the required estimates, the Contractor shall furnish lien waivers and labor releases as good and sufficient evidence that the premises are free from all liens, damages, and anything chargeable to said contractor.

(f) Except as otherwise provided in State law, DOH shall retain five (5) percent of the amount of progress payments until completion and acceptance of all work under the contract; except, that if upon completion of 50 percent of the work, the Contracting Officer, after consulting with the Architect, determines that the Contractor's performance and progress are satisfactory, DOH may make the remaining payments in full for the work subsequently completed. If the Contracting Officer subsequently determines that the Contractor's performance and progress are unsatisfactory, DOH shall reinstate the five (5) percent retainage until such time as the Contracting Officer determines that performance and progress are satisfactory. Retainage will be released 90 days after project completion.

(g) The Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration when computing progress payments. Material delivered to the Contractor at locations other than the site may also be taken into consideration if the Contractor furnishes satisfactory evidence that (1) it has acquired title to such material; (2) the material is properly stored in a bonded warehouse, storage yard, or similar suitable place as may be approved by the Contracting Officer; (3) the material is insured to cover its full value; and (4) the material will be used to perform this contract. Before any progress payment which includes delivered material is made, the Contractor shall furnish such documentation as the Contracting Officer may require to assure the protection of DOH's/Homeowner's interest in such materials. The Contractor shall remain responsible for such stored material notwithstanding the transfer of title to the Homeowner.

(h) All material and work covered by progress payments made shall, at the time of payment become the sole property of the Homeowner, but this shall not be construed as (1) relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or, (2) waiving the right of DOH/Homeowner to require the fulfillment of all of the terms of the contract. In the event the work of the Contractor has been damaged by other contractors or persons other than employees of DOH in the course of their employment, the Contractor shall restore such damaged work without cost to DOH/Homeowner and to seek redress for its damage only from those who directly caused it.

(i) DOH shall make the final payment due the Contractor under this contract after (1) completion and final acceptance of all work; and (2) presentation of release of all claims against DOH/Homeowner arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. Each such exception shall embrace no more than one claim, the basis and scope of which shall be clearly defined. The amounts for such excepted claims shall not be included in the request for final payment. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned.

(j) Prior to making any payment, the Contracting Officer may require the Contractor to furnish receipts or other evidence of payment from all persons performing work and supplying material to the Contractor, if the Contracting Officer determines such evidence is necessary to substantiate claimed costs.

(k) DOH shall not; (1) determine or adjust any claims for payment or disputes arising there under between the Contractor and its subcontractors or material suppliers; or, (2) withhold any moneys for the protection of the subcontractors or material suppliers. The failure or refusal of DOH to withhold moneys from the Contractor shall in nowise impair the obligations of any surety or sureties under any bonds furnished under this contract.

26. Contract Modifications

(a) Only the Contracting Officer has authority to modify any term or condition of this contract. Any contract modification shall be authorized in writing.

(b) The Contracting Officer may modify the contract unilaterally (1) pursuant to a specific authorization stated in a contract clause (e.g., Changes); or (2) for administrative matters which do not change the rights or responsibilities of the parties (e.g., change in DOH/homeowner's address). All other contract modifications shall be in the form of supplemental agreements signed by the Contractor and the Contracting Officer.

(c) When a proposed modification requires the approval of DOH prior to its issuance (e.g., a change order that exceeds DOH's approved threshold), such modification shall not be effective until the required approval is received by DOH.

27. Changes

(a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract including changes:
   (1) In the specifications (including drawings and designs);
   (2) In the method or manner of performance of the work;
   (3) Directing the acceleration in the performance of the work.

(b) Any other written order or oral order (which, as used in this paragraph (b), includes direction,

instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances and source of the order and (2) that the Contractor regards the order as a change order.

(c) Except as provided in this clause, no order, statement or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for a adjustment based on defective specifications, no proposal for any change under paragraph (b) above shall be allowed for any costs incurred more than 20 days (5 days for oral orders) before the Contractor gives written notice as required. In the case of defective specifications for which DOH is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

(e) The Contractor must assert its right to an adjustment under this clause within 30 days after (1) receipt of a written change order under paragraph (a) of this clause, or (2) the furnishing of a written notice under paragraph(b) of this clause, by submitting a written statement describing the general nature and the amount of the proposal. If the facts justify it, the Contracting Officer may extend the period for submission. The proposal may be included in the notice required under paragraph (b) above. No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

(f) The Contractor's written proposal for equitable adjustment shall be submitted in the form of a lump sum proposal supported with an itemized breakdown of all increases and decreases in the contract in at least the following details:

(1) Direct Costs. Materials (list individual items, the quantity and unit cost of each, and the aggregate cost); Transportation and delivery costs associated with materials; Labor breakdowns by hours or unit costs (identified with specific work to be performed); Construction equipment exclusively necessary for the change; Costs of preparation and/ or revision to shop drawings resulting from the change; Worker's Compensation and Public Liability Insurance; Employment taxes under FICA and FUTA; and, Bond Costs when size of change warrants revision.

(2) Indirect Costs. Indirect costs may include overhead, general and administrative expenses, and fringe benefits not normally treated as direct costs.

a. Overhead on work performed by General Contractor for the General Contractor – 10 percent above Direct Costs.

b. Overhead on work performed by Subcontractor for the Subcontractor – 10 percent above Direct Costs.

c. Overhead on work performed by Subcontractor for General Contractor – 5 percent above Direct Costs

(3) Profit. The amount of profit shall be negotiated and may vary according to the nature, extent, and complexity of the work required by the change. Generally

a. Profit on Work Performed by General Contractor for General Contractor – 5 percent profit above Direct Costs

b. Profit on Work Performed by Subcontractor for Subcontractor – 5 percent profit above Direct Costs

c. Profit on Work Performed by Subcontractor for General Contractor – 2.5 percent above Direct Costs

The allowability of the direct and indirect costs shall be determined in accordance with the Contract Cost Principles and Procedures for Commercial Firms in Part 31 of the Federal Acquisition Regulation (48 CFR 1-31), as implemented by HUD Handbook 2210.18, in effect on the date of this contract. Equitable adjustments for deleted work shall include a credit for profit and may include a credit for indirect costs. On proposals covering both increases and decreases in the amount of the

contract, the application of indirect costs and profit shall be on the net- change in direct costs for the Contractor or subcontractor performing the work

(g) The Contractor shall include in the proposal its request for time extension (if any), and shall include sufficient information and dates to demonstrate whether and to what extent the change will delay the completion of the contract in its entirety.
(h) The Contracting Officer shall act on proposals within 30 days after their receipt, or notify the Contractor of the date when such action will be taken.
(i) Failure to reach an agreement on any proposal shall be a dispute under the clause entitled Disputes herein. Nothing in this clause, however, shall excuse the Contractor from proceeding with the contract as changed.
(j) Except in an emergency endangering life or property, no change shall be made by the Contractor without a prior order from the Contracting Officer.

28. Suspension of Work

(a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of DOH/Homeowner.

If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified (or within a reasonable time if not specified) in this contract an adjustment may be made for any increase in the cost of performance of the contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or for which any equitable adjustment is provided for or excluded under any other provision of this contract.

(b) A claim under this clause shall not be allowed without prior written approval of the Contracting Officer.

29. Disputes

(a) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to the contract. A claim arising under the contract, unlike a claim relating to the contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim. The submission may be converted to a claim by complying with the requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.
(b) Except for disputes arising under the clauses entitled Labor Standards - Davis Bacon and Related Acts, herein, all disputes arising under or relating to this contract, including any claims for damages for the alleged breach thereof which are not disposed of by agreement, shall be resolved under this clause.
(c) All claims by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision.
(d) A claim by the Homeowner against the Contractor shall be subject to a written decision by the Contracting Officer.
(e) The Contracting Officer shall, within 60 (unless otherwise indicated) days after receipt of the request,

decide the claim or notify the Contractor of the date by which the decision will be made.

(f) The Contracting Officer's decision shall be final unless the Contractor (1) appeals in writing to a higher level in DOH in accordance with DOH's policy and procedures, (2) refers the appeal to an independent mediator or arbitrator, or (3) files suit in a court of competent jurisdiction. Such appeal must be made within (30 unless otherwise indicated) days after receipt of the Contracting Officer's decision.

(g) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

30. Default

(a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with the diligence that will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within this time, the Contracting Officer may, by written notice to the Contractor, terminate the right to proceed with the work (or separable part of the work) that has been delayed. In this event, DOH may take over the work and complete it, by contract or otherwise, and may take possession of and use any materials, equipment, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to DOH/Homeowner resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by DOH/Homeowner in completing the work.

(b) The Contractor's right to proceed shall not be terminated or the Contractor charged with damages under this clause if—

(1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God, or of the public enemy, (ii) acts of DOH or other governmental entity in either its sovereign or contractual capacity, (iii) acts of another contractor in the performance of a contract with DOH, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and

(2) The Contractor, within days (5 days unless otherwise indicated) from the beginning of such delay (unless extended by the Contracting Officer) notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of the delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, time for completing the work shall be extended by written modification to the contract. The findings of the Contracting Officer shall be reduced to a written decision which shall be subject to the provisions of the Disputes clause of this contract

(c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been for convenience of DOH.

31. Liquidated Damages

(a) If the Contractor fails to complete the work within the time specified in the contract, or any extension, as specified in the clause entitled Default of this contract, the Contractor may pay to DOH as liquidated damages, the sum of $100.00 for each day of delay. If different completion dates are specified in the contract for separate parts or stages of the work, the amount of liquidated damages

shall be assessed on those parts or stages which are delayed. To the extent that the Contractor's delay or nonperformance is excused under another clause in this contract, liquidated damages shall not be due DOH. The Contractor remains liable for damages caused other than by delay.

(b) If DOH terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned DOH in completing the work.
(c) If DOH does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

32. Termination for Convenience

(a) The Contracting Officer may terminate this contract in whole, or in part, whenever the Contracting Officer determines that such termination is in the best interest of DOH/Homeowner. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which the performance of the work under the contract is terminated, and the date upon which such termination becomes effective.
(b) If the performance of the work is terminated, either in whole or in part, DOH/Homeowner shall be liable to the Contractor for reasonable and proper costs resulting from such termination upon the receipt by DOH of a properly presented claim setting out in detail: (1) the total cost of the work performed to date of termination less the total amount of contract payments made to the Contractor; (2) the cost (including reasonable profit) of settling and paying claims under subcontracts and material orders for work performed and materials and supplies delivered to the site, payment for which has not been made by DOH to the Contractor or by the Contractor to the subcontractor or supplier; (3) the cost of preserving and protecting the work already performed until DOH or assignee takes possession thereof or assumes responsibility therefore; (4) the actual or estimated cost of legal and accounting services reasonably necessary to prepare and present the termination claim to DOH/Homeowner; and (5) an amount constituting a reasonable profit on the value of the work performed by the Contractor.
(c) The Contracting Officer will act on the Contractor's claim within days (60 days unless otherwise indicated) of receipt of the Contractor's claim.
(d) Any disputes with regard to this clause are expressly made subject to the provisions of the Disputes clause of this contract.

33. Assignment of Contract

The Contractor shall not assign or transfer any interest in this contract; except that claims for monies due or to become due from DOH/Homeowner under the contract may be assigned to a bank, trust company, or other financial institution. Such assignments of claims shall only be made with the written concurrence of the Contracting Officer. If the Contractor is a partnership, this contract shall inure to the benefit of the surviving or remaining member(s) of such partnership as approved by the Contracting Officer.

34. Insurance

(a) Before commencing work, the Contractor and each subcontractor shall furnish DOH with certificates of insurance listing DOH and the Homeowner as additionally insured A.T.I.M.A. showing the following insurance is in force and will insure all operations under the Contract:

(1) Workers' Compensation, in accordance with state or Territorial Workers' Compensation laws.

(2) Commercial General Liability with a combined single limit for bodily injury and property damage of not less than $1,000,000 per occurrence to protect the Contractor and each subcontractor against claims for bodily injury or death and damage to the property of others. This shall cover the use of all equipment, hoists, and vehicles on the site(s) not covered by Automobile Liability under

(3) below. If the Contractor has a "claims- made" policy, then the following additional requirements apply: the policy must provide a "retroactive date" which must be on or before the execution date of the Contract; and the extended reporting period may not be less than five years following the completion date of the Contract.

(3) Automobile Liability on owned and non -owned motor vehicles used on the site(s) or in connection therewith for a combined single limit for bodily injury and property damage of not less than $1,000,000 per occurrence.

(4) Cargo Insurance in the amount of $250,000 is required when the project involves raising the structure above the Base Flood Elevation.

(b) Before commencing work, the Contractor shall furnish DOH with a certificate of insurance evidencing that Builder's Risk (fire and extended coverage) Insurance on all work in place and/or materials stored at the building site(s), including foundations and building equipment, is in force. The Builder's Risk Insurance shall be for the benefit of the Contractor, the Homeowner and DOH as their interests may appear and each shall be named in the policy or policies as an insured. The Contractor in installing equipment supplied by DOH shall carry insurance on such equipment from the time the Contractor takes possession thereof until the Contract work is accepted by DOH. The Builder's Risk Insurance need not be carried on excavations, piers, footings, or foundations until such time as work on the superstructure is started. It need not be carried on landscape work. Policies shall furnish coverage at all times for the full cash value of all completed construction, as well as materials in place and/or stored at the site(s), whether or not partial payment has been made by DOH. The Contractor may terminate this insurance on buildings as of the date taken over for occupancy by the Homeowner. The Contractor is not required to carry Builder's Risk Insurance for modernization work which does not involve structural alterations or additions and where the Homeowner's existing fire and extended coverage policy can be endorsed to include such work.

(c) All insurance shall be carried with companies which are financially responsible and admitted to do business in the State in which the project is located with a minimum Best rating of A-. If any such insurance is due to expire during the construction period, the Contractor (including subcontractors, as applicable) shall not permit the coverage to lapse and shall furnish evidence of coverage to the Contracting Officer. All certificates of insurance, as evidence of coverage, shall provide that no coverage may be canceled or non- renewed by the insurance company until at least 30 days prior written notice has been given to the Contracting Officer.

35. Subcontracts

(a) Definitions. As used in this contract -

(1) "Subcontract" means any contract, purchase order, or other purchase agreement, including modifications and change orders to the foregoing, entered into by a subcontractor to furnish supplies, materials, equipment, and services for the performance of the prime contract or a subcontract.

(2) "Subcontractor" means any supplier, vendor, or firm that furnishes supplies, materials, equipment, or services to or for the Contractor or another subcontractor.

(b) The Contractor shall not enter into any subcontract with any subcontractor who has been temporarily denied participation in a HUD program or who has been suspended or debarred from participating in contracting programs by any agency of the United States Government or of the state in which the work under this contract is to be performed.

(c) The Contractor shall be as fully responsible for the acts or omissions of its subcontractors, and of persons either directly or indirectly employed by them as for the acts or omissions of persons directly employed by the Contractor.

(d) The Contractor shall insert appropriate clauses in all subcontracts to bind subcontractors to the terms and conditions of this contract insofar as they are applicable to the work of subcontractors.

(e) Nothing contained in this contract shall create any contractual relationship between any subcontractor

and DOH or between the subcontractor and HUD.

36. Subcontracting with Small and Minority Firms, Women's Business Enterprise, and Labor Surplus Area Firms

The Contractor shall take the following steps to ensure that, whenever possible, subcontracts are awarded to small business firms, minority firms, women's business enterprises, and labor surplus area firms:

(a) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
(b) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;
(c) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;
(d) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises; and
(e) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies.

37. Equal Employment Opportunity

During the performance of this contract, the Contractor agrees as follows:

(a) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, or handicap.
(b) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, or handicap. Such action shall include, but not be limited to, (1) employment, (2) upgrading, (3) demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training, including apprenticeship.
(c) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.
(d) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, or handicap.
(e) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.
(f) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.
(g) The Contractor shall furnish all information and reports required by Executive Order 11246, as amended, Section 503 of the Rehabilitation Act of 1973, as amended, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto. The Contractor shall permit access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
(h) In the event of a determination that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts, or Federally assisted construction contracts under the procedures authorized in Executive Order 11246,

as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

(i) The Contractor shall include the terms and conditions of this clause in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor. The Contractor shall take such action with respect to any subcontract or purchase order as the Secretary of Housing and Urban Development or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

(j) Compliance with the requirements of this clause shall be to the maximum extent consistent with, but not in derogation of, compliance with section 7(b) of the Indian Self-Determination and Education Assistance Act and the Indian Preference clause of this contract.

38. Employment, Training, and Contracting Opportunities for Low-Income Persons, Section 3 of the Housing and Urban Development Act of 1968.

(a) The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

(b) The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 135, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the Part 135 regulations.

(c) The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this Section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

(d) The contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 135.

(e) The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR Part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR Part 135.

(f) Noncompliance with HUD's regulations in 24 CFR Part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

(g) With respect to work performed in connection with Section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians,

and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of Section 3 and Section 7(b)agree to comply with Section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

39. Interest of Members of Congress

No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of this contract or to any benefit that may arise therefrom.

40. Interest of Members, Officers, or Employees and Former Members, Officers, or Employees

No member, officer, or employee of DOH, no member of the governing body of the locality in which the project is situated, no member of the governing body of the locality in which DOH was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the project, shall, during his or her tenure, or for one year thereafter, have any interest, direct or indirect, in this contract or the proceeds thereof.

41. Limitations on Payments made to Influence Certain Federal Financial Transactions

(a) The Contractor agrees to comply with Section 1352 of Title 31, United States Code which prohibits the use of Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

(b) The Contractor further agrees to comply with the requirement of the Act to furnish a disclosure (OMB Standard Form LLL, Disclosure of Lobbying Activities) if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

42. Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringement of any patent rights and shall save DOH/Homeowner harmless from loss on account thereof; except that DOH shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified and the Contractor has no reason to believe that the specified design, process, or product is an infringement. If, however, the Contractor has reason to believe that any design, process or product specified is an infringement of a patent, the Contractor shall promptly notify the Contracting Officer. Failure to give such notice shall make the Contractor responsible for resultant loss.

43. Examination and Retention of Contractor's Records

(a) DOH, HUD, or Comptroller General of the United States, or any of their duly authorized representatives shall, until 3 years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.

(b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders not exceeding $10,000.

(c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the Disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which DOH, HUD, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

44. Labor Standards - Davis-Bacon and Related Acts

Except for housing rehabilitation/reconstruction projects designed to contain fewer than eight (8) units, if the total amount of this contract exceeds $2,000, the Federal labor standards set forth in the clause below shall apply to the development or construction work to be performed under the contract.

(a) Minimum Wages.

(1) All laborers and mechanics employed under this contract in the development or construction of the project(s) involved will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof (if applicable), regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to su ch laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the regular weekly period, are deemed to be constructively made or incurred during such weekly period. If applicable, such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers (if applicable).

(2) (i) Any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met: (A) The work to be performed by the classification requested is not performed by a classification in the wage determination; and (B) The classification is utilized in the area by the construction industry; and (C) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employee Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

(iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

(iv) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (a)(2)(ii) or (iii) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in classification.

(3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(b) Withholding of funds. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working in the construction or development of the project, all or part of the wages required by the contract, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due.

(c) Payrolls and basic records.

(1) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working in the construction or development of the project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of

the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(2)

(i) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under subparagraph (c)(1) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The Contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1214-0149.)

(ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

a. That the payroll for the payroll period contains the information required to be maintained under paragraph (c) (1) of this clause and that such information is correct and complete;

b. That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3; and

c. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirements for submission of the "Statement of Compliance" required by subparagraph (c)(2)(ii) of this clause.

(iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(3) The Contractor or subcontractor shall make the records required under subparagraph (c)(1) available for inspection, copying, or transcription by authorized representatives of HUD or its designee, the Contracting Officer, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(d) (1) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship and Training, Employer and Labor Services (OATELS), or with a State Apprenticeship Agency recognized by OATELS, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage rate on the wage determination for the

classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted underthe plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(3) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

(e) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

(f) Contract termination; debarment. A breach of this contract clause may be grounds for termination of the contract and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.

(g) Compliance with Davis-Bacon and related Act requirements. All rulings and interpretations of the Davis- Bacon and related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

(h) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this clause shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of

its subcontractors) and DOH, HUD, the U.S. Department of Labor, or the employees or their representatives.

(i) Certification of eligibility.

(1) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(2) No part of this contract shall be subcontracted to any person or firm ineligible for award of a United States Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(3) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

(j) Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics, including watchmen and guards, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set forth in subparagraph (j)(1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic (including watchmen and guards) employed in violation of the provisions set forth in subparagraph (j)(1) of this clause, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in subparagraph (j)(1) of this clause.

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in subparagraph (j)(2) of this clause.

(k) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts all the provisions contained in this clause, and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all these provisions

45. . Non-Federal Prevailing Wage Rates

(a) Any prevailing wage rate (including basic hourly rate and any fringe benefits), determined under State or tribal law to be prevailing, with respect to any employee in any trade or position employed under the contract, is inapplicable to the contract and shall not be enforced against the Contractor or any subcontractor, with respect to employees engaged under the contract whenever such non-Federal prevailing wage rate exceeds:

(1) The applicable wage rate determined by the Secretary of Labor pursuant to the Davis-Bacon Act (40 U.S.C. 3141 et seq.) to be prevailing in the locality with respect to such trade;

(b) An applicable apprentice wage rate based thereon specified in an apprenticeship program registered with the U.S. Department of Labor (DOL) or a DOL- recognized State Apprenticeship Agency; or
(c) An applicable trainee wage rate based thereon specified in a DOL-certified trainee program.

46. Procurement of Recovered Materials.

(a) In accordance with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, the Contractor shall procure items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contains the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition. The contractor shall procure items designated in the EPA guidelines that contain the highest percentage of recovered materials practicable unless the Contractor determines that such items:
    (1) Are not reasonably available in a reasonable period of time:
    (2) Fail to meet reasonable performance standards, which shall be determined on the basis of the guidelines of the National Institute of Standards and Technology, if applicable to the item; or
    (3) Are only available at an unreasonable price.

(b) Paragraph (a) of this clause shall apply to items purchased under this contract where: (1) the Contractor purchases in excess of $10,000 of the item under this contract; or (2) during the preceding Federal fiscal year, the Contractor: (i) purchased any amount of the items for use under a contract that was funded with Federal appropriations and was within a Federal agency or a State agency of a political subdivision of a State; and (ii) purchased a total of in excess of $10,000 of the item both under and outside that contract

SECTION 00 01 15

LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled 'Project 2503 – 23 Caroline Street Milford, CT, Connecticut Department of Housing, Community Development Block Grant, Disaster Recovery Program, Owner Occupied Rehabilitation and Rebuilding Program, dated April 2016, as modified by subsequent Addenda and Contract modifications.

B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of the type indicated.

SHEET NO.	TITLE
T-0.0	TITLE SHEET
1 of 1	TOPOGRAPHIC AND BOUNDARY SURVEY
C-1.0	IMPROVEMENT PLAN
C-1.1	SOIL EROSION AND SEDIMENT CONTROL AND DEMOLITION PLAN
C-1.2	SITE PLAN
C-2.0	SOIL EROSION AND SEDIMENT CONTROL DETAILS
C-2.1	MISCELLANEOUS SITE DETAILS
C-2.2	BUILDING UTILITY DETAILS
A-1.0	PROPOSED FLOOR PLANS - 1

A-1.1	PROPOSED FLOOR PLANS - 2
A-1.2	PROPOSED FLOOR PLANS - 3
A-1.3	PROPOSED FLOOR PLANS - 4
A-2.0	PROPOSED BUILDING ELEVATIONS
A-3.0	ARCHITECTURAL DETAILS
A-3.1	ARCHITECTURAL DETAILS
S-1	FOUNDATION DESIGN - PILE LAYOUT AND FOUNDATION PLAN
S-2	FOUNDATION DESIGN - FIRST FLOOR FRAMING SUPPORT PLAN
S-3	FOUNDATION DESIGN – STRUCTURAL NOTES AND SECTIONS
MP-1.0	MECHANICAL AND PLUMBING PLANS – 1
MP-1.1	MECHANICAL AND PLUMBING PLANS – 2
E-1.0	ELECTRICAL PLANS – 1
E-1.1	ELECTRICAL PLANS – 2

END OF SECTION

SECTION 00 31 26

EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for the Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. Asbestos, lead, PCB's, mold or other hazardous materials: Reports were prepared to investigate hazardous materials at the site and these reports are attached. It is the Contractor's responsibility to appropriately characterize, remove, and dispose of soil and hazardous materials at the site.

C. Related Requirements:
   1. Specification 00 31 32 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.
   2. Specification 02 41 19 "Selective Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.
   3. Specification 02 83 13 "Lead Hazard Remediation" for requirements if materials suspected of containing lead materials.

D. Attachments:
   1. Hazardous Materials Inspection Report, prepared by Facility Support Services, dated April 28, 2015.
   2. Lead in Paint Results, prepared by Gilbertco Lead Inspections LLC, dated April 9, 2015**.**

END OF SECTION

Facility Support Services, LLC

Environmental & Safety Consulting Engineers

Connecticut Department of Housing
Community Development Block Grant – Disaster Recovery
Owner Occupied Recovery and Rehabilitation Program

Hazardous Materials
Inspection Report

23 Caroline St.
Milford, Connecticut

PREPARED FOR:

Martinez Couch & Associates, LLC
1084 Cromwell Ave. Suite A-2
Rocky Hill, CT 06067

PREPARED BY:

Facility Support Services, LLC
2685 State Street
Hamden, CT 06517
Phone (203) 288-1281

April 28, 2015

SIGNATURES OF REPORT AUTHORS

The employees of Facility Support Services, LLC whose names appear below prepared this report. Requests for information on the content of this document should be directed to these individuals.

Michael DiFabio
CTDPH Asbestos Inspector #000898

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IV.	PCBs	3
V.	Lead	3
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ATTACHMENTS

Attachment A	FSS Licensure
Attachment B	Asbestos Laboratory Analytical Data
Attachment C	PCB Laboratory Analytical Data
Attachment D	Lead Report

I. Introduction

Facility Support Services, LLC (FSS) was contracted by Martinez, Couch & Associates, LLC (MCA) to perform a limited scope hazardous materials survey of 23 Caroline Street in Milford, Connecticut (the "Site"). The purpose of this inspection was to identify the presence of asbestos, PCBs, lead paint and mold in certain building materials damaged by the October 2012 Tropical Storm Sandy under the Connecticut Department of Housing (DOH), Community Development Block Grant – Disaster Recovery Owner Occupied Recovery and Rehabilitation Program. FSS did not perform radon testing due to the proposed demolition of the residence.

FSS utilized best industry practices to identify all suspect materials associated with the structures. Any material that has not been identified during this inspection or discovered during demolition activities must be presumed to be hazardous until such time that samples of the material can be collected and analyzed.

II. Mold

FSS conducted an inspection of visible mold growth within the residence on April 9, 2015. No visible mold growth was observed in any portion of the residence, in addition, since this project does not involve renovations to the residence, testing for mold air was not conducted at the 23 Caroline Street in Milford residence.

III. Asbestos

FSS conducted a limited scope asbestos inspection and bulk sampling on April 9, 2015 of suspect building materials that are proposed for demolition. The inspection was conducted by Michael DiFabio, a State of Connecticut licensed Asbestos Inspector. Mr. DiFabio's Connecticut Asbestos Inspectors license is provided in Attachment A.

The following suspect materials were indentified during the inspection:

- Living Room:
  - Textured Ceiling
  - Ceiling Joint Compound
  - Flooring (Floral)
  - Flooring (Beneath Floral Layer)
  - Ceiling Sheetrock

- Kitchen - Flooring Underlayment
- Laundry Room - Setting Compound
- Rear Addition Bathroom - Setting Compound
- Rear Addition - Interior Vinyl Window Caulking
- Bedroom Flooring:
    - Tar Paper (Top Layer)
    - Tar Paper (Bottom Layer)
- Attic - Blown-in Insulation
- Bathroom:
    - Flooring
    - Flooring Underlayment
    - Window Caulking (Interior)
- Hallway:
    - Textured Ceiling
    - Ceiling Joint Compound
    - Green & White Flooring
- Master Bedroom:
    - Textured Ceiling
    - Ceiling Joint Compound
    - Green & White Flooring
    - Ceiling Sheetrock
- Green & White Flooring Underlayment
- Main House - Interior Vinyl Window Caulking
- Porch - Tile Setting Compound
- Exterior:
    - Cement Shingle Siding
    - Main Roof - Asphalt Shingles (Top Layer)
    - Main Roof - Asphalt Shingles (Second Layer)
    - Porch Roof - Asphalt Shingles (Third Layer)
    - Main Roof - Tar Paper
    - Main House - Exterior Vinyl Window Caulking
    - Main House – Exterior Cinder Block Coating (White)
- Porch Roof to Main House Tar
- Rear Addition - Rolled Roofing
- Rear Addition - Roof Sealant Tar

This asbestos inspection was performed in accordance with the EPA, NESHAP regulations for building renovations and demolition, 40 CFR Part 61, Amended 11/20/1990. The bulk asbestos samples collected during this inspection were delivered under full chain of custody and analyzed by EMSL Analytical, Inc., via EPA/600/R-93/116. This is currently the approved EPA test method, which uses Polarized Light Microscopy (PLM). EMSL Analytical, Inc. is an accredited asbestos laboratory (NVLAP # 200700-0) and is a State of Connecticut approved public health laboratory for asbestos analysis. EMSL recommended additional Transmission Electron Microscopy (TEM) analysis for one of the materials sampled (Porch Roof to Main House Tar) due to matrix interferences. FSS activated the samples for TEM analysis. Copies of the laboratory analytical results can be found in Attachment B of this report.

Laboratory results have revealed that the asbestos content of the following materials are above the 1% required to confirm a material as asbestos containing.

- **Bathroom Flooring**
- **Cement Shingle Siding**
- **Rear Addition - Roof Sealant Tar**
- **Porch Roof to Main House Tar**

IV. PCBs

Following an inspection of building materials proposed for renovations, eight suspected PCB-containing materials were identified:

- Bathroom:
  - Interior Window Caulking
  - Flooring Underlayment
- Bedroom:
  - Tar Paper (Top Layer)
  - Tar Paper (Bottom Layer)
- Porch Roof to House Tar
- Green & White Flooring Underlayment
- Main Roof Tar Paper
- Rear Addition Roof Flashing Tar

Copies of the laboratory analytical results can be found in Attachment C of this report.

Laboratory results have revealed that the PCB content of the tested material is below the 1 ppm required to confirm a material is regulated for PCBs.

V. Lead

The subject residential structure was built prior to 1978 (in 1954) and therefore the likelihood that lead painted surfaces are present is increased. As a residential structure built prior to 1978 the removal of lead painted materials where a child under 6 is housed, or may visit, would trigger the EPA Renovation, Repair and Painting (RRP) rule. Furthermore, adherence to the requirements of The Lead-Safe Housing Rule (US Department of Housing and Urban development, HUD) are stipulated by the Connecticut Department of Housing (DOH) as part of the Community Development Block Grant – Disaster Recovery Owner Occupied Recovery and Rehabilitation Program.

A building wide XRF inspection was conducted by Maureen Monaco of Gilberto Lead Inspections, LLC (Gilbertco) utilizing a RMD LPA-1 X-Ray Fluoroscope Spectrum Analyzer. Appendix E contains the Lead Inspection Report. The findings of the investigation determined that none of the tested surfaces were positive for lead based paint (>1.0 mg/cm^2).

Non-Intact Materials

A copy of the Gilbertco Lead Inspection Report is provided in Appendix D. Following the HUD Lead-Safe Housing Guidelines, non-intact materials should undergo interim measures to abate the hazard. No non-intact lead containing materials have been identified in the residence; therefore, no further consideration for lead paint is required.

Demolition Materials

When toxic wastes are land disposed, contaminated liquid may leach from the waste and pollute ground water. Toxicity is defined through a laboratory procedure called the Toxicity Characteristic Leaching Procedure (TCLP) (Method 1311). The TCLP helps identify wastes likely to leach concentrations of contaminants that may be harmful to human health or the environment. There are no areas that tested positive for lead (regardless of intactness) that are proposed for demolition.

VI. Conclusions & Recommendations

When the structure is renovated/demolished, all removed debris should be sent to an appropriate landfill for final disposal following all appropriate regulations. Any work involving lead-containing paints should be conducted under the EPA's RRP Renovation, Repair and Painting Rule. Any material discovered during renovation activities which have not been included in this survey must be presumed to contain asbestos, lead and PCBs until such time that the material can be evaluated and sampled.

Asbestos – Four asbestos containing materials (>1% asbestos) were identified in materials proposed for renovation or demolition:

- **Bathroom Flooring**
- **Cement Shingle Siding**
- **Rear Addition - Roof Sealant Tar**
- **Porch Roof to Main House Tar**

An asbestos work plan will be required for removal and proper disposal of this material prior to demolition of the residence.

PCBs- Eight suspected PCB-containing materials were identified in proposed demolition materials. Testing of these materials found that it does not contain regulated levels of PCBs. No further investigations or special disposal requirements (for PCBs) are required for this project.

Mold - FSS conducted a visual inspection of mold growth within the residence. No visible mold growth was observed in any portion of the residence; in addition, since this project does not involve renovations to the residence, testing for mold air was not conducted.

Lead - Following the HUD Lead-Safe Housing Guidelines, the non-intact areas should undergo interim measures to abate the hazard. No non-intact lead containing surfaces were identified within the residence; therefore no further consideration of lead paint is required.

There are no areas that tested positive for lead (regardless of intactness) that are proposed for demolition. No further consideration for lead containing demolition debris is required for this project.

ATTACHMENTS

ATTACHMENT A

FSS LISENSURE

State of Connecticut

Lookup Detail View

Name

Name
MIKE V DIFABIO

License Information
lookup

License Type	License Number	Expiration Date	Granted Date	License Name	License Status	Licensure Actions or Pending Charges
Asbestos Consultant-Inspector	898	12/31/2015	02/25/2015	MIKE V DIFABIO	ACTIVE	None

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ATTACHMENT B

ASBESTOS LABORATORY ANALYTICAL DATA

EMSL Analytical, Inc.
29 North Plains Highway, Unit # 4, Wallingford, CT 06492
Phone/Fax: 203-284-5948 / (203) 284-5978
http://www.EMSL.com wallingfordlab@emsl.com

EMSL Order:	241501411
CustomerID:	FSS93
CustomerPO:	
ProjectID:	

Attn: **Michael DiFabio**
Facility Support Services, LLC
2685 State Street

Hamden, CT 06517

Project: **22214-23 CAROLINE**

Phone:	(203) 288-1281
Fax:	(203) 248-4409
Received:	04/10/15 8:20 AM
Analysis Date:	4/15/2015
Collected:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
22214-0409-2301A *241501411-0001*	Living room - textured ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2301B *241501411-0002*	Living room - textured ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2301C *241501411-0003*	Living room - textured ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2302A *241501411-0004*	Living room - ceiling joint compound	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2302B *241501411-0005*	Living room - ceiling joint compound	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2302C *241501411-0006*	Living room - ceiling joint compound	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2303A *241501411-0007*	Living room - flooring (floral)	Brown/Tan/Red Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	**None Detected**
22214-0409-2303B *241501411-0008*	Living room - flooring (floral)	Brown/Tan/Red Fibrous Homogeneous	75% Cellulose	25% Non-fibrous (other)	**None Detected**

Analyst(s)

Desiree Lunt (47)
Joshua Snyder (44)

Gloria V. Oriol, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. South Portland, ME

Initial report from 04/17/2015 08:51:59

EMSL Analytical, Inc.
29 North Plains Highway, Unit # 4, Wallingford, CT 06492
Phone/Fax: 203-284-5948 / (203) 284-5978
http://www.EMSL.com wallingfordlab@emsl.com

EMSL Order:	241501411
CustomerID:	FSS93
CustomerPO:	
ProjectID:	

Attn: **Michael DiFabio**
Facility Support Services, LLC
2685 State Street

Hamden, CT 06517

Project: **22214-23 CAROLINE**

Phone:	(203) 288-1281
Fax:	(203) 248-4409
Received:	04/10/15 8:20 AM
Analysis Date:	4/15/2015
Collected:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
22214-0409-2303C *241501411-0009*	Living room - flooring (floral)	Brown/Tan/Red Fibrous Homogeneous	70%	Cellulose	30%	Non-fibrous (other)	**None Detected**
22214-0409-2304A *241501411-0010*	Living room - flooring (beneath floral)	Gray/Black Fibrous Homogeneous	75%	Cellulose	25%	Non-fibrous (other)	**None Detected**
22214-0409-2304B *241501411-0011*	Living room - flooring (beneath floral)	Gray/Black Fibrous Homogeneous	70%	Cellulose	30%	Non-fibrous (other)	**None Detected**
22214-0409-2304C *241501411-0012*	Living room - flooring (beneath floral)	Gray/Black Fibrous Homogeneous	70%	Cellulose	30%	Non-fibrous (other)	**None Detected**
22214-0409-2305A *241501411-0013*	Kitchen - flooring underlayment	Gray/Black Fibrous Homogeneous	80%	Cellulose	20%	Non-fibrous (other)	**None Detected**
22214-0409-2305B *241501411-0014*	Kitchen - flooring underlayment	Gray/Black Fibrous Homogeneous	80%	Cellulose	20%	Non-fibrous (other)	**None Detected**
22214-0409-2305C *241501411-0015*	Kitchen - flooring underlayment	Gray/Black Fibrous Homogeneous	75%	Cellulose	25%	Non-fibrous (other)	**None Detected**
22214-0409-2306A *241501411-0016*	Laundry room - setting compound	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**

Analyst(s)

Desiree Lunt (47)
Joshua Snyder (44)

Gloria V. Oriol, Laboratory Manager
or other approved signatory

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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
22214-0409-2306B *241501411-0017*	Laundry room - setting compound	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
22214-0409-2306C *241501411-0018*	Laundry room - setting compound	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
22214-0409-2307A *241501411-0019*	Rear addition bathroom - setting compound	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
22214-0409-2307B *241501411-0020*	Rear addition bathroom - setting compound	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
22214-0409-2307C *241501411-0021*	Rear addition bathroom - setting compound	Gray Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
22214-0409-2308A *241501411-0022*	Rear interior addition - vinyl window caulking	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
22214-0409-2308B *241501411-0023*	Rear interior addition - vinyl window caulking	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
22214-0409-2309A *241501411-0024*	Bedroom flooring - tar paper (top layer)	Black Fibrous Homogeneous	90%	Cellulose	10%	Non-fibrous (other)	**None Detected**

Analyst(s)

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Project: **22214-23 CAROLINE**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**% Type**
22214-0409-2309B *241501411-0025*	Bedroom flooring - tar paper (top layer)	Black Fibrous Homogeneous	90%	Cellulose	10%	Non-fibrous (other)	**None Detected**
22214-0409-2309C *241501411-0026*	Bedroom flooring - tar paper (top layer)	Black Fibrous Homogeneous	80%	Cellulose	20%	Non-fibrous (other)	**None Detected**
22214-0409-2310A *241501411-0027*	Bedroom flooring - tar paper (bottom layer)	Gray/Black Fibrous Homogeneous	85%	Cellulose	15%	Non-fibrous (other)	**None Detected**
22214-0409-2310B *241501411-0028*	Bedroom flooring - tar paper (bottom layer)	Gray/Black Fibrous Homogeneous	85%	Cellulose	15%	Non-fibrous (other)	**None Detected**
22214-0409-2310C *241501411-0029*	Bedroom flooring - tar paper (bottom layer)	Gray/Black Fibrous Homogeneous	70%	Cellulose	30%	Non-fibrous (other)	**None Detected**
22214-0409-2311A *241501411-0030*	Attic - blown-in insulation	Brown/Gray Fibrous Homogeneous	98%	Cellulose	2%	Non-fibrous (other)	**None Detected**
22214-0409-2311B *241501411-0031*	Attic - blown-in insulation	Brown/Gray Fibrous Homogeneous	98%	Cellulose	2%	Non-fibrous (other)	**None Detected**
22214-0409-2311C *241501411-0032*	Attic - blown-in insulation	Brown/Gray Fibrous Homogeneous	95%	Cellulose	5%	Non-fibrous (other)	**None Detected**

Analyst(s)

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or other approved signatory

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Hamden, CT 06517

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Collected:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos	
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**%**	**Type**
22214-0409-2312A *241501411-0033*	Bathroom flooring	Gray Non-Fibrous Homogeneous			94%	Non-fibrous (other)	**6%**	**Chrysotile**
22214-0409-2312B *241501411-0034*	Bathroom flooring						**Stop Positive (Not Analyzed)**	
22214-0409-2312C *241501411-0035*	Bathroom flooring						**Stop Positive (Not Analyzed)**	
22214-0409-2313A *241501411-0036*	Bathroom flooring - underlayment	Black Fibrous Homogeneous	95%	Cellulose	5%	Non-fibrous (other)	**None Detected**	
22214-0409-2313B *241501411-0037*	Bathroom flooring - underlayment	Black Fibrous Homogeneous	95%	Cellulose	5%	Non-fibrous (other)	**None Detected**	
22214-0409-2313C *241501411-0038*	Bathroom flooring - underlayment	Black Fibrous Homogeneous	80%	Cellulose	20%	Non-fibrous (other)	**None Detected**	
22214-0409-2314A *241501411-0039*	Bathroom - window caulking (interior)	Beige Non-Fibrous Homogeneous	8%	Cellulose	92%	Non-fibrous (other)	**None Detected**	
22214-0409-2314B *241501411-0040*	Bathroom - window caulking (interior)	Beige Non-Fibrous Homogeneous	8%	Cellulose	92%	Non-fibrous (other)	**None Detected**	
22214-0409-2314C *241501411-0041*	Bathroom - window caulking (interior)	Beige Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**	

Analyst(s)

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Gloria V. Oriol, Laboratory Manager
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Collected:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
22214-0409-2315A *241501411-0042*	Hallway - textured ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2315B *241501411-0043*	Hallway - textured ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2315C *241501411-0044*	Hallway - textured ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2316A *241501411-0045*	Master bedroom - textured ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2316B *241501411-0046*	Master bedroom - textured ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2316C *241501411-0047*	Master bedroom - textured ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2317A *241501411-0048*	Hallway - joint compound (ceiling)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2317B *241501411-0049*	Hallway - joint compound (ceiling)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**

Analyst(s)

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Gloria V. Oriol, Laboratory Manager
or other approved signatory

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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
22214-0409-2317C *241501411-0050*	Hallway - joint compound (ceiling)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2318A *241501411-0051*	Master bedroom - joint compound (ceiling)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2318B *241501411-0052*	Master bedroom - joint compound (ceiling)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2318C *241501411-0053*	Master bedroom - joint compound (ceiling)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2319A *241501411-0054*	Master bedroom/hallway - green + white flooring	White/Green Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (other)	**None Detected**
22214-0409-2319B *241501411-0055*	Master bedroom/hallway - green + white flooring	White/Green Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (other)	**None Detected**
22214-0409-2319C *241501411-0056*	Master bedroom/hallway - green + white flooring	White/Green Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (other)	**None Detected**
22214-0409-2320A *241501411-0057*	Green + white flooring underlayment	Brown Fibrous Homogeneous	50% Cellulose	50% Non-fibrous (other)	**None Detected**

Analyst(s)

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Sample	Description	Appearance	Non-Asbestos %	Fibrous	Non-Asbestos %	Non-Fibrous	Asbestos % Type
22214-0409-2320B *241501411-0058*	Green + white flooring underlayment	Brown Fibrous Homogeneous	50%	Cellulose	50%	Non-fibrous (other)	**None Detected**
22214-0409-2320C *241501411-0059*	Green + white flooring underlayment	Brown Fibrous Homogeneous	45%	Cellulose	55%	Non-fibrous (other)	**None Detected**
22214-0409-2321A *241501411-0060*	Main house - interior vinyl window caulking	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
22214-0409-2321B *241501411-0061*	Main house - interior vinyl window caulking	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
22214-0409-2321C *241501411-0062*	Main house - interior vinyl window caulking	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
22214-0409-2322A *241501411-0063*	Porch - tile setting compound	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
22214-0409-2322B *241501411-0064*	Porch - tile setting compound	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**
22214-0409-2322C *241501411-0065*	Porch - tile setting compound	White Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**None Detected**

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Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos				Asbestos	
Sample	**Description**	**Appearance**	**%**	**Fibrous**	**%**	**Non-Fibrous**	**%**	**Type**
22214-0409-2323A *241501411-0066*	Living room - ceiling sheetrock	Gray Fibrous Homogeneous	12%	Cellulose	88%	Non-fibrous (other)		**None Detected**
22214-0409-2323B *241501411-0067*	Living room - ceiling sheetrock	Gray Fibrous Homogeneous	10%	Cellulose	90%	Non-fibrous (other)		**None Detected**
22214-0409-2324A *241501411-0068*	Master bedroom - ceiling sheetrock	Gray Fibrous Homogeneous	12%	Cellulose	88%	Non-fibrous (other)		**None Detected**
22214-0409-2324B *241501411-0069*	Master bedroom - ceiling sheetrock	Gray Fibrous Homogeneous	10%	Cellulose	90%	Non-fibrous (other)		**None Detected**
22214-0409-2325A *241501411-0070*	Cement shingle siding	Gray Fibrous Homogeneous			85%	Non-fibrous (other)	**15%**	**Chrysotile**
22214-0409-2325B *241501411-0071*	Cement shingle siding							**Stop Positive (Not Analyzed)**
22214-0409-2325C *241501411-0072*	Cement shingle siding							**Stop Positive (Not Analyzed)**
22214-0409-2326A *241501411-0073*	Roof - asphalt shingles (top layer)	White/Black Fibrous Homogeneous	25%	Cellulose	75%	Non-fibrous (other)		**None Detected**
22214-0409-2326B *241501411-0074*	Roof - asphalt shingles (top layer)	White/Black Fibrous Homogeneous	35%	Cellulose	65%	Non-fibrous (other)		**None Detected**

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Gloria V. Oriol, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. South Portland, ME

Initial report from 04/17/2015 08:51:59

EMSL Analytical, Inc.
29 North Plains Highway, Unit # 4, Wallingford, CT 06492
Phone/Fax: 203-284-5948 / (203) 284-5978
http://www.EMSL.com wallingfordlab@emsl.com

EMSL Order:	241501411
CustomerID:	FSS93
CustomerPO:	
ProjectID:	

Attn: **Michael DiFabio**
Facility Support Services, LLC
2685 State Street

Hamden, CT 06517

Project: **22214-23 CAROLINE**

Phone:	(203) 288-1281
Fax:	(203) 248-4409
Received:	04/10/15 8:20 AM
Analysis Date:	4/15/2015
Collected:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos %	Fibrous	Non-Asbestos %	Non-Fibrous	Asbestos %	Type
22214-0409-2327A *241501411-0075*	Roof - asphalt shingles (2nd layer)	Gray/White/Black Fibrous Homogeneous	30%	Cellulose	70%	Non-fibrous (other)		**None Detected**
22214-0409-2327B *241501411-0076*	Roof - asphalt shingles (2nd layer)	Gray/White/Black Fibrous Homogeneous	30%	Cellulose	70%	Non-fibrous (other)		**None Detected**
22214-0409-2328A *241501411-0077*	Roof (porch) - asphalt shingles (3rd layer)	Gray/Red/Black Fibrous Homogeneous	25% 5%	Cellulose Synthetic	70%	Non-fibrous (other)		**None Detected**
22214-0409-2328B *241501411-0078*	Roof (porch) - asphalt shingles (3rd layer)	Gray/Red/Black Fibrous Homogeneous	40% 12%	Cellulose Synthetic	48%	Non-fibrous (other)		**None Detected**
22214-0409-2329A *241501411-0079*	Main roof - roof tar paper	Black Fibrous Homogeneous	75%	Cellulose	25%	Non-fibrous (other)		**None Detected**
22214-0409-2329B *241501411-0080*	Main roof - roof tar paper	Black Fibrous Homogeneous	75%	Cellulose	25%	Non-fibrous (other)		**None Detected**
22214-0409-2329C *241501411-0081*	Main roof - roof tar paper	Black Fibrous Homogeneous	90%	Cellulose	10%	Non-fibrous (other)		**None Detected**
22214-0409-2330A *241501411-0082*	Porch roof to main house tar	Black Non-Fibrous Homogeneous			100%	Non-fibrous (other)	**<1%**	**Chrysotile**

TEM recommended.

Analyst(s)

Desiree Lunt (47)
Joshua Snyder (44)

Gloria V. Oriol, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. South Portland, ME

Initial report from 04/17/2015 08:51:59

EMSL Analytical, Inc.
29 North Plains Highway, Unit # 4, Wallingford, CT 06492
Phone/Fax: 203-284-5948 / (203) 284-5978
http://www.EMSL.com wallingfordlab@emsl.com

EMSL Order:	241501411
CustomerID:	FSS93
CustomerPO:	
ProjectID:	

Attn: **Michael DiFabio**
Facility Support Services, LLC
2685 State Street

Hamden, CT 06517

Project: **22214-23 CAROLINE**

Phone:	(203) 288-1281
Fax:	(203) 248-4409
Received:	04/10/15 8:20 AM
Analysis Date:	4/15/2015
Collected:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos % Fibrous	Non-Asbestos % Non-Fibrous	Asbestos % Type
22214-0409-2330B *241501411-0083*	Porch roof to main house tar	Black Non-Fibrous Homogeneous	TEM recommended.	100% Non-fibrous (other)	**<1% Chrysotile**
22214-0409-2330C *241501411-0084*	Porch roof to main house tar	Black Non-Fibrous Homogeneous		100% Non-fibrous (other)	**<1% Chrysotile**
22214-0409-2331A *241501411-0085*	Rear addition rolled roofing	White/Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (other)	**None Detected**
22214-0409-2331B *241501411-0086*	Rear addition rolled roofing	White/Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (other)	**None Detected**
22214-0409-2331C *241501411-0087*	Rear addition rolled roofing	White/Black Fibrous Homogeneous	15% Glass	85% Non-fibrous (other)	**None Detected**
22214-0409-2332A *241501411-0088*	Roof - rear addition sealant tar	Black Non-Fibrous Homogeneous		97% Non-fibrous (other)	**3% Chrysotile**
22214-0409-2332B *241501411-0089*	Roof - rear addition sealant tar				**Stop Positive (Not Analyzed)**
22214-0409-2332C *241501411-0090*	Roof - rear addition sealant tar				**Stop Positive (Not Analyzed)**

Analyst(s)

Desiree Lunt (47)
Joshua Snyder (44)

Gloria V. Oriol, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. South Portland, ME

Initial report from 04/17/2015 08:51:59

EMSL Analytical, Inc.
29 North Plains Highway, Unit # 4, Wallingford, CT 06492
Phone/Fax: 203-284-5948 / (203) 284-5978
http://www.EMSL.com wallingfordlab@emsl.com

EMSL Order:	241501411
CustomerID:	FSS93
CustomerPO:	
ProjectID:	

Attn: **Michael DiFabio**
Facility Support Services, LLC
2685 State Street

Hamden, CT 06517

Project: **22214-23 CAROLINE**

Phone:	(203) 288-1281
Fax:	(203) 248-4409
Received:	04/10/15 8:20 AM
Analysis Date:	4/15/2015
Collected:	

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
22214-0409-2333A *241501411-0091*	Main house - exterior vinyl window caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2333B *241501411-0092*	Main house - exterior vinyl window caulking	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2334A *241501411-0093*	Exterior cinder block coating (white)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2334B *241501411-0094*	Exterior cinder block coating (white)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2334C *241501411-0095*	Exterior cinder block coating (white)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2334D *241501411-0096*	Exterior cinder block coating (white)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**
22214-0409-2334E *241501411-0097*	Exterior cinder block coating (white)	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	**None Detected**

Analyst(s)

Desiree Lunt (47)
Joshua Snyder (44)

Gloria V. Oriol, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. South Portland, ME

Initial report from 04/17/2015 08:51:59

OrderID: 241501411

EMSL ANALYTICAL, INC.
LABORATORY•PRODUCTS•TRAINING

Asbestos Chain of Custody

EMSL Order Number *(Lab Use Only)*: 24150141

EMSL Analytical, Inc.
29 North Plains Hwy, Unit 4

Wallingford, CT 06492
PHONE: (203) 284-5948
FAX: (203) 284-5978

Company Name : Facility Support Services, LLC.		**EMSL Customer ID:**	
Street: 2685 State Street		**City:** Hamden	**State/Province:** CT
Zip/Postal Code: 06517	**Country:** United States	**Telephone #:** 203-288-1281	**Fax #:**
Report To (Name): Michael DiFabio		**Please Provide Results:** ☐ Fax ☑ Email	
Email Address: mdifabio@fssteam.com		**Purchase Order:**	
Project Name/Number: 22214 - 23 Caroline		**EMSL Project ID** *(Internal Use Only)*:	
U.S. State Samples Taken: CT		**CT Samples:** ☐ Commercial/Taxable ☒ Residential/Tax Exempt	

EMSL-Bill to: ☐ Same ☑ Different - If Bill to is Different note instructions in Comments**
Third Party Billing requires written authorization from third party

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☒ 1 Week ☐ 2 Week

**For TEM Air 3 hr through 6 hr, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PCM - Air ☐ Check if samples are from NY
- ☐ NIOSH 7400
- ☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
- ☒ PLM EPA 600/R93/116 (<1%)
- ☐ PLM EPA NOB(<1%)

Point Count
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

Point Count w/Gravimetric
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NYS 198.1 (friable in NY)
- ☐ NYS 198.6 NOB (non-friable-NY)
- ☐ NYS 198.8 SOF-V
- ☐ NIOSH 9002 (<1%)

TEM – Air ☐ **4-4.5hr TAT** (AHERA only)
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level I
- ☐ ISO 10312

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (non-friable-NY)
- ☐ Chatfield SOP
- ☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
- Fibers >10µm ☐ Waste ☐ Drinking
- All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
- ☐ Microvac - ASTM D 5755
- ☐ Wipe - ASTM D6480
- ☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite*
- ☐ PLM CARB 435 - A (0.25% sensitivity)
- ☐ PLM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - C (0.01% sensitivity)
- ☐ TEM Qual. via Filtration Technique
- ☐ TEM Qual. via Drop-Mount Technique

*Can not accept New York State Loose Fill Vermiculite Samples

Other: ☐

☒ **Check For Positive Stop – Clearly Identify Homogenous Group** | **Filter Pore Size (Air Samples):** ☐ 0.8µm ☐ 0.45µm

Samplers Name: Michael DiFabio | **Samplers Signature:** [signature]

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
22214-0409-23 01A	Living Room Textured Ceiling		
01B	↓		
01C	↓		
02A	Living Room Ceiling Joint Compound		
02B	↓		
02C	↓		
03A	Living Room Flooring (Floral)		

Client Sample # (s): 01 - 34 | **Total # of Samples:** 97

Relinquished (Client): [signature] **Date:** 4/10/15 **Time:** 8:20

Received (Lab): **Date:** **Time:**

Comments/Special Instructions:
BillTo: Facility Support Services, LLC., 2685 State Street, Hamden, CT, 06517, United States
Attention: Michele Viarengo Phone: 203-288-1281 Email: mviarengo@fssteam.com Purchase Order:

RECEIVED
APR 10 2015
By [signature] 8:20 am
walk-in

Controlled Document – Asbestos COC – R9 – 10/30/2014

Page 1 of_____ pages

OrderID: 241501411

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number (*Lab Use Only*): 24150141

EMSL Analytical, Inc.
29 North Plains Hwy, Unit 4

Wallingford, CT 06492
PHONE: (203) 284-5948
FAX: (203) 284-5978

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
22214-0409-23 03B	Living Room Flooring (Floral)		
03C	↓		
04A	Living Room Flooring (Beneath Floral)		
04B	↓		
04C	↓		
05A	Kitchen Flooring Underlayment		
05B	↓		
05C	↓		
06A	Laundry Room Setting Compound		
06B	↓		
06C	↓		
07A	Rear Addition Bathroom Setting Compound		
07B	↓		
07C	↓		
08A	Rear Interior Addition Vinyl Window Caulking		
08B	↓		
09A	Bedroom Flooring Tarpaper ~~Underlayment~~ (Top Layer)		
09B	↓		
09C	↓		
10A	Bedroom Flooring Tarpaper (Bottom Layer)		
10B	↓		
10C	↓		
11A	Blown-in ~~Cinder Block~~ Attic insulation		
11B	↓		

***Comments/Special Instructions:**
BillTo: Facility Support Services, LLC., 2685 State Street, Hamden, CT, 06517, United States
Attention: Michele Viarengo Phone: 203-288-1281 Email: mviarengo@fssteam.com Purchase Order:

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By 8:20 am

Controlled Document – Asbestos COC – R9 – 10/30/2014

OrderID: 241501411

EMSL ANALYTICAL, INC.
LABORATORY•PRODUCTS•TRAINING

Asbestos Chain of Custody

EMSL Order Number *(Lab Use Only)*:

24150141

EMSL Analytical, Inc.
29 North Plains Hwy, Unit 4

Wallingford, CT 06492
PHONE: (203) 284-5948
FAX: (203) 284-5978

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
22214-0409-23 11C	Blown-In ~~Cinder Block~~ Attic Insulation.		
12A	Bathroom Flooring		
12B	↓		
12C	↓		
13A	Bathroom Flooring Underlayment		
13B	↓		
13C	↓		
14A	Bathroom Window Caulking (Interior)		
14B	↓		
14C	↓		
15A	~~Master Bedroom~~ Hallway Textured Ceiling		
15B	↓		
15C	↓		
16A	Master Bedroom Textured Ceiling		
16B	↓		
16C	↓		
17A	Hallway Joint Compound (Ceiling)		
17B	↓		
17C	↓		
18A	Master Bedroom Joint Compound (Ceiling)		
18B	↓		
18C	↓		
19A	Master Bedroom/Hallway Green + White Flooring		
19B	↓		

***Comments/Special Instructions:**
BillTo: Facility Support Services, LLC., 2685 State Street, Hamden, CT, 06517, United States
Attention: Michele Viarengo Phone: 203-288-1281 Email: mviarengo@fssteam.com Purchase Order:

RECEIVED
APR 10 2015
By EJ 8:20am

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Controlled Document – Asbestos COC – R9 – 10/30/2014

OrderID: 241501411

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number (*Lab Use Only*): 24150141

EMSL Analytical, Inc.
29 North Plains Hwy, Unit 4

Wallingford, CT 06492
PHONE: (203) 284-5948
FAX: (203) 284-5978

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
22214-0409-23 19C	Master Bedroom / Hallway Green + white Flooring		
20A	Green + White Flooring Underlayment		
20B	↓		
20C	↓		
21A	Interior Vinyl Window Caulking (Main House)		
21B	↓		
21C	↓		
22A	Porch Tile Setting Compound		
22B	↓		
22C	↓		
23A	Living Room Ceiling Sheet Rock		
23B	↓		
24A	Master Bedroom Ceiling Sheet Rock		
24B	↓		
25A	Cement Shingle Siding		
25B	↓		
25C	↓		
26A	Asphalt Shingles (Top layer) Roof		
26B	↓		
27A	Asphalt Shingles (2nd layer) Roof		
27B	↓		
28A	Asphalt Shingles (3rd layer) Roof (porch)		
28B	↓		
29A	Roof Tar Paper (Main Roof)		

***Comments/Special Instructions:**
BillTo: Facility Support Services, LLC., 2685 State Street, Hamden, CT, 06517, United States
Attention: Michele Viarengo Phone: 203-288-1281 Email: mviarengo@fssteam.com Purchase Order:

Page _____ of _____ pages

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OrderID: 241501411

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number *(Lab Use Only)*:

24150141

EMSL Analytical, Inc.
29 North Plains Hwy, Unit 4

Wallingford, CT 06492
PHONE: (203) 284-5948
FAX: (203) 284-5978

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
22244-0409-23 29B	Roof Tar paper (Main Roof)		
29C	↓		
30A	Porch Roof TO Main House Tar		
30B	↓		
30C	↓		
31A	[redacted] (Rear Addition Rolled Roofing)		
31B	↓		
31C	↓		
32A	Rear Addition Sealant Tar (Roof)		
32B	↓		
32C	↓		
33A	Exterior Vinyl Window Caulking (Main House)		
33B	↓		
34A	Exterior Cinder Block Coating (White)		
34B	↓		
34C	↓		
34D	↓		
34E	↓		

***Comments/Special Instructions:**
BillTo: Facility Support Services, LLC., 2685 State Street, Hamden, CT, 06517, United States
Attention: Michele Viarengo Phone: 203-288-1281 Email: mviarengo@fssteam.com Purchase Order:

Page _____ of _____ pages

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APR 10 2015
By 8:20 am

Controlled Document – Asbestos COC – R9 – 10/30/2014

EMSL Analytical, Inc.
29 North Plains Highway, Unit # 4, Wallingford, CT 06492
Phone/Fax: 203-284-5948 / (203) 284-5978
http://www.EMSL.com wallingfordlab@emsl.com

EMSL Order:	241501745
CustomerID:	FSS93
CustomerPO:	
ProjectID:	

Attn: **Michael DiFabio**
Facility Support Services, LLC
2685 State Street

Hamden, CT 06517

Phone:	(203) 288-1281
Fax:	(203) 248-4409
Received:	04/28/15 12:15 PM
Analysis Date:	4/29/2015
Collected:	

Project: **22214-23 CAROLINE**

Test Report: Asbestos Analysis of Non-Friable Organically Bound Materials by TEM via EPA/600/R-93/116 Section 2.5.5.1

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
22214-0409-30A *241501745-0001*	Porch roof to main house tar	Black Non-Fibrous Homogeneous	93.7	None	6.3% Chrysotile
22214-0409-30B *241501745-0002*	Porch roof to main house tar				
Positive Stop (Not Analyzed)					
22214-0409-30C *241501745-0003*	Porch roof to main house tar				
Positive Stop (Not Analyzed)					

Analyst(s)

Christina Walker (1)

Gloria V. Oriol, Laboratory Manager
or other approved signatory

This laboratory is not responsible for % asbestos in total sample when the residue only is submitted for analysis. The above report relates only to the items tested. This report may not be reproduced, except in full, without written approval by EMSL Analytical, Inc. Samples received in good condition unless otherwise noted. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample.

Samples analyzed by EMSL Analytical, Inc. South Portland, ME

Initial report from 05/04/2015 09:05:57

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

24150174

Asbestos Chain of Custody

EMSL Order Number (*Lab Use Only*): 24150141

EMSL Analytical, Inc.
29 North Plains Hwy, Unit 4

Wallingford, CT 06492
PHONE: (203) 284-5948
FAX: (203) 284-5978

Company Name : Facility Support Services, LLC.		**EMSL Customer ID:**	
Street: 2685 State Street		**City:** Hamden	**State/Province:** CT
Zip/Postal Code: 06517	**Country:** United States	**Telephone #:** 203-288-1281	**Fax #:**
Report To (Name): Michael DiFabio		**Please Provide Results:** ☐ Fax ☑ Email	
Email Address: mdifabio@fssteam.com		**Purchase Order:**	
Project Name/Number: 22214 - 23 Caroline		**EMSL Project ID** (*Internal Use Only*):	
U.S. State Samples Taken: CT		**CT Samples:** ☐ Commercial/Taxable ☒ Residential/Tax Exempt	

EMSL-Bill to: ☐ Same ☑ Different - If Bill to is Different note instructions in Comments**
Third Party Billing requires written authorization from third party

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☒ 1 Week ☐ 2 Week

**For TEM Air 3 hr through 6 hr, please call ahead to schedule. *There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PCM - Air ☐ Check if samples are from NY
- ☐ NIOSH 7400
- ☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
- ☒ PLM EPA 600/R93/116 (<1%)
- ☐ PLM EPA NOB(<1%)

Point Count
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

Point Count w/Gravimetric
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NYS 198.1 (friable in NY)
- ☐ NYS 198.6 NOB (non-friable-NY)
- ☐ NYS 198.8 SOF-V
- ☐ NIOSH 9002 (<1%)

TEM – Air ☐ **4-4.5hr TAT** (AHERA only)
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level I
- ☐ ISO 10312

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (non-friable-NY)
- ☐ Chatfield SOP
- ☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
- Fibers >10µm ☐ Waste ☐ Drinking
- All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
- ☐ Microvac - ASTM D 5755
- ☐ Wipe - ASTM D6480
- ☐ Carpet Sonication (EPA 600/J93/167)

Soil/Rock/Vermiculite*
- ☐ PLM CARB 435 - A (0.25% sensitivity)
- ☐ PLM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435- B (0.1% sensitivity)
- ☐ TEM CARB 435- C (0.01% sensitivity)
- ☐ TEM Qual. via Filtration Technique
- ☐ TEM Qual. via Drop-Mount Technique

*Can not accept New York State Loose Fill Vermiculite Samples

Other: ☐

☒ **Check For Positive Stop – Clearly Identify Homogenous Group** | **Filter Pore Size (Air Samples):** ☐ 0.8µm ☐ 0.45µm

Samplers Name: Michael DiFabio | **Samplers Signature:** [signature]

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
22214-0409-23 01A	Living Room Textured Ceiling		
01B	↓		
01C	↓		
02A	Living Room Ceiling Joint Compound		
02B	↓		
02C	↓		
03A	Living Room Flooring (Floral)		

Client Sample # (s): 01 - 34 | **Total # of Samples:** 97

Relinquished (Client): [signature] | **Date:** 4/10/15 | **Time:** 8:20

Received (Lab): | **Date:** | **Time:**

Comments/Special Instructions:
BillTo: Facility Support Services, LLC., 2685 State Street, Hamden, CT, 06517, United States
Attention: Michele Viarengo Phone: 203-288-1281 Email: mviarengo@fssteam.com Purchase Order:

RECEIVED APR 28 2015 By [signature] 12:15pm

RECEIVED APR 10 2015 By [signature] 8:20am Walk-in

Controlled Document – Asbestos COC – R9 – 10/30/2014

Page 1 of_____ pages

OrderID: 241501745
OrderID: 241501411

24150174 5

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody

EMSL Order Number (*Lab Use Only*): 24150141

EMSL Analytical, Inc.
29 North Plains Hwy, Unit 4

Wallingford, CT 06492
PHONE: (203) 284-5948
FAX: (203) 284-5978

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
22244-0401-23 29B	Roof Tar Paper (Main Roof)		
29C	↓		
30A	Porch Roof TO Main House Tar		
30B	↓		
30C	↓		
31A	[redacted] (Rear Addition Rolled Roofing)		
31B	↓		
31C	↓		
32A	Rear Addition Sealant Tar (Roof)		
32B	↓		
32C	↓		
33A	Exterior Vinyl Window Caulking (Main House)		
33B	↓		
34A	Exterior Cinder Block Coating (White)		
34B	↓		
34C	↓		
34D	↓		
34E	↓		

RECEIVED
APR 28 2015
By 12:15pm

***Comments/Special Instructions:**
BillTo: Facility Support Services, LLC., 2685 State Street, Hamden, CT, 06517, United States
Attention: Michele Viarengo Phone: 203-288-1281 Email: mviarengo@fssteam.com Purchase Order:

Page _____ of _____ pages

RECEIVED
APR 10 2015
By 8:20am

Controlled Document – Asbestos COC – R9 – 10/30/2014

Gonzalez, Ivanilly

From: Michael DiFabio <mdifabio@fssteam.com>
Sent: Tuesday, April 28, 2015 12:15 PM
To: EMSL Lab - Wallingford
Subject: PLM to TEM Analysis Upgrade

Good Afternoon,

I would like to have sample 22214-0409-23 30A, B, C re-run, with positive stop, with TEM EPA NOB anaylsis for a 1 week turnaround time. The EMSL order number is 241501411 and our customer ID number is FSS93. If you need any further information please do not hesitate to contact me.

Thank you,
Mike DiFabio
Facility Support Services, LLC.
2685 State Street Hamden, CT 06517
Office: (203)-288-1281
Cell: (203)-645-8888
mdifabio@fssteam.com

ATTACHMENT C

PCB LABORATORY ANALYTICAL DATA

80 Lupes Drive
Stratford, CT 06615

Tel: (203) 377-9984
Fax: (203) 377-9952
e-mail: cet1@cetlabs.com

Client: Mr. Kevin Bogue
Facility Support Services
2685 State Street
Hamden, CT 06517

Analytical Report

CET# 5040281

Report Date:April 15, 2015
Project: 23 Caroline St, Milford
PO Number:

Connecticut Laboratory Certificate: PH 0116
Massachussetts laboratory Certificate: M-CT903

New York Certification: 11982
Rhode Island Certification: 199

SAMPLE SUMMARY

The sample(s) were received at 4.6°C.

This report contains analytical data associated with following samples only.

Sample ID	Laboratory ID	Matrix	Collection Date/Time	Receipt Date
Bathroom Interior Window Caulking	5040281-01	Solid	4/09/2015	04/10/2015
Bathroom Flooring Underslayment	5040281-02	Solid	4/09/2015	04/10/2015
Bedroom Tar Paper Bottom Layer	5040281-03	Solid	4/09/2015	04/10/2015
Bedroom Tar Paper Top Layer	5040281-04	Solid	4/09/2015	04/10/2015
Porch Roof to House Tar	5040281-05	Solid	4/09/2015	04/10/2015
Green + White Flooring Underlayment	5040281-06	Solid	4/09/2015	04/10/2015
Main Roof Tar Paper	5040281-07	Solid	4/09/2015	04/10/2015
Rear Addition Edge Flashing Tar	5040281-08	Solid	4/09/2015	04/10/2015

Client Sample ID Bathroom Interior Window Caulking
Lab ID: 5040281-01

PCBs by Soxhlet **Analyst: SJ**

Method: EPA 8082A **Matrix: Solid**

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 22:48	
PCB-1221	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 22:48	
PCB-1232	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 22:48	
PCB-1242	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 22:48	
PCB-1248	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 22:48	
PCB-1254	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 22:48	
PCB-1260	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 22:48	
PCB-1268	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 22:48	
PCB-1262	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 22:48	
Surrogate: TCMX	*84.6 %*	*50 - 150*			B5D1312	04/13/2015	*04/14/2015 22:48*	
Surrogate: DCB	*152 %*	*50 - 150*			B5D1312	04/13/2015	*04/14/2015 22:48*	**H**

Client Sample ID Bathroom Flooring Underslayment
Lab ID: 5040281-02

PCBs by Soxhlet **Analyst: SJ**

Method: EPA 8082A **Matrix: Solid**

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	20	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:06	
PCB-1221	ND	20	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:06	
PCB-1232	ND	20	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:06	
PCB-1242	ND	20	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:06	
PCB-1248	ND	20	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:06	
PCB-1254	ND	200	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:06	
PCB-1260	ND	200	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:06	
PCB-1268	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:06	
PCB-1262	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:06	
Surrogate: TCMX	*97.0 %*	*50 - 150*			B5D1312	04/13/2015	*04/14/2015 23:06*	
Surrogate: DCB	*151 %*	*50 - 150*			B5D1312	04/13/2015	*04/14/2015 23:06*	**PH**

Client Sample ID Bedroom Tar Paper Bottom Layer
Lab ID: 5040281-03

PCBs by Soxhlet **Analyst: SJ**

Method: EPA 8082A **Matrix: Solid**

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:25	
PCB-1221	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:25	
PCB-1232	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:25	
PCB-1242	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:25	
PCB-1248	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:25	
PCB-1254	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:25	
PCB-1260	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:25	
PCB-1268	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:25	
PCB-1262	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:25	
Surrogate: TCMX	*90.4 %*	*50 - 150*			B5D1312	04/13/2015	*04/14/2015 23:25*	
Surrogate: DCB	*155 %*	*50 - 150*			B5D1312	04/13/2015	*04/14/2015 23:25*	**PH**

Client Sample ID Bedroom Tar Paper Top Layer
Lab ID: 5040281-04

PCBs by Soxhlet **Analyst: SJ**

Method: EPA 8082A **Matrix: Solid**

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	120	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:44	
PCB-1221	ND	120	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:44	
PCB-1232	ND	120	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:44	
PCB-1242	ND	120	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:44	
PCB-1248	ND	120	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:44	
PCB-1254	ND	24	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:44	
PCB-1260	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:44	
PCB-1268	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:44	
PCB-1262	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/14/2015 23:44	
Surrogate: TCMX	*85.8 %*	*50 - 150*			B5D1312	04/13/2015	*04/14/2015 23:44*	
Surrogate: DCB	*55.8 %*	*50 - 150*			B5D1312	04/13/2015	*04/14/2015 23:44*	

Client Sample ID Porch Roof to House Tar
Lab ID: 5040281-05

PCBs by Soxhlet **Analyst: SJ**

Method: EPA 8082A **Matrix: Solid**

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:02	
PCB-1221	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:02	
PCB-1232	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:02	
PCB-1242	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:02	
PCB-1248	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:02	
PCB-1254	**0.99**	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:02	
PCB-1260	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:02	
PCB-1268	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:02	
PCB-1262	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:02	
Surrogate: TCMX	*80.8 %*	*50 - 150*			B5D1312	04/13/2015	*04/15/2015 00:02*	
Surrogate: DCB	*62.0 %*	*50 - 150*			B5D1312	04/13/2015	*04/15/2015 00:02*	

Client Sample ID Green + White Flooring Underlayment
Lab ID: 5040281-06

PCBs by Soxhlet **Analyst: SJ**

Method: EPA 8082A **Matrix: Solid**

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:21	
PCB-1221	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:21	
PCB-1232	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:21	
PCB-1242	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:21	
PCB-1248	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:21	
PCB-1254	ND	8.0	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:21	
PCB-1260	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:21	
PCB-1268	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:21	
PCB-1262	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:21	
Surrogate: TCMX	*91.3 %*	*50 - 150*			B5D1312	04/13/2015	*04/15/2015 00:21*	
Surrogate: DCB	*76.7 %*	*50 - 150*			B5D1312	04/13/2015	*04/15/2015 00:21*	

Client Sample ID Main Roof Tar Paper
Lab ID: 5040281-07

PCBs by Soxhlet **Analyst: SJ**

Method: EPA 8082A **Matrix: Solid**

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:40	
PCB-1221	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:40	
PCB-1232	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:40	
PCB-1242	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:40	
PCB-1248	ND	24	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:40	
PCB-1254	ND	24	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:40	
PCB-1260	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:40	
PCB-1268	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:40	
PCB-1262	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:40	
Surrogate: TCMX	*83.4 %*	*50 - 150*			B5D1312	04/13/2015	*04/15/2015 00:40*	
Surrogate: DCB	*65.9 %*	*50 - 150*			B5D1312	04/13/2015	*04/15/2015 00:40*	

Client Sample ID Rear Addition Edge Flashing Tar
Lab ID: 5040281-08

PCBs by Soxhlet **Analyst: SJ**

Method: EPA 8082A **Matrix: Solid**

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Dilution	Prep Method	Batch	Prepared	Date/Time Analyzed	Notes
PCB-1016	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:58	
PCB-1221	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:58	
PCB-1232	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:58	
PCB-1242	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:58	
PCB-1248	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:58	
PCB-1254	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:58	
PCB-1260	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:58	
PCB-1268	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:58	
PCB-1262	ND	0.80	4	EPA 3540C	B5D1312	04/13/2015	04/15/2015 00:58	
Surrogate: TCMX	*54.1 %*	*50 - 150*			B5D1312	04/13/2015	*04/15/2015 00:58*	
Surrogate: DCB	*42.6 %*	*50 - 150*			B5D1312	04/13/2015	*04/15/2015 00:58*	**L**

QUALITY CONTROL SECTION

Batch B5D1312 - EPA 8082A

Analyte	Result (mg/kg (As Rec))	RL (mg/kg (As Rec))	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Blank (B5D1312-BLK1)					Prepared: 4/13/2015 Analyzed: 4/14/2015				
PCB-1016	ND	0.20							
PCB-1221	ND	0.20							
PCB-1232	ND	0.20							
PCB-1242	ND	0.20							
PCB-1248	ND	0.20							
PCB-1254	ND	0.20							
PCB-1260	ND	0.20							
PCB-1268	ND	0.20							
PCB-1262	ND	0.20							
Surrogate: TCMX					*76.9*	*50 - 150*			
Surrogate: DCB					*131*	*50 - 150*			
LCS (B5D1312-BS1)					Prepared: 4/13/2015 Analyzed: 4/14/2015				
PCB-1016	0.773	0.20	1.000		77.3	50 - 150			
PCB-1260	0.963	0.20	1.000		96.3	50 - 150			
Surrogate: TCMX					*75.8*	*50 - 150*			
Surrogate: DCB					*128*	*50 - 150*			

CET # : 5040281

Project: 23 Caroline St, Milford

Batch S5D1511 - EPA 8082A

Analyte	Result (ug/L)	RL (ug/L)	Spike Level	Source Result	% Rec	% Rec Limits	RPD	RPD Limit	Notes
Calibration Check (S5D1511-CCV1)					Prepared: 4/14/2015 Analyzed: 4/14/2015				
PCB-1016	971		1,000.000		97.1	80 - 120			
PCB-1260	1140		1,000.000		114	80 - 120			
Surrogate: TCMX					*94.9*	*50 - 150*			
Surrogate: DCB					*109*	*50 - 150*			

80 Lupes Drive
Stratford, CT 06615

Tel: (203) 377-9984
Fax: (203) 377-9952
email: cet1@cetlabs.com

Quality Control Definitions and Abbreviations

Internal Standard (IS)	An Analyte added to each sample or sample extract. An internal standard is used to monitor retention time, calculate relative response, and quantify analytes of interest.
Surrogate Recovery	The % recovery for non-tarer organic compounds that are spiked into all samples. Used to determine method performance.
Continuing Calibration	An analytical standard analyzed with each set of samples to verify initial calibration of the system.
Batch	Samples that are analyzed together with the same method, sequence and lot of reagents within the same time period.
ND	Not detected
RL	Reporting Limit
Dilution	Multiplier added to detection levels (MDL) and/or sample results due to interferences and/or high concentration of target compounds.
Duplicate	Result from the duplicate analysis of a sample.
Result	Amount of analyte found in a sample.
Spike Level	Amount of analyte added to a sample
Matrix Spike Result	Amount of analyte found including amount that was spiked.
Matrix Spike Dup	Amount of analyte foun in duplicate spikes including amount that was spike.
Matrix Spike % Recovery	% Recovery of spiked amount in sample.
Matrix Spike Dup % Recovery	% Recovery of spiked duplicate amount in sample.
RPD	Relative percent difference between Matrix Spike and Matrix Spike Duplicate.
Blank	Method Blank that has been taken through all steps of the analysis.
LCS % Recovery	Laboratory Control Sample percent recovery. The amount of analyte recovered from a fortified sample.
Recovery Limits	A range within which specified measurements results must fall to be compliant.
CC	Calibration Verification

Flags:

- H- Recovery is above the control limits
- L- Recovery is below the control limits
- B- Compound detected in the Blank
- P- RPD of dual column results exceeds 40%
- #- Sample result too high for accurate spike recovery.

Connecticut Laboratory Certification PH0116
Massachussets Laboratory Certification M-CT903

New York Certification 11982
Rhode Island Certification 199

Questions related to this report should be directed to David Ditta, Timothy Fusco, or Robert Blake at 203-377-9984.

Sincerely,

David Ditta
Laboratory Director

Report Comments:

Sample Result Flags:
E- The result is estimated, above the calibration range.
H- The surrogate recovery is above the control limits.
L- The surrogate recovery is below the control limits.
B- The compound was detected in the laboratory blank.
P- The Relative Percent Difference (RPD) of dual column analyses exceeds 40%.
D- The RPD between the sample and the sample duplicate is high. Sample Homogenity may be a problem.
+- The Surrogate was diluted out.
*C1- The Continuing Calibration did not meet method specifications and was biased low for this analyte. Increased uncertainty is associated with the reported value which is likely to be biased low.
*C2- The Continuing Calibration did not meet method specifications and was biased high for this analyte. Increased uncertainty is associated with the reported value which is likely to be biased high.
*F1- The Laboratory Control Sample recovery is outside of control limits. Reported value for this analyte is likely to be biased on the low side.
*F2- The Laboratory Control Sample recovery is outside of control limits. Reported value for this analyte is likely to be biased on the high side.
I- The Analyte exceeds %RSD limits for the Initial Calibration. This is a non-directional bias.

All results met standard operating procedures unless indicated by a data qualifier next to a sample result, or a narration in the QC report.

Complete Environmental Testing is only responsible for the certified testing and is not directly responsible for the integrity of the sample before laboratory receipt.

ND is None Detected at the specified detection limit
All analyses were performed in house unless a Reference Laboratory is listed.
Samples will be disposed of 30 days after the report date.

CET # : 5040281
Project: 23 Caroline St, Milford

CERTIFICATIONS

Certified Analyses included in this Report

Analyte	Certifications
EPA 8082A in Soil	
PCB-1016	CT,NY
PCB-1221	CT,NY
PCB-1232	CT,NY
PCB-1242	CT,NY
PCB-1248	CT,NY
PCB-1254	CT,NY
PCB-1260	CT,NY
PCB-1268	CT
PCB-1262	CT
EPA 8082A in Solid	
PCB-1016	CT,NY
PCB-1221	CT,NY
PCB-1232	CT,NY
PCB-1242	CT,NY
PCB-1248	CT,NY
PCB-1254	CT,NY
PCB-1260	CT,NY
PCB-1268	CT
PCB-1262	CT

Complete Environmental Testing operates under the following certifications and accreditations:

Code	Description	Number	Expires
CT	Connecticut Public Health	PH0116	09/30/2016
NY	New York Certification (NELAC)	11982	04/01/2015

5040281

CET
COMPLETE ENVIRONMENTAL TESTING, INC.

CHAIN OF CUSTODY

Volatile Soils Only:
Date and Time in Freezer
Client:
CET:

80 Lupes Drive
Stratford, CT 06615
Tel: (203) 377-9984
Fax: (203) 377-9952
e-mail: cet1@cetlabs.com
Bottle Request e-mail: bottleorders@cetlabs.com

Sample ID	Sample Depths (Units)	Collection Date/Time	Matrix (A=Air, S=Soil, W=Water, DW=Drinking Water, C=Cassette, Solid, Wipe, Other (Specify))	Turnaround Time ** (check one): Same Day *	Next Day *	2-3 Days *	Std (5-7 Days)	Organics: 8260 CT List	8260 Aromatics	8260 Halogens	624	CT ETPH	8270 CT List	8270 PNAs	PCBs Soxhlet	Pesticides	Metals (check all that apply): 13 Priority Poll	8 RCRA	TOTAL	TCLP	SPLP	Field Filtered	Lab To Filter	Additional Analysis	TOTAL # OF CONT.	NOTE #
Bathroom Interior Window Caulking		4/9/15	Solid				X								X										1	
Bathroom Flooring Underlayment							X								X										1	
Bedroom Tar Paper Bottom Layer							X								X										1	
Bedroom Tar Paper Top Layer							X								X										1	
Porch Roof to House Tar							X								X										1	
Green + White Flooring Underlayment							X								X										1	
Main Roof Tar Paper							X								X										1	
Rear Addition Edge flashing Tar							X								X										1	
																									8	

PRESERVATIVE (Cl–HCl, N–HNO_3, S–H_2SO_4, Na–NaOH, C=Cool, O–Other)

CONTAINER TYPE (P–Plastic, G–Glass, V–Vial, O–Other)

Soil VOCs Only (M=MeOH B= Sodium Bisulfate W=Water F= Empty Vial E=Encore)

RELINQUISHED BY:	DATE/TIME	RECEIVED BY:
[signature]	4-10-15 1355	[signature]
RELINQUISHED BY:	DATE/TIME	RECEIVED BY:
[signature]	4-10-15 1450	[signature]
RELINQUISHED BY:	DATE/TIME	RECEIVED BY:

NOTES:

Client / Reporting Information

Company Name: Facility Support Services, LLC.
Address: 2685 state Street
City: Hamden State: CT Zip: 06517
Report To: Michael DiFabio E-mail: MdiFabio@fssteam.com
Phone #: 203-288-1281 Fax #:

Project Information

Project Contact: Kevin Bogue PO #:
Project: 23 Caroline St. Project #:
Location: Milford CT Collector(s):
QA/QC: ☒ Std ☐ Site Specific (MS/MSD) * ☐ RCP Pkg * ☐ DQAW *
Data Report: ☒ PDF ☐ EDD - Specify Format ☒ ~~Other~~ MD
RSR Reporting Limits (check one): ☐ GA ☐ GB ☐ SWP ☒ Other 1 ppm
Laboratory Certification Needed (check one): ☐ CT ☐ NY ☐ RI ☐ MA
Temp Upon Receipt 4.6 °C Evidence of Cooling: (Y) N
SHEET ____ OF ____

* Additional charge may apply. ** TAT begins when the samples are received at the Lab and all issues are resolved. TAT for samples received after 3 p.m. will start on the next business day.

REV. 06/14

112

ATTACHMENT D

LEAD REPORT

LEAD BASED PAINT INSPECTION
REPORT OF FINDINGS
OF:

23 CAROLINE STREET
MILFORD, CONNECTICUT

DATE:
APRIL 9, 2015

PREPARED BY:
GILBERTCO LEAD INSPECTIONS LLC
287 MAIN STREET
ANSONIA, CONNECTICUT 06401

GILBERTCO
LEAD INSPECTIONS, LLC

"LEAD BASED PAINT SPECIALIST"

April 9, 2015

Job 040915

Michael DiFabio
Facility Support Services, LLC
2685 State Street
Hamden, Connecticut 06517

Re: Lead Free Certification- 23 Caroline Street, Milford, Connecticut

Gilbertco Lead Inspections LLC performed a limited XRF inspection for the presence of lead based paint at 23 Caroline Street, Milford, Connecticut. The inspection was requested by Facility Support Services in response to planned renovations to the site by State of Connecticut Department of Housing Community Block Grant Disaster Recovery Program.

The site inspected consisted of a single family, ranch style home built about 1954. The exterior is painted stucco with painted shingles. All windows are vinyl replacements except a laundry room windows. The rear deck was unpainted. The interior of the home had all walls and trim removed, with some ceilings remaining. It was vacant at the time of inspection. The separate, free standing shed was also tested.

In accordance with the Manufacturers Specifications, the RMD LPA-1 Analyzer was used in the "Quick" assaying mode. This enables the equipment to accurately determine whether the result is "Positive", above the 1.0 mg/cm2 action level or "Negative", below the action level regardless of precision or operator bias. In accordance with the above guidance, values of 0.9 mg/cm2 through 1.1 mg/cm2 are considered "Inconclusive", meaning the value level of lead in paint was so close to the 1.0 mg/cm2 action level that further analysis by XRF would not result in a "Positive" or "Negative" answer. Only laboratory analysis of the paint film can determine actual values in this range. Chip sampling of inconclusive was not included in the scope of this report, therefore, any results above 0.9 mg/cm2 are considered positive. Results are arranged floor plan style with the substrate and condition noted. Orientation of rooms places side 'one' as street side, with side 'two' to the left, side 'three' opposite, and wall 'four' to the right. Rooms were tested in a clockwise pattern.

287 Main Street
Ansonia, CT 06401
203-732-2615 - FAX 866-437-8191
Toll Free In CT Only 1-800-959-2985

In regards to the above mentioned property *no lead based painted surfaces were identified.*

Components of the demolished home do not need to undergo TCLP testing for disposal.

Lead in dust was not included in the scope of this report. Only laboratory analysis can insure that no lead dust hazards remain after renovations or from everyday use of the home.

Please feel free to call if any questions arise,

Maureen Monaco

Maureen Monaco
Director of Operations
Consultant Contractor #270
Lead Inspector Risk Assessor #1172
Lead Abatement Supervisor #2383

CERTIFICATION
LEAD IN PAINT RESULTS

AGENCY:	GILBERTCO LEAD INSPECTIONS LLC 287 MAIN STREET ANSONIA, CONNECTICUT 06401
PROJECT ADDRESS:	23 CAROLINE STREET MILFORD, CONNECTICUT
PROJECT NUMBER:	040915
TEST DATE:	APRIL 9, 2015
REQUIREMENTS:	CHAPTER 7, HUD GUIDELINES LEAD INSPECTION- SURFACE BY SURFACE
INSTRUMENTATION:	LPA-1 SERIAL NUMBER L7-643 (PROTEC) FLUOROSCOPE SPECTRUM ANALYZER (XRF) COBALT 57 SOURCE
REPORT MEDIUM:	MG PB/CM2 (MILLIGRAMS OF LEAD PER SQUARE CENTIMETER)
CALIBRATION:	TO MEASURE LEAD K-SHELL EMISSIONS. FACTORY CALIBRATED WITH HUD APPROVED REFERENCE STANDARDS. CALIBRATION FIELD CHECKED HOURLY AS RECOMMENDED BY MANUFACTURER
OPERATORS CERTIFICATION:	LEAD CONSULTANT CONTRACTOR-CC270 LEAD INSPECTOR RISK ASSESSOR- IR 1172 LEAD ABATEMENT SUPERVISOR- 2383 LEAD PLANNER/PROJECT DESIGNER -2152 MT(ASCP)- BS- Medical Technology CLS- Clinical Laboratory Scientist

I hereby certify to the best of my knowledge and capabilities that this report reflects the true lead content of the surfaces tested in this report on this date.

Maureen Minaw 4/9/2015

23 Caroline Street, Milford, Connecticut
April 9, 2015

Reading	Rm #	Room	Side	Component	Member	Condition	Substrate	Color	mg/cm2	Decision
1		Calibration							1	okay
2	1	Encl Porch	4	Door		Defective	Metal	N/A	0	Negative
3	1	Encl Porch	4	Door	Lft jamb	Defective	Wood	N/A	-0.1	Negative
4	1	Encl Porch	4	Door	Rgt casing	Defective	Wood	N/A	0	Negative
5	1	Encl Porch	3	Wall		Defective	Cement	white	-0.2	Negative
6	1	Encl Porch	1	Wall		Defective	Cement	white	-0.4	Negative
7	1	Encl Porch	2	Wall		Defective	Cement	white	-0.1	Negative
8	1	Encl Porch	1	Window	Sill	Defective	Wood	white	0.1	Negative
9	1	Encl Porch	1	Window	Apron	Defective	Wood	white	0	Negative
10	1	Encl Porch	1	Floor		Defective	Cement		-0.1	Negative
11	1	Encl Porch	1	Ceiling		Defective	Cement	white	-0.2	Negative
12	1	Encl Porch	4	Window	Header	Defective	Wood	white	-0.2	Negative
13	1	Encl Porch	3	Door	Lft jamb	Defective	Wood	white	0.6	Negative
14	1	Encl Porch	3	Door		Defective	Wood	white	0	Negative
15	2	Living Rm	1	Door		Defective	Wood	white	-0.1	Negative
16	2	Living Rm	1	Door	Lft jamb	Defective	Wood	white	0.3	Negative
17	2	Living Rm	1	Wall		Defective	Cement	black	-0.2	Negative
18	2	Living Rm	4	Wall		Defective	Cement	black	-0.2	Negative
19	2	Living Rm	1	Window	Sill	Defective	Wood	white	-0.1	Negative
20	2	Living Rm	1	Window	Rgt casing	Defective	Wood	white	0.1	Negative
21	2	Living Rm	1	Ceiling		Defective	Dry wall	white	-0.1	Negative
22	2	Living Rm	4	Window	Sill	Defective	Wood	white	-0.1	Negative
23	2	Living Rm	4	Window	Header	Defective	Wood	white	0	Negative
24	2	Living Rm	4	Wall	2x4	Defective	Wood	white	0.1	Negative
25	3	Kitchen	4	Window	Sill	Defective	Wood	white	0	Negative
26	3	Kitchen	4	Window	Rgt jamb	Defective	Wood	white	-0.4	Negative
27	3	Kitchen	4	Wall	2x4	Defective	Wood	white	0.2	Negative
28	3	Kitchen	4	Wall		Defective	Cement	black	-0.1	Negative
29	3	Kitchen	3	Wall		Defective	Cement	black	-0.1	Negative
30	4	Hallway	1	Wall		Defective	Plaster	white	0.1	Negative
31	4	Hallway	4	Door		Defective	Wood	white	-0.1	Negative
32	5	Laundry	4	Window	Sash	Defective	Wood	white	-0.1	Negative
33	5	Laundry	4	Window	Rgt jamb	Defective	Wood	white	0	Negative
34	5	Laundry	2	Window	Rgt jamb	Defective	Wood	white	-0.1	Negative
35	6	Bathroom	3	Window	Sash	Defective	Wood	white	-0.1	Negative
36	6	Bathroom	3	Window	Rgt casing	Defective	Wood	white	-0.1	Negative
37	7	Bedroom	3	Window	Sash	Defective	vinyl	white	-0.2	Negative
38	7	Bedroom	3	Floor		Defective	Wood	white	0.2	Negative

39	7	Bedroom	1	Wall		Defective	Cement	black	-0.3	Negative
40	7	Bedroom	1	Door	threshold	Defective	Cement	black	-0.1	Negative
41	8	Bedroom	2	Wall		Defective	Cement	black	-0.1	Negative
42	8	Bedroom	3	Wall		Defective	Cement	black	-0.1	Negative
43	8	Bedroom	2	Window	Sill	Defective	Wood	white	-0.4	Negative
44	8	Bedroom	2	Window	Rgt jamb	Defective	Wood	white	-0.1	Negative
45	9	Hallway	2	Ceiling		Defective	Dry wall	white	0	Negative
46	9	Hallway	2	Ceiling	Hatch	Defective	Wood	white	-0.1	Negative
47	10	Bathroom	2	Window	Rgt casing	Defective	Wood	white	-0.2	Negative
48	10	Bathroom	2	Wall		Defective	Cement	black	0	Negative
49	11	Bedroom	2	Window	Sill	Defective	Wood	white	-0.3	Negative
50	11	Bedroom	2	Window	Apron	Defective	Wood	white	-0.2	Negative
51	11	Bedroom	2	Wall		Defective	Cement	black	-0.1	Negative
52	11	Bedroom	2	Ceiling		Defective	Dry wall	white	-0.2	Negative
53	12	Exterior	1	Wall		Defective	Cement	white	0.2	Negative
54	12	Exterior	1	Window	Rgt casing	Defective	Wood	white	-0.1	Negative
55	12	Exterior	1	Overhang		Defective	Wood	white	-0.2	Negative
56	12	Exterior	1	Overhang		Defective	Wood	white	0.3	Negative
57	12	Exterior	4	Wall		Defective	Cement		0	Negative
58	12	Exterior	4	Window	Rgt casing	Defective	Wood		0.1	Negative
59	12	Exterior	4	Door		Defective	Wood		0	Negative
60	12	Exterior	4	Door	threshold	Defective	Wood		0	Negative
61	12	Exterior	4	Ceiling		Defective			-0.5	Negative
62	12	Exterior	4	Wall		Defective	Wood		0	Negative
63	12	Exterior	3	Wall		Defective	Wood		0.1	Negative
64	12	Exterior	2	Wall		Defective	Wood		0	Negative
65	12	Exterior	2	Window	Rgt casing	Defective	Wood		0	Negative
66	12	Exterior	2	Window	Sill	Defective	Wood		-0.2	Negative
67	12	Exterior	2	Overhang		Defective	Wood		-0.1	Negative
68	12	Exterior	2	Wall		Defective	Cement		0	Negative
69	12	Exterior	2	Window	Rgt casing	Defective	Wood		0.2	Negative
70	12	Exterior	2	Window	Rgt casing	Defective	Wood		0	Negative
71	13	Shed	1	Wall		Defective	Wood		-0.3	Negative
72	13	Shed	1	Overhang		Defective	Wood		-0.2	Negative
73	13	Shed	1	Window	Sill	Defective	Wood		-0.1	Negative
74	13	Shed	1	Window	Rgt casing	Defective	Wood		-0.3	Negative
75	13	Shed	4	Wall		Defective	Wood		-0.4	Negative
76	13	Shed	4	Door		Defective	Wood		-0.2	Negative
77	13	Shed	4	Door	Lft casing	Defective	Wood		-0.2	Negative
78	13	Shed	3	Wall		Defective	Wood		-0.3	Negative
79		Calibration							1.1	okay

SECTION 00 31 32

GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions.

B. A geotechnical investigation report for Project, prepared by Clarence Welti, P.E., P.C. dated June 16th, 2015, is attached to this Document. The report includes logs of borings conducted at the site.

C. Related Requirements:
   1. Document 00 31 26 "Existing Hazardous Material Information" for hazardous materials reports that are made available to bidders.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

DR. CLARENCE WELTI, P.E., P.C.

GEOTECHNICAL ENGINEERING

227 Williams Street · P.O. Box 397
Glastonbury, CT 06033-0397

(860) 633-4623 / FAX (860) 657-2514

June 16, 2015

Mr. Matthew Ranando
Martinez Couch & Associates
1084 Cromwell Avenue, Suite A-2
Rocky Hill, CT 06067

Re: Geotechnical Study for Proposed New Foundation/Raising of Residence
23 Caroline Street, Milford, CT

Dear Matthew:

1.0 Herewith are the boring data pertaining to the above. One boring was drilled to auger refusal at 58.5 feet below the existing grade. The boring location is shown on the attached sketch. *The boring was drilled by Clarence Welti Associates, Inc. and sampling was conducted by this firm solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.*

2.0 The **Subject Project** will include a renovation or replacement of the existing residence to be compliant with the current FEMA standards and DEEP requirements for construction within a flood zone. The residence is located within a AE flood zone with a base flood elevation (100 year flood) at Elev.11. Based on the property survey the existing grades on the lot are at about Elev.4. The DEEP (IWRD) recommends that residential structures be designed to the 500 year base flood level and that the 500 year flood level be calculated by multiplying the 100 year flood level by 1.25 (Elev.13.8).The is no delineation of the (LIMWA) limits of moderate wave action in the subject area. The ASCE 24-05 defines a "Coastal High Hazard Area" as "where the still water depth of the base flood above the eroded ground elevation is greater than or equal to 3.8 feet, i.e., sufficient to support a wave heights greater than 3 feet and where conditions are conducive to the formation and propagation of such waves". The site conditions would satisfy the water depth criteria. The determination of whether or not the conditions in the area around the subject site area conducive to wave formation is not within the scope of this study. The IRC requires that structures erected in Coastal High Hazard Areas shall be supported on pilings or columns, that the pilings shall have adequate penetration to resist the combined wave and wind load (lateral and uplift), and that the design of piles shall include consideration of the decreased resistance capacity caused by scour of the soil surrounding the piles. ***Apart from the FEMA, ASCE 24-05 and IRC requirements for construction in flood zones, the soils cross section at the subject residence will require that it be placed on a pile or helical pier supported foundation.***

3.0 The **Soils Cross Section** from the borings is generally as follows:

Topsoil to 4"

FILL; fine to medium SAND, little Silt and Concrete to 2 feet

FILL; fine to coarse SAND, some Silt, little Gravel to 4 feet, loose

Organic SILT to 10 feet, very soft

Fine to medium SAND, some Silt, little Gravel, trace Organics to 13.5 feet, very loose

SILT, trace fine Sand to 30 feet, medium compact to dense

SILT, trace Clay to 55 feet, medium compact

Weathered Rock to auger refusal at 58.5 feet, very dense

3.1 The **Water Table** was at 5 feet below the existing grades at the completion of the boring (about Elev.0).

4.0 The **Criteria for Foundation Type and Loading** are as follows:

1. The maximum total settlement shall not exceed 1" and the maximum differential settlement shall not exceed ½ the maximum settlement.

2. The Slab on Grade must not settle differentially more than ½" in excess of the structure subsidence.

The above criteria have been assumed by the writer in developing the recommendations, included herein. More stringent criteria than the above may require supplemental geotechnical input.

5.0 Based on the soils cross section, which included organic soils to about 13.5 feet, the foundation for a new or reconstructed residence should be with driven piles or helical piers. The design should address compression loading, lateral and uplifts loading from wind and moving waters, and the potential loss of lateral support due to the scour of soils around the piles and grade beam. Based on the height of the structure above the existing grades, it is assumed that the design would include a grade beam with concrete columns extending up to the first floor living space. ***If the existing house is to be raised in place while a new foundation is constructed beneath it, the driven pile option would probably not be feasible. The helical piers could be installed within less space and vertical clearance.***

5.1 The **driven piles** could be concrete filled pipe piles or timber piles. A pipe pile (PP10-3/4 X 0.365 wall with closed end) and a timber pile (14" diameter Class A timber piles with tips at least

9" in diameter) would achieve an ultimate capacity of 40 Tons if driven to the bedrock at about 55 feet below the existing grades. The allowable design loading should be no more than ½ the ultimate capacity.

5.2 The **helical piles** could achieve an ultimate compressive capacity of 20 Tons/pile within a length of 45 feet. The actual load would be determined by the installation torque requirements and possible settlements.

5.3 The allowable lateral loading on a vertical driven pile can be 1 kip/pile. Additional lateral resistance could be provided with battered piles. A more detailed analysis of the pile response with lateral loading can be done with the L PILE program when the loads at the pile head have been determined. The helical piers should also be evaluated for buckling and lateral resistance.

5.5 The **Frost Protection Depth (by code)** is 3.5 feet below finish grades in areas, which are exposed to weather. The bottom of the pile caps and/or grade beams should be below frost depth.

5.6 **Summary of Pile Foundation Design Parameters**:

Parameter	Value
Allowable Axial Compression Load PP10-3/4 Concrete filled pipe or Timber Pile (Class A - minimum 14" diameter butt and 9" tip)	20 Tons/pile
Allowable Tension Load (pile driven to at least 40 feet below the existing grades)	12 Tons/pile
Allowable Lateral Load on PP10 pipe pile with free head	1 kips/pile
Allowable Compression Load of Helical Piers	20 Tons/pier

* Backfill material conforming to section 6.0 below

6.0 Regarding **Backfill of Excavations for Grade Beams and Pile Caps, and Fill Beneath the Slabs on Grade** the material shall conform generally to the following gradation or be 3/8" crushed stone.

Percent Passing	Sieve Size
100	3.5"
50 - 100	3/4"

25 - 80	No.4

The fraction, passing the No.4 sieve shall have less than 15%, passing the No. 200 sieve.

All backfill and fill must be compacted to at least 95% of modified optimum density.

Where filling below water or over a wet sub grade the fill should be with the 3/8" crushed stone. The crushed stone should be carried to at least 6" above the water table. The crushed stone does not require compaction testing.

7.0 Regarding **Earthwork** the soils are in OSHA Class C and all excavations deeper than 5 feet, which are not shored, must be cut back to slopes less than 34°.

8.0 This report has been prepared for specific application to the subject project in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made. In the event that any changes in the nature, design and location of structures are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

The analyses and recommendations submitted in this report are based in part upon data obtained from referenced explorations. The extent of variations between explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

Dr. Clarence Welti, P.E., P.C., should perform a general review of the final design and specifications in order that geotechnical design recommendations may be properly interpreted and implemented as they were intended.

Based on the deductible for owner occupied residences in our error and omissions policy, our liability for errors and omissions to such owners or their agents would be $10,000. The full policy limits will apply to Martinez Couch & Associates and the State of Connecticut.

If you have any questions please call me.

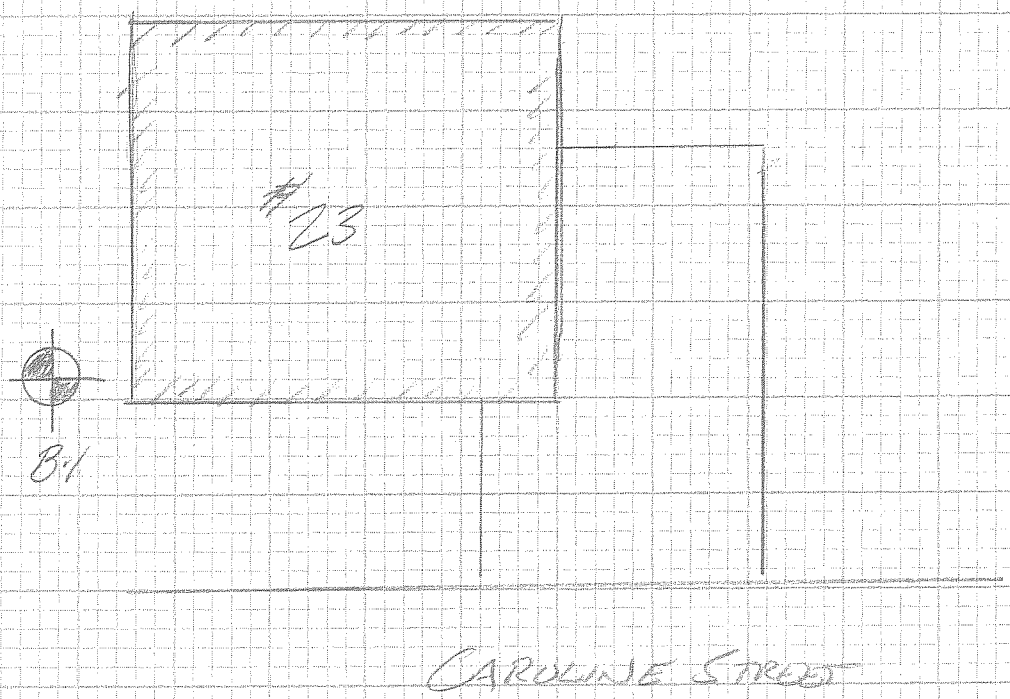
Very truly yours,

Max Welti, P.E.

Clarence Welti Ph.D., P. E.
President, Dr. Clarence Welti P.E.; P.C.

DR. CLARENCE WELTI, PE, PC
P.O. BOX 397
GLASTONBURY, CONNECTICUT 06033 • (860) 633-4623

CLIENT MCA
PROJECT
SUBJECT
BY MW DATE 5/5/15 SHEET NO.



CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033	CLIENT MARTIN COUCH & ASSOCIATES	PROJECT NAME LOCATION 23 CAROLINE STREET, MILFORD, CT.

	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV.	HOLE NO. B-1
TYPE	HSA		SS		LINE & STA.	GROUND WATER OBSERVATIONS	START DATE 5/5/15
SIZE I.D.	3.75"		1.375"		N. COORDINATE	AT 5.0 FT. AFTER 0 HOURS	
HAMMER WT.			140 lbs		E. COORDINATE	AT FT. AFTER HOURS	FINISH DATE 5/5/15
HAMMER FALL			30"				

DEPTH	SAMPLE NO.	BLOWS/6"	DEPTH	A	STRATUM DESCRIPTION + REMARKS	ELEV.
0	1	5-7-15-27	0.00'-2.00'		TOPSOIL 0.33	
					BR. FINE-MED. SAND, LITTLE SILT 1.0	
					BR. FINE-CRS.SAND, SOME CONCRETE, LITTLE SILT - FILL 2.0	
	2	3-3-4-1	2.00'-4.00'		GREY/BR. FINE-MED.SAND, SOME SILT, LITTLE FINE GRAVEL, TRACE ROOTS - FILL	
	3	2-2-2-1	4.00'-6.00'		GREY ORGANIC SILT, TRACE SHELLS 4.0	
5						
	4	1-2-1-2	6.00'-8.00'			
	5	2-2-2-1	8.00'-10.00'			
10	6	1-1-0-1	10.00'-12.00'		GREY FINE-MED.SAND, SOME SILT, LITTLE GRAVEL, TRACE ORGANICS 10.0	
	7	1-1-1-13	12.00'-14.00'			
					GREY FINE SAND, LITTLE SILT 13.5	
15	8	6-9-13	15.00'-16.50'		GREY/BR. SILT, TRACE FINE SAND 15.0	
20	9	13-16-16	20.00'-21.50'			
25	10	13-21-28	25.00'-26.50'			
30	11	2-4-6	30.00'-31.50'		GREY/BR. SILT, LITTLE CLAY 30.0	
35						

LEGEND: COL. A:

SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON

PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: T. CZMYR
INSPECTOR:

SHEET 1 OF 2 HOLE NO. B-1

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033	CLIENT MARTIN COUCH & ASSOCIATES	PROJECT NAME LOCATION 23 CAROLINE STREET, MILFORD, CT.

DEPTH	SAMPLE NO.	BLOWS/6"	DEPTH	A	STRATUM DESCRIPTION + REMARKS	ELEV.
	12	3-5-4	35.00'-36.50'			
40	13	4-5-9	40.00'-41.50'			
45	14	3-5-6	45.00'-46.50'			
50	15	4-5-7	50.00'-51.50'			
55	16	60	55.00'-55.17'		WEATHERED ROCK 55.0	
					AUGER REFUSAL @ 58.5' 58.5	
60						
65						
70						
75						

LEGEND: COL. A:

SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON

PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: T. CZMYR
INSPECTOR:

SHEET 2 OF 2 | HOLE NO. B-1

SECTION 01 10 00

SUMMARY OF WORK

General Conditions

The following provisions are intended to supplement and complement each other and shall, where possible, be thus interpreted. If, however, any provision of the Project Documents irreconcilably conflicts with one or more of the following provisions, the provision imposing the greater duty or obligation on the Contractor shall govern. Where referenced herein MCA shall mean Martinez Couch & Associates, LLC.

1. Contractor shall supply all materials (except where indicated), labor, tools, equipment, and supplies required to complete the total Project in accordance with the drawings, specifications and other Contract Documents. Prior to beginning Work, Contractor shall list any deficiencies in scope and report to MCA.

2. Contractor shall provide all coordination of all Work with Owner, Owner Vendors, DOH, and DOH Agencies as required for project completion.

3. Contractor will develop a comprehensive logistics plan for all activities that affect the Owner.

4. Contractor shall, at MCA's request be responsible for submitting Construction Report's (CR's) for the periodic increments specified by MCA, indicating subcontractors, total number of people working, description of Work completed, including total hours worked that day, and any major deliveries.

5. Contractor shall secure and pay for a dumpster for all refuse and waste material. The dumpster location will be determined by the Property Owner or MCA.

6. If required for the Project (as reasonably determined by Owner) Contractor shall erect and maintain dust-barriers to separate living areas from areas of construction.

7. In the event of a required utility shutdown, Contractor will diligently schedule work with the Owner. Contractor will give the Owner Project Manager at least three (3) days advance notice of any proposed utility shutdown.

8. Contractor shall comply with all of the legal regulations, including, but not limited to, OSHA safety regulations and regulations of municipal, city, local, and other government agencies having jurisdiction concerning the Work. Contractor shall give all notices and comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the Work. If Contractor performs any Work that is contrary to such laws, ordinances, codes, rules, and regulations, it shall make all changes to comply therewith and bear all costs arising therefrom.

9. All permits, required for any part of Contractor's Work, including those to be obtained in the Owner's name, shall be procured and paid for by Contractor.

10. Contractor to secure and pay for temporary sanitary facilities for use during construction period.

GENERAL SCOPE

Existing residential structure is to be demolished and removed offsite. A new wood frame residential structure is to be constructed in substantially the same footprint. The structure will be constructed above the indicated elevation. The structure will be supported on a new timber pile foundation. New steel and wood framing supports are to be installed and a new modular home installed. New access stairs are to be constructed with pressure treated lumber on reinforced concrete foundations. An elevated wooden deck will be constructed. All building utilities will be extended to the elevated house. The project scope includes all trades to furnish and install all materials for a complete residence as indicated on the plans and meeting requirements of the specifications. The project includes two (2) alternates. Prior to the demolition of the existing house environmental abatement work must be completed.

The Contractor is responsible for obtaining, and all costs associated with, required permits from authorities having jurisdiction. The Contractor shall provide utility coordination for utility disconnects and reconnections. All disturbed surfaces are to be restored substantially to the condition they existed prior to the start of construction. All work shall be performed in accordance with the contract drawings, specifications, and applicable codes. Contractor is expected to complete their own due diligence during the bid process. Any need for clarification shall be presented to MCA for resolution prior to bid submission. Bid submission is statement of understanding work required for successful completion at the offered fee.

PROJECT SCOPE

1. EROSION & SEDIMENT CONTROL
- 1.1. Furnish and install Erosion and Sediment Control at the site.
- 1.2. Furnish and install temporary chain link fence to provide site access control.
- 1.3. Maintain all sediment and erosion control measures for project duration.

2. ENVIRONMENTAL
- 2.1. Furnish all materials and labor to complete work in accordance with;
  - 2.1.1. See Section 02 82 13 – ‘Asbestos Abatement’

3. SELECTIVE DEMOLITION
- 3.1. Coordinate all utility disconnects

3.1.1. Properly cap and stub utilities for duration of project work.

3.2. Remove and dispose offsite existing structure and site features identified to be demolished.

3.3. Remove below-grade structure foundation, including foundation walls and footings and dispose of offsite.

3.4. Salvage and store onsite all items indicated on drawings.

3.5. Demolish and remove offsite all items as indicated on drawings.

4. BUILDING FOUNDATION

4.1. Furnish and install materials for new foundation in accordance with drawings and specifications.

5. FRAMING/ROUGH CARPENTRY/WOOD DECKING/GLUED LAMINATED CONSTRCTION

5.1. Furnish and install materials for project work in accordance with drawings and specifications; items include but are not limited to the following;

5.1.1. Decking and stairs

5.1.2. Structural framing.

6. ARCHITECTURAL WOODWORK/FINISH CARPENTRY/SIDING/ROOFING

6.1. Remove and reset trims, casings, and associated materials required to complete work.

6.2. Furnish and install in accordance with and as indicated in drawings and specifications.

7. INSULATION

7.1. Furnish and install in accordance with and as indicated in drawings and specifications;

7.1.1. Foamed in place insulation on underside of finished area living spaces.

7.1.2. Insulation as required for utility access chase construction.

7.1.3. Batt insulation for structure.

8. FINISHES

8.1. Prime, paint and stain all finished surfaces where indicated on drawings and as required to patch and repair building components damaged by construction

8.2. Detach, salvage, and reinstall any building materials required to complete the work.

8.3. Furnish and install all materials for finishes in accordance with drawings and specifications;

8.3.1. Gypsum board, flooring, and all other finishes for entire structure.

8.3.2. Gypsum board at underside of house.

9. OPENINGS

9.1. Furnish and install all materials for doors and windows in accordance with drawings and specifications.

10. MECHANICAL

10.1. Complete all work in accordance with drawings and specifications. Furnish and install all materials.

10.2. Connect, balance and fully commission all building mechanical, heating, ventilation and cooling systems.

11. PLUMBING

11.1. Complete all work in accordance with drawings and specifications. Furnish and install all materials.

11.2. Coordinate disconnects and reconnection of domestic water piping to elevated home.

11.2.1. Coordinate water meter relocation/replacement as shown on drawings and to local utility provider requirements.

11.2.2. Furnish and install all materials required for complete and functioning domestic water utility service.

11.3. Coordinate disconnect and reconnection of sanitary sewer service to elevated home

11.3.1. Furnish and install all materials required for complete and functioning sewer utility service.

11.4. Coordinate disconnect and reconnection of natural gas service to elevated home

11.4.1. Furnish and install all materials required for complete and functioning natural gas utility service.

11.5. Furnish and install all materials in accordance with specifications, drawings for heat tracing and piping insulation on,

11.5.1. Domestic water piping at underside of first finished floor.

11.5.2. Radiant heating piping at underside of first finished floor.

12. ELECTRICAL

12.1. Coordinate overhead power disconnect/reconnection with local utility provider.

12.2. Coordinate reconnection of telecommunications utility services.

12.3. Furnish and install all materials in accordance with specifications, drawings, and manufacturer requirements.

13. SITE WORK

13.1. Repair and restore all site features damaged by construction activities

13.2. Complete site work as indicated on drawings.

END OF SECTION

SECTION 01 22 00

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Requirements:
   1. Section 01 40 00 "Quality Requirements" for general testing and inspecting requirements.

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: See 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 MCA or 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: Authorized Additional Excavation and Replacement

1. Description: Unsatisfactory soil excavation and disposal off site and replacement with satisfactory fill material or engineered fill from off site, as required, according to Section 31 20 00 "Earth Moving."
2. Unit of Measurement: Cubic yard of soil excavated, based on survey of volume removed.

B. Unit Price No. 2: Rock excavation and replacement with satisfactory soil material.

1. Description: Classified rock excavation and disposal off site and replacement with satisfactory fill material or engineered fill from off site, as required, according to Section 31 20 00 "Earth Moving."
2. Unit of Measurement: Cubic yard of rock excavated, based on survey of volume removed.

C. Unit Price No. 3 – Timber Pile depth beyond length as specified on Drawing No. S2 Entitled "Foundation Design - Foundation Plan & Pile Cap Details":

1. Description: Helical Piles according to Section 31 62 19
2. Unit of Measurement: Linear feet based on actual installed feet of helical piles.

END OF SECTION

SECTION 01 23 00

ALTERNATES

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. 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. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. 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: Revise 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 revisions 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 Number 1: Lump sum alternate for forced air heating system in lieu of fin tube baseboard heating.

B. Alternate Number 2: Lump sum alternate for vertical platform lift in enclosure in lieu of stairway chair lift.

END OF SECTION

SECTION 01 25 00

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. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 01 21 00 "Allowances" for products selected under an allowance.
2. Section 01 23 00 "Alternates" for products selected under an alternate.
3. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

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 ACTION 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 revisions 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 MCA's 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. MCA's Action: If necessary, MCA will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. MCA will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

   a. Forms of Acceptance: Change Order, Construction Change Directive, or MCA's Supplemental Instructions for minor changes in the Work.
   b. Use product specified if MCA 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 a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise 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 on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: MCA will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, MCA 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. Requested substitution provides sustainable design characteristics that specified product provided.
c. Substitution request is fully documented and properly submitted.
d. Requested substitution will not adversely affect Contractor's construction schedule.
e. Requested substitution has received necessary approvals of authorities having jurisdiction.
f. Requested substitution is compatible with other portions of the Work.
g. Requested substitution has been coordinated with other portions of the Work.
h. Requested substitution provides specified warranty.
i. 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.

B. Substitutions for Convenience: MCA will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of MCA.

1. Conditions: MCA will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, MCA will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution does not require extensive revisions to the Contract Documents.
b. Requested substitution is consistent with the Contract Documents and will produce indicated results.
c. Substitution request is fully documented and properly submitted.
d. Requested substitution will not adversely affect Contractor's construction schedule.
e. Requested substitution has received necessary approvals of authorities having jurisdiction.
f. Requested substitution is compatible with other portions of the Work.
g. Requested substitution has been coordinated with other portions of the Work.
h. Requested substitution provides specified warranty.
i. 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.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00

PAYMENT 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. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 01 21 00 "Allowances" for procedural requirements governing the handling and processing of allowances.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with continuation sheets.
b. Submittal schedule.
c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to MCA at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

   a. Project name and location.
   b. Name of MCA.
   c. MCA's project number.
   d. Contractor's name and address.
   e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703 or EJCDC Document C-620. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Change Orders (numbers) that affect value.
   d. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

   a. Include separate line items under principal subcontracts for project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
6. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

7. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by MCA.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: Submit Application for Payment to MCA by the 7th day of the month. The period covered by each Application for Payment is one month in accordance with Section 2 of the general conditions section of this document.

1. Submit draft copy of Application for Payment 10 days prior to due date for review by MCA.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. MCA will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Stored Materials: No payment will be made for stored materials (either on-site or off-site).

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to MCA by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. MCA reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Forms: Submit executed waivers of lien on forms acceptable to MCA.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Submittal schedule (preliminary if not final).
6. Copies of building permits.
7. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
8. Certificates of insurance and insurance policies.
9. Performance and payment bonds.

I. Application for Payment at Substantial Completion: After MCA issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

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. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
1. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
2. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 ACTION SUBMITTALS

A. Coordination drawings. See paragraph 1.7 of this section.

1.5 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.6 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of subcontractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.7 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to MCA indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to

accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.

3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Review: MCA will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If MCA determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, MCA will so inform Contractor, who shall make changes as directed and resubmit.
9. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "Submittal Procedures."

C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Preparation Format: DWG, Version 2013, operating in Microsoft Windows operating system.
3. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format and Portable Data File (PDF) format.

4. MCA will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

    a. MCA makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.

b. Contractor shall execute a data licensing agreement in the form of AIA Document C106 or other Agreement form acceptable to MCA.

1.8 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. MCA will return RFIs submitted to MCA by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Contract
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 or Software-generated form with substantially the same content as indicated above, acceptable to MCA.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. MCA’s Action: MCA will review each RFI, determine action required, and respond. Allow seven working days for MCA’s response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

a. Requests for approval of submittals.

b. Requests for approval of substitutions.
c. Requests for approval of Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of MCA's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. MCA's action may include a request for additional information, in which case MCA's time for response will date from time of receipt of additional information.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly Use CSI Log Form 13.2B. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of MCA.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date MCA's response was received.

F. On receipt of MCA's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify MCA within seven days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.9 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and MCA of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including MCA, within three days of the meeting.

B. Preconstruction Conference: MCA will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and MCA, but no later than 10 days after a notice to proceed.

1. Conduct the conference to review responsibilities and personnel assignments.

2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, MCA, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Lines of communications.
    f. Procedures for processing field decisions and Change Orders.
    g. Procedures for RFIs.
    h. Procedures for testing and inspecting.
    i. Procedures for processing Applications for Payment.
    j. Distribution of the Contract Documents.
    k. Submittal procedures.
    l. Preparation of record documents.
    m. Use of the premises and existing building.
    n. Work restrictions.
    o. Working hours.
    p. Owner's occupancy requirements.
    q. Responsibility for temporary facilities and controls.
    r. Procedures for moisture and mold control.
    s. Procedures for disruptions and shutdowns.
    t. Construction waste management and recycling.
    u. Parking availability.
    v. Office, work, and storage areas.
    w. Equipment deliveries and priorities.
    x. First aid.
    y. Security.
    z. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and MCA, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, MCA and its consultants, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of record documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for preparing operations and maintenance data.
e. Requirements for delivery of material samples, attic stock, and spare parts.
f. Requirements for demonstration and training.
g. Preparation of Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Coordination of separate contracts.
k. Owner's partial occupancy requirements.
l. Installation of Owner's furniture, fixtures, and equipment.
m. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

D. Progress Meetings: Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority and MCA and its consultants, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction 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.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Deliveries.
4) Off-site fabrication.
5) Access.
6) Site utilization.
7) Temporary facilities and controls.
8) Progress cleaning.

9) Quality and work standards.
10) Status of correction of deficient items.
11) Field observations.
12) Status of RFIs.
13) Status of proposal requests.
14) Pending changes.
15) Status of Change Orders.
16) Pending claims and disputes.
17) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

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. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Biweekly construction reports.
5. Site condition reports.
6. Special reports.

B. Related Requirements:
1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
2. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by MCA.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 ACTION SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.
3. Two paper copies.

B. Startup construction schedule.

1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Weekly Construction Reports: Submit at biweekly intervals.

G. Material Location Reports: Submit at biweekly intervals.

H. Site Condition Reports: Submit at time of discovery of differing conditions.

I. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing work, stages area, separations, interim milestones, and partial Owner occupancy.
4. Review submittal requirements and procedures.
5. Review time required for review of submittals and resubmittals.
6. Review requirements for tests and inspections by independent testing and inspecting agencies.
7. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
8. Review and finalize list of construction activities to be included in schedule.
9. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts (where applicable), submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice of Award to date of final completion. Contract completion date shall not be changed by submission of a schedule that shows and early or delayed completion date, unless specifically authorized by a Construction Change Directive or Change Order

B. Activities: Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by MCA.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items as separate activities. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: If required for project systems include no fewer than 5 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for MCA's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 15 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work Restrictions: Show the effect of the following items on the schedule:

    a. Uninterruptible services.
    b. Partial occupancy before Substantial Completion.
    c. Use of premises restrictions.
    d. Provisions for future construction.
    e. Seasonal variations.
    f. Environmental control.

4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    a. Submittals.
    b. Installation.
    c. Tests and inspections.
    d. Adjusting.
    e. Curing.

5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
    a. Substantial Completion.
    b. Final Completion

6. Other Constraints: Not Used.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones where applicable by project scope:

1. Site work for New Foundation
2. Pile Installation
3. Formwork for Structural Concrete
4. Rebar Placement for Structural Concrete
5. Completion of Concrete Foundation
6. Completion of Superstructure Framing
7. Completion of Mechanical, Electrical, and Plumbing Installations
8. Completion of Building Utility Connections and Service Restorations
9. Re-occupancy of property by owner.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
1. Software shall be Microsoft Project or other software acceptable to MCA.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within 10 days of date established for the Notice of Award.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. Format: Submit Microsoft Excel format, latest software version or other software acceptable to MCA.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit a comprehensive, fully developed, horizontal, bar-chart-type, Contractor's construction schedule within 15 days of date established for the commencement of

Work. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

C. Format: Submit using Microsoft Project file format for Windows Operating Systems or other software acceptable to MCA

2.4 REPORTS

A. Biweekly Construction Reports: Prepare a biweekly construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. Accidents.
7. Meetings and significant decisions.
8. Unusual events (see special reports).
9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recordings.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Change Orders received and implemented.
14. Construction Change Directives received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial completions and occupancies.
18. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to MCA within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At biweekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to MCA, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules 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 performance of construction activities.

END OF SECTION

SECTION 01 33 00

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require MCA's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require MCA's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

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.

D. Martinez Couch & Associates LLC (MCA) is the Project Manager and for this project. MCA will provide technical consultation, review all project materials, and provide project management. All references to MCA in this specification and in all other specifications means Martinez Couch & Associates, LLC of Rocky Hill, Connecticut.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by MCA and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.

2. Format: Arrange the following information in a tabular format:

a. Scheduled date for first submittal.
b. Specification Section number and title.
c. Submittal category: Action; informational.
d. Name of subcontractor.
e. Description of the Work covered.
f. Scheduled date for MCA final release or approval.
g. Scheduled date of fabrication.
h. Scheduled dates for purchasing.
i. Scheduled dates for installation.
j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. MCA's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by MCA for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. 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. MCA reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on MCA'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 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. MCA 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 21 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by MCA's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to MCA and to MCA's consultants, allow 21 days for review of each submittal. Submittal will be returned to MCA before being returned to Contractor.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by MCA.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to MCA**,** containing the following information:

    a. Project name.
    b. Date.
    c. Name and address of MCA.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Names of subcontractor, manufacturer, and supplier.
    h. Category and type of submittal.
    i. Submittal purpose and description.
    j. Specification Section number and title.
    k. Specification paragraph number or drawing designation and generic name for each of multiple items.
    l. Drawing number and detail references, as appropriate.
    m. Location(s) where product is to be installed, as appropriate.
    n. Related physical samples submitted directly.

o. Indication of full or partial submittal.
p. Transmittal number, numbered consecutively.
q. Submittal and transmittal distribution record.
r. Other necessary identification.
s. Remarks.

E. Paper Submittals: Place a permanent label or title block on each submittal item 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 Engineer.
3. Include the following information for processing and recording action taken:
a. Project name.
b. Date.
c. Name of Engineer.
d. Name of Construction Manager.
e. Name of Contractor.
f. Name of subcontractor.
g. Name of supplier.
h. Name of manufacturer.
i. Submittal number or other unique identifier, including revision identifier.
1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
j. Number and title of appropriate Specification Section.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Other necessary identification.
4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will discard submittals received from sources other than Contractor.
a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
1) Project name.
2) Date.
3) Destination (To:).
4) Source (From:).
5) Name and address of Engineer.
6) Name of Contractor.
7) Name of firm or entity that prepared submittal.
8) Names of subcontractor, manufacturer, and supplier.
9) Category and type of submittal.
10) Submittal purpose and description.
11) Specification Section number and title.

12) Specification paragraph number or drawing designation and generic name for each of multiple items.
13) Drawing number and detail references, as appropriate.
14) Indication of full or partial submittal.
15) Transmittal number numbered consecutively.
16) Submittal and transmittal distribution record.
17) Remarks.
18) Signature of transmitter.

F. Options: Identify options requiring selection by MCA.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by MCA on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

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 with approval notation from MCA's action stamp.

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: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from MCA's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files to mranando@martinezcouch.com and recouch@martinezcouch.com

a. MCA will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Certificates and Certifications Submittals: Provide a 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.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

    a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.

d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
3. Submit Shop Drawings in the following format:

a. PDF electronic file.
b. Three opaque copies of each submittal. MCA will retain two copies; remainder will be returned.

D. Samples: When requested by MCA Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of applicable Specification Section.
e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: When requested by MCA Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. MCA will return submittal with options selected.

6. Samples for Verification: When requested by MCA Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three sets of Samples. MCA will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:

    a. PDF electronic file.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

K. Maintenance Data: Comply with requirements of contract documents

L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of MCAs and owners, and other information specified.

M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

N. Installer Certificates: Submit 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.

O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

R. Material Test Reports: Submit 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.

S. Product Test Reports: Submit written reports indicating that 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.

T. Research Reports: Submit 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.

U. Preconstruction Test Reports: Submit 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.

V. Compatibility Test Reports: Submit 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.

W. Field Test Reports: Submit written reports 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.

X. Design Data: Prepare and submit 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.

2.2 DELEGATED-DESIGN SERVICES

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 MCA.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, 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.

1. 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 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: 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 MCA.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. 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.

3.2 MCA'S ACTION

A. Action Submittals: MCA will review each submittal, make marks to indicate corrections or revisions required, and return it. MCA will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
   1. Approved
   2. Approved As Noted
   3. Approved As Noted/Confirm
   4. Approved As Noted/Resubmit.
   5. Not Approved
   6. Comments Attached
   7. Receipt Acknowledged

B. Informational Submittals: MCA will review each submittal and will not return it, or will return it if it does not comply with requirements. MCA will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from MCA.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the MCA without action.

END OF SECTION

SECTION 013513

SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.1 RESIDENTIAL CONSTRUCTION METHOD

A. Project drawings and specifications have been prepared with the intent for a construction method of a factory built modular residential structure.

B. Contractors electing to employ an onsite stick-frame construction method for the proposed residential structure shall be responsible for preparation of all required documents by licensed professionals to obtain required building permits.

1. Refer to specification section 13 34 00 'Fabricated Engineered Structures' for design requirements required.

C. Stick-frame built structures substituted for factory built modular residential structures shall conform to all requirements of the 2013 State of Connecticut Building Code Amendment to the 2005 State of Connecticut Building Code.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013513

SECTION 01 40 00

QUALITY 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. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

C. The contractor shall bear sole responsibility for the costs of complying with quality requirements in this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. MCA: Where referenced in this section, MCA is defined as Martinez Couch and Associates, LLC.

C. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and

completed construction comply with requirements. Services do not include contract enforcement activities performed by MCA or Construction Manager.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to the Construction Manager for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to MCA for a decision before proceeding.

1.5 ACTION SUBMITTALS

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system.
2. Main wind-force-resisting system.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 15 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to MCA. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated in paragraph 1.11 of this section
3. MCA performed tests and inspections indicated in the Contract Documents

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work MCA has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical 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.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.9 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems 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.

C. Fabricator Qualifications: A firm experienced in producing products 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.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. 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 the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to MCA, the MCA, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with MCA, the MCA, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify MCA, the MCA, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services as required by Martinez Couch and Associates, LLC, the Construction Manager Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Martinez Couch and Associates, LLC the Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
   1. Cast in Place Concrete –
      a. Mix Design – Inspector Certification shall be ACI-CCT or ICC-RCSI. Inspector scope shall review concrete batch tickets and verify compliance with approved mix design. Verification that water added at the site does not exceed that allowed by mix design.
      b. Reinforcement Installation – Inspector certification shall be ACI-CCI or ICC-RCSI. Inspection scope shall include size, spacing, cover, positioning and grade of reinforcing steel. Verification that reinforcing bars are free from deleterious materials, adequate bar ties, chair supports or bolsters, bar laps, and mechanical splices shall be included in inspection scope.
      c. Welding of Reinforcing – Inspector certification shall be AWS-CWI. Inspection scope shall include visual inspection of all reinforcing steel welds, verification of weldability of reinforcing steel, and preheating of steel when required.
      d. Concrete Placement – Inspector certification shall be ACI-CCI or ICC-RCSI. Inspection scope shall include the verification of concrete conveyance and depositing avoids segregation or contamination, proper consolidation, and placement of concrete
      e. Sampling and Testing of Concrete – Inspector certification shall be ACI-CFTT, ACI-STT to sample;
         1) Concrete Compressive Strength, ASTM C31 & C39
         2) Concrete Slump, ASTM C143
         3) Concrete Air Content, ASTM C231 or ASTM C173
         4) Temperature, ASTM C1064
      f. Curing and Protection – Inspector Certification shall be ACI-CCI or ICC-RCSI. Inspection scope shall verify cold weather protection and hot weather protection procedures as necessary.
   2. Structural Steel –
      a. Material Certification – Inspector Certification shall be AWS/AISC-SSI or ICC-SWSI. Inspection scope shall include review certified mill test reports and identification marking on wide flange shapes, high strength bolts, nuts and welding electrodes.
      b. Bolting – Inspector certification shall be AWS/AISC-SSI or ICC-SWSI. Inspection scope shall include installation and tightening of high strength bolts and verification of proper tightening sequence.
      c. Welding – Inspector certification shall be AWS-CWI or ASNT. Inspection scope shall include visual inspection of all welds, surface preparation between passes, and verification of size and length of fillet welds.
   3. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
   4. Notifying MCA and the MCA, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   5. Submitting a certified written report of each test, inspection, and similar quality-control service to MCA and the MCA, with copy to Contractor and to authorities having jurisdiction.

6. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
7. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
8. Retesting and reinspecting corrected work.
9. Where appropriate a Professional Engineer, P.E., designated by MCA or MCA shall be allowed to inspect structural steel and cast in place concrete work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to MCA.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for the Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: During the construction period various types of services are necessary to record or support the construction process, which are not an integral part of the final construction. Provide temporary facilities and controls in accordance with the Contract Documents.

B. Scope of Work includes but is not limited to:
1. Layout and measurements.
2. Staging areas.
3. Rubbish removal.
4. Safety, protection and security.
5. Temporary toilets.
6. Water Service
7. Site Fence
8. Temporary scaffolding, ladders, stairs, hoists, etc.
9. Temporary closures
10. Labor disputes
11. Temporary light and power
12. Temporary heat
13. Ventilation and Humidity Control

1.2 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. Ladders, scaffolds, planks, hoists and similar items required for a specific item of work shall be part of that Scope of Work

1.3 QUALITY ASSURANCE

A. Codes: Comply with applicable Building Code and Standards.

B. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

C. Standards: Comply with the State and Local Board of Health, Environmental Protection Agency, Fire Department and other applicable standards.

D. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

E. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.4 SUBMITTALS

A. Refer to Section 01 33 00 or certain individual items of this section.

1.5 PRODUCT HANDLING

A. Maintain temporary facilities and controls in proper safe condition throughout progress of the Work.

1.6 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

PART 2 - PRODUCTS AND EXECUTION

2.1 TEMPORARY FACILITIES INSTALLATION

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to Martinez Couch and Associates, testing agencies, and authorities having jurisdiction.

B. Layout and Measurements:
1. Use of Data Furnished: Boring, and survey data made available to the Contractor is for information only, and the Contractor shall use his own judgment as to the actual conditions. He is warned that reliance on the information presented is at his own risk, and neither the Owner, State, nor the MCA and his consultants will be liable for errors relating to such data.
2. Additional Data Required By Contractor: The Contractor may make borings or drive test pits he requires to verify the conditions at the site at his own expense. The location and size of such exploratory holes will be subject to approval by the MCA.

3. Protection of Survey: Land monuments, bench marks, survey points and other such references shall be protected from damage unless and until their removal is authorized. If they are disturbed, they shall be replaced in their proper positions.
4. Measurements: Take measurements of the work and be responsible for it.
   a. Discrepancies: Thoroughly examine the drawings and specifications, carefully checking the figured dimensions, before commencing work, and report to the MCA if any discrepancy, error, or defect appears.
   b. Dimensions: If figured dimensions are lacking on the drawings, the MCA will supply them.

C. Staging Area:
1. Scope: Access and staging areas for purposes of this Contract shall be confined to areas as directed by MCA within the property boundary.
2. Location of Apparatus: The locations of material, apparatus, equipment, fixtures, piping outlets, etc., are not specified. The actual location shall be as directed or as required to suit the conditions at the time of installation. Before installation, the Contractor shall consult the MCA and ascertain the actual location.
3. Provide temporary storage sheds if necessary, and other storage facilities on the job site for the storage of materials that may be subject to weather damage when interior or covered space is not available.
4. Provide for adequate timber bridging and planking or other suitable means as required for legal egress, and for the safeguarding of existing paving, walks and curbs, structures and utilities from damage due to construction vehicle traffic. Safeguard existing conditions from damage during construction. Repair or replace the damaged existing surroundings within the designated access and staging areas which is needed to remain in place and which is damaged by operations under this Contract.
5. Do not encumber the premises nor overload the structures beyond their allowable design live load with his/her apparatus, storage of materials and the operation of his/her workmen, and shall be confined within the limits designated by MCA.

D. Rubbish Removal:
1. Clean-up debris, rubbish and old materials resulting from the Work on a daily basis.
2. Cleaning Responsibility: Remove from the work area of building and site debris, resulting from the work daily or as often as necessary if it interferes with the work or staging area under the contract or presents a fire hazard. No rubbish or debris shall be dropped from a height of more than 6 feet, or thrown out of windows or openings without a chute. An adequate number of cleaning personnel shall be provided during working hours, who shall keep areas within and adjacent to the building free from dust and loose dirt by sweeping and wet mopping.
3. Rubbish Disposal: Furnish containers at central collection locations as designated by MCA on the site to receive construction debris. Cost of containers, removal and disposal charges shall be paid by the Contractor. Containers shall be removed as often as necessary to minimize interference with work in progress.
4. Clean the site around the building and maintain it clean and free from food and beverage containers, waste and other debris. Provide and rigidly enforce the use of waste receptacles by construction personnel. Burning of refuse is not permitted.
5. Salvage Materials: Construction salvage materials, not indicated items elsewhere to be returned to the Owner, shall become the property of the Contractor and shall be

taken from the premises. Storage of materials and equipment on the site, other than for this project, will not be permitted.

E. Safety, Protection and Security:

1. Provide safety and protection in accordance with Contract Documents.

2. Protection: Protection shall be maintained for the duration of the Project and shall include:
   a. Weather Protection: Arrange to provide protection against rain, wind, storms, frost, heat and other weather conditions, so as to maintain work, materials, apparatus and fixtures free from injury or damage. At the end of each day's work items likely to be damaged shall be covered. Remove snow and ice for the proper protection and/or execution of the construction work.
   b. Protection of Finished or Existing Work: Provide protection for the finished work. Finished or Existing floors that will remain shall be protected from traffic or construction work by covering with materials approved by the finish manufacturer. Finished construction and materials shall be protected from rain, snow and windstorm damage throughout the construction period.
   c. Fire Protection: Maintain fire-fighting equipment for the duration of construction in accordance with the requirements of the Fire Department and the Insurance Underwriters and subject to approval of the Owner's insurance agent. .Provide fire extinguishers as required by the local Fire Department and the Building Code. Coordinate with existing firefighting equipment in existing building.
   d. Volatile Liquids: Bulk storage of volatile liquids shall be outside the building at designated location. Only as much volatile liquid shall be allowed within the building at any given time as is needed for that day's operation.
   e. Vermin and Rodent Control: Prevent the infestation and multiplication of vermin and rodents, and, if necessary, employ an exterminator to rid the premises of them if there is evidence that they exist.
   f. Dust Protection: Prevent the nuisance of dust to the surrounding areas, and provide coverings or water sprinkling materials and equipment as required for such dust prevention for the work.
   g. Structural Alterations: Do not permit endangering work by excavation or otherwise and shall not cut or alter the work without the consent of the Structural MCA. Written instruction shall be obtained from the Structural MCA's representatives before cutting beams or other structural members, arches, lintels, etc.

3. Protection of Adjacent Property:
   a. Scope: Take necessary precautions to protect public and private property on or adjacent to the job site, including utilities, street signs, light standards, hydrants, pavements and walks, planting and natural features, against damage or injury including settlement or collapse.
   b. Building Damage: Should damage result to structures or property, the Contractor shall correct or repair it without undue delay and to the complete satisfaction of MCA. No "Waiver of Responsibility" for incomplete,

inadequate or defective adjoining work will be accepted unless otherwise stated by the MCA.

c. Excavation Damage: Maintain the existing and adjoining structures safety. Concrete or rock excavation in the proximity of the adjoining structures shall be done by line drilling. Existing footings and foundation work exposed shall be underpinned as directed by MCA. Prevent damage to pipes, conduits, wires, cables or structures above or below ground.

d. Site Damage: Repair and restoration of existing roads, pavements, walks, curbs, manholes, hydrants, light standards, street signs, catch basins, railings and plantings, and other construction or surfaces required due to the work under this contract shall be included in the work under the Contract even if not specifically called for in the various sections of the Specifications. Repair and restoration work shall match existing work. Costs incurred in repair work, including permits, bonds and supervision by public authorities, shall be borne by the Contractor causing the damage.

4. Welding & Cutting:

a. Handling of Welding Materials: The handling and storage of welding materials, acetylene and oxygen tanks, burners, and other equipment required for the execution of welding and cutting work at the job shall be subject to the approval of the Building Department and Fire Marshal.

b. Welding Standards: Work shall be performed in accordance with the standard specifications of the American Welding Society.

c. Fire Protection: Welders shall take precautions required to prevent fires as a result of his/her operations. When welding tools or torches are in used, the Contractor shall have available, in the immediate vicinity of the work, a fire extinguisher of the $C0_2$ type. The fire extinguisher shall be provided and maintained by the Installer. Fuel for cutting and heating torches shall be gas only, and shall be contained in Underwriters Laboratory listed containers. Storage of gas shall be in locations approved by the Fire Department.

Provide fireproofed tarpaulins where applicable at welding and cutting operations.

d. Power: The Owner will not provide power for electric welders.

5. Tree Protection: Trees identified by the Owner or MCA to remain must be protected by the Contractor during the construction period. Avoid driving vehicles or storing materials within the tree root area and excavating in the root area unless accepted by the Owner or MCA.

6. Security: The Contractor shall secure his/her tools, materials and assemblies. Claims shall not be made against the Owner or MCA for equipment or tool losses or damage to installed assemblies.

F. Temporary Toilets:

1. Chemical Toilets: The Contractor shall provide and maintain temporary enclosed and weatherproof chemical toilets located on the site. Use of the owner's toilets by construction personnel within occupied areas of the building is not permitted.

2. Cleaning of Toilets: Toilets shall be maintained in a clean and sanitary condition and shall conform to the requirements of the local Department of Health and Labor requirements. Toilets shall be pumped and cleaned a minimum of once per week.

G. Water Service:
1. Water shall be available for the various trades as coordinated with the property Owner. Prevent freeze-ups. Have water available for the various trades during the normal working periods and for fire prevention purposes.
2. Cost: the Contractor shall pay the cost of water.

H. Temporary Scaffolding, Ladders, Stairs, Hoists, Etc.:
1. Scope: Coordinate the installation and maintenance and safety of temporary stairs, ladders, ramps, scaffolds, runways, sidewalk bridges, fences, derricks, hoists, chutes, and other such operational facilities as may be needed for the proper execution of the work. Apparatus, equipment and construction shall meet the requirements of the Labor Law and other State and local Building Department Requirements.
2. Scaffolding: Coordinate the location, erection, maintenance and removal of scaffolding and other temporary facilities as required for the proper installation of the work.
3. Hoists and/or Crane: (for General Use) Coordinate and maintain the use of conventional construction hoists of sufficient size and capacity to raise materials and equipment and give access to construction levels.

I. Site Fence:
1. Location: A site fence shall be installed by the Contractor at the construction site perimeter and adjacent staging areas if required by the contract documents. New construction work, including trailer and staging shall be contained within the site fence.
2. Type:
   a. Woven Wire Mesh: 6'-0" high with gates and required bracing.
   b. Maintain fence and gates during entire construction period in a neat and orderly way free of graffiti or unauthorized signs.

J. Temporary Closures:
1. Take special precautions against damage to materials and work installed in cold or freezing weather, by providing adequate special heat and/or covering to prevent damage by the elements.
2. Temporary Partitions: (adjacent to occupied areas) after relocation of occupancy from spaces requiring access, provide temporary partitions to isolate occupied areas from work areas. Temporary partitions shall be of gypsum board on suitable studs and shall not interfere with the emergency exit requirements of occupied areas.
3. Exterior partitions shall be suitably weather protected insulated and otherwise sealed off to prevent dirt and weather infiltration.
4. Interior partitions shall be suitably sealed to limit noise and dirt infiltration.

K. Labor Disputes:

1. Notifications: Immediately notify the MCA of actual or impending labor disputes that may affect or is affecting the schedule of the Work. Take appropriate measures to eliminate or minimize the effect of such labor dispute on the schedule, including but not limited to, such measures as: promptly seeking appropriate injunctive relief; filing appropriate charges with the National Labor Relations Board under the applicable provisions of the Labor Management Relations Act of 1947, as amended; filing appropriate damage actions; taking such measures as establishing a reserved gate, where appropriate; seek other sources or supply or service; and other measures that may be appropriately utilized to limit or eliminate the effect of the labor dispute.

2. Damage - Time Extension: To the extent the Contractor fails to promptly initiate measures that are appropriate, no extension of time for completion shall be allowed. In addition, any delay impact on any Contractor's schedule or on the schedule for the Project, which is a direct result of such failure, shall be considered as a Contractor caused delay under applicable provisions of the Contract. The rights and remedies provided in this paragraph are in addition to other rights or remedies provided by law or under this Contract. The Contractor shall include this clause in every Contract, together with a requirement that Sub-Subcontractors include a substantially similar clause in each lower tier subcontract.

L. Temporary Light and Power:

1. Scope: The Contractor shall provide labor, materials, tools, appliances, and equipment and perform operations necessary for the complete execution of a separate system of temporary electric light and power throughout the project suitable for supplying electrical energy for illumination and for power tools and equipment. Such system shall be installed and maintained in place as needed and removed promptly as its necessity ceases to exist. Maintaining shall and include energizing and de-energizing the electrical systems each working day, and turning on and off of lights daily.

2. Lighting Standards: The minimum temporary lighting to be provided, and maintained in each room and changed as needed when interior walls are being erected as directed by OSHA standards. Temporary lighting must be maintained for twenty-four (24) hours a day, and seven (7) days a week at stairs and corridors below ground. In other spaces, temporary lighting and power shall be energized approximately thirty (30) minutes before the starting time and after the quitting time of the latest stopping unless otherwise directed by code.

3. Wiring Standards: Temporary wiring and equipment shall conform to the requirements of the National Electrical Code, regulations of the Building Code.

4. Energy Costs: The Contractor shall pay the Electric Utility bills, as they become due, for electric energy used for temporary lighting and power to perform work in the building.

5. Other Costs: The Contractor shall be responsible for the other costs in connection with providing and maintaining the temporary electrical power system.

M. Temporary Heat:
   1. Scope of Enclosed Building Protection: Prior to the winter weather, protection as required to accomplish the following:
   2. To protect the finish work.
   3. If the heat not available from existing heating plant, the Contractor is responsible to provide sufficient heat so that the work can be accomplish in accordance with the Contract.
   4. Cost: If the other than existing plant used for heat the Contractor shall pay for temporary heat equipment, safety provisions and fuel charges.
   5. Damage Due to Lack of or Improperly Operated Temporary Heat: Maintain heat to prevent damage due to frost and freezing during the period when temporary heat is needed. Prevent damage due to defective equipment or the use of equipment, including but not limited to damage such a stains, smudges, soot or fire, and repair damage in a manner satisfactory to the Owner and MCA.

N. Ventilation and Humidity Control (Where necessary for project work): Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

   1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

2.2 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Maintain support facilities until MCA schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will not be permitted to use permanent facilities.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Construction personnel shall park offsite. Vehicle parking onsite shall only be for work vehicles and limited to paved areas. All damage to site surfaces by contractor vehicles shall be repaired at contractors expense and no additional compensation.

2.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

B. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

C. Barricades and Warning Signs: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs.

D. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

E. Prohibit smoking in construction areas.

F. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

2.4 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary dehumidifiers or permanent HVAC system, if available to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to MCA.
    c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

2.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been 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 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 Contractor.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION

SECTION 01 60 00

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. 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; and comparable products.

B. Related Requirements:

1. Section 01 21 00 "Allowances" for products selected under an allowance.
2. Section 01 23 00 "Alternates" for products selected under an alternate.
3. Section 01 25 00 "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

A. Products: Items obtained 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 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.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," 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 additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. MCA's Action: If necessary, MCA will request additional information or documentation for evaluation within one week of receipt of a comparable product request. MCA will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 10 days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
    b. Use product specified if MCA does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "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, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, MCA will determine which products shall be used.

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 and vandalism. 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 determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

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 weather tight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

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: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for 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 indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, 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," MCA will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
   a. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:
   a. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated 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 requirements in "Comparable

Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match MCA's sample", provide a product that complies with requirements and matches MCA's sample. MCA's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by MCA from manufacturer's full range" or similar phrase, select a product that complies with requirements. MCA will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: MCA will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, MCA may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require 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 MCAs and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 73 00

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. 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.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
4. Section 017700 "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 ACTION SUBMITTALS

A. Final Property Survey – Survey substantially accurate to indicate compliance with design drawings and zoning compliance for project construction of foundation walls, major site improvements, and all other project work.
   1. Prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.

B. Certified Surveys: Submit two copies signed by land surveyor.

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 length of time permanent services and systems will be disrupted.

      a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

1.6 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 MCA of locations and details of cutting and await directions from MCA before proceeding. Shore, brace, and support structural elements 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 the following:

   a. Primary operational systems and equipment.
   b. Mechanical systems piping and ducts.
   c. Control systems.
   d. Communication systems.
   e. Electrical wiring systems.
   f. Operating systems of special construction.

3. 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 MCA's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

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 MCA 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 sitework, 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. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. 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 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 Contractor, submit a request for information to MCA according to requirements in Section 01310 "Project Management and Coordination."

E. Surface and Substrate Preparation: Comply with manufacturer's written recommendations for preparation of substrates to receive subsequent work.

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 Engineer promptly

B. General: Engage a land surveyor 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 limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.
7. 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 MCA.

3.4 FIELD ENGINEERING

A. 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 Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. 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.

C. 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 sitework.

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 minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

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. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Emergency Vehicle Access - Contractor must maintain emergency vehicle access at all times to all units/residential units.

G. Disturbances/Repairs - If during the course of installation the Contractor breaks a utility (water, sewer, telephone, cable, electricity), it is the Contractor's responsibility to repair the utility within a period that will not exceed disruption of services for more than 6-hours.

H. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

I. 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.

J. 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 MCA.
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.

K. 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.

L. 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. 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.

C. Temporary Support: Provide temporary support of work to be cut.

D. 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.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01100 "Summary."

F. 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 minimize interruption to occupied areas.

G. Cutting: Where authorized by MCA, 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 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 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.

H. 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 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 and ensures thermal and moisture integrity of building enclosure.

I. 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 requirements in 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. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

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 Section 01500 "Temporary Facilities and Controls." Section 01524 "Construction Waste Management."

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.

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 Section 01400 "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.

END OF SECTION

SECTION 01 74 19

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 other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:
1. Section 02 41 19 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
2. Section 31 10 00 "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: 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 ACTION SUBMITTALS

A. 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.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Management Plan: Submit plan within 30 days of date established for commencement of the Work.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan. Plan shall distinguish between demolition and construction waste.

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. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

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 Facilities and Controls."

B. 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, and reused.
2. Comply with Section 01 50 00 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.
3. Comply with Section 31 25 13 "Erosion Controls" for erosion and sediment controls.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Preparation of 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.
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.

3.4 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Break up and transport paving to asphalt-recycling facility at contractors option.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

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.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

3.6 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 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: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 77 00

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:
1. Section 017300 "Execution" for progress cleaning of Project site.
2. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 15 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by MCA. Label with manufacturer's name and model number where applicable.
5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 15 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner and MCA in conducting inspection and walkthrough.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.

10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, MCA will either proceed with inspection or notify Contractor of unfulfilled requirements. MCA 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 MCA, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection 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.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of MCA's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by MCA. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements if applicable.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, MCA will either proceed with inspection or notify Contractor of unfulfilled requirements. MCA 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. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: 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. Use an form acceptable to MCA. Present format to be used to MCA for approval.

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 MCA.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

    a. MS Excel electronic file. MCA will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of MCA for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-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.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. 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.

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

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 designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, 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.
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. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
q. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." And Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

   a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 78 39

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:
1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
1. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal:
1) Submit record digital data files and 2 (two) sets of plots.
2) MCA will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit three paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record prints and three set(s) of prints.
3) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy and annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy and annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy and annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

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 provide information for preparation of corresponding 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 acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

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 MCA'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 and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
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. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with MCA. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to MCA for resolution.
4. MCA will furnish Contractor one set of digital PDF data files of the Contract Drawings for use in recording information.

    a. See Section 013300 "Submittal Procedures" for requirements related to use of MCA's digital data files.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where MCA determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult MCA for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Hard Copy 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. Electronic Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.

c. Designation "PROJECT RECORD DRAWINGS."
d. Name of MCA.
e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. 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. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
3. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file and one paper copy of marked-up paper copy of Specifications.

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.

B. Format: Submit record Product Data as annotated PDF electronic file and one paper copy of marked-up paper copy of Product Data.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

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.

1. Include the following but not limited to where project appropriate
   a. Pile Installation Test Reports and Certifications
   b. Foundation Inspection Reports and Certifications
   c. Municipal and Building Official Reports and Certifications
   d. System Commissioning data for all utilities.

B. Format: Submit miscellaneous record submittals as PDF electronic file and paper copy.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

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 revisions to project record documents as they occur; do not wait until 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 MCA's reference during normal working hours.

END OF SECTION

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including DPHg General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

A. American National Standards Institute (ANSI/ASSE)

B. State of Connecticut Department of Housing (CT DOH)

C. State of Connecticut Department of Energy and Environmental Protection (CT DEEP)

D. State of Connecticut Department of Public Health (CT DPH)

E. Occupational Safety and Health Administration (OSHA)

1.3 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.
3. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.4 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse or storage.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.5 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.6 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.7 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.

C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

1.8 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Notify MCA of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify MCA and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.11 COORDINATION

A. All phasing of selective demolition and new construction activities is the sole responsibility of the contractor.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
   1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
   2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Site Access and Temporary Controls – Conduct selective demolition and debris removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent properties.

B. Temporary Facilities – Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent properties.

C. Temporary Shoring – Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Contractor will arrange to shut off indicated services/systems.
2. Arrange to shut off utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Work in Historic Areas: Selective demolition may be performed only in areas of Project that are not designated as historic.

D. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area indicated on Drawings.
5. Protect items from damage during transport and storage.

E. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

F. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by MCA, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Division 7 for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction. and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.9 SELECTIVE DEMOLITION SCHEDULE

A. Remove: As indicated on drawings.

B. Remove and Salvage: As indicated on drawings.

C. Remove and Reinstall: As indicated on drawings.

D. Existing to Remain: As indicated on drawings.

E. Dismantle: As indicated on drawings.

END OF SECTION

SECTION 02 82 13

ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. "Asbestos Containing Materials Removal Work Plan, Roofing Materials, 23 Caroline Street, Milford, CT 06460", prepared by Facility Support Services, LLC for Martinez Couch & Associates, LLC dated May 11, 2015.

PART 2 - PRODUCTS

2.1 All products in accordance with "Asbestos Containing Materials Removal Work Plan, Roofing Materials, 23 Caroline Street, Milford, CT 06460"

PART 3 - EXECUTION

3.1 All work, labor, and materials in accordance with "Asbestos Containing Materials Removal Work Plan, Roofing Materials, 23 Caroline Street, Milford, CT 06460".

END OF SECTION

Facility Support Services, LLC

Environmental & Safety Consulting Engineers

May 11, 2015 FSS PN: 22214

Martinez Couch & Associates, LLC
Attn: Mr. Matthew Ranando
1084 Cromwell Ave. Suite A-2
Rocky Hill, CT 06067

RE: Specifications: Asbestos Abatement
Applicant #0409
23 Caroline Street
Milford, Connecticut 06460

Dear Mr. Ranando:

Enclosed please find the Specifications for Asbestos Abatement (Section 02080) and associated work to support the asbestos abatement of asbestos containing materials to facilitate demolition of a single family home located at 23 Caroline Street in Milford, Connecticut. These Specifications have been prepared to satisfy the requirements of standards for asbestos abatement in the State of Connecticut.

If you have any questions regarding these Specifications, please contact the undersigned at our Hamden, CT office at (203) 288-1281. Thank you for this opportunity to have served your environmental needs.

Sincerely,

Facility Support Services, LLC (FSS)

Christopher M. Hudacek
Project Manager
CTDPH Project Designer #000239

Enclosure

Facility Support Services, LLC

Environmental & Safety Consulting Engineers

ASBESTOS ABATEMENT SPECIFICATIONS

23 CAROLINE STREET
MILFORD, CONNECTICUT 06460

Prepared For:

Martinez Couch & Associates, LLC
1084 Cromwell Avenue
Suite A-2
Rocky Hill, Connecticut 06067

Prepared By:

Facility Support Services, LLC
2685 State Street
Hamden, Connecticut 06517

Christopher Hudacek
CTDPH Project Designer #000239

May 11, 2015

FSS Project No: 22214

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PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Contractor Qualifications.

B. Contractor Use of Site and Premises.

C. Work Sequence.

D. Owner‟s Operations.

E. Closeout and Punch List.

F. Cleaning.

G. Emergency Calls

1.2 CONTRACTOR QUALIFICATIONS

A. The Contractor selected must appear on the approved list of Asbestos Abatement Contractors on file at the State of Connecticut Department of Public Health (CTDPH). Only State of Connecticut licensed asbestos abatement supervisors and workers shall perform asbestos abatement work activities.

B. The Contractor shall obtain and pay for all required permits, and prepare and file any original and amended local forms immediately following award of the work.

C. The Contractor shall conduct personal exposure air monitoring for airborne fibers as prescribed by OSHA during the project performance.

D. The Owner reserves the right to award this Contract to the Contractor who best meets all contractor qualifications and Owner‟s interests.

1.3 CONTRACTORS USE OF SITE AND PREMISES

A. Limit use of site and premises as follows:
   1. Owner occupancy.
   2. Work by Owner.
   3. Use of site and premises by public.

B. Coordinate use of the premises, including use of utilities under direction of Owner and in accordance with local ordinances.

C. Assume full responsibility for protection and safekeeping of products under this Contract.

1.4 WORK SEQUENCE

A. Work must be performed to accommodate Owner‟s requirements and work by other trades. Coordinate abatement schedule and operations with the Owner and Consultant. Re-occupancy by owner and other trades shall occur following completion of work by the Contractor and successful air clearance sampling by the Consultant.

B. The Owner will not occupy the building during the Work.

1.5 CONTRACTOR'S OPERATIONS

A. Maintain means of egress.

B. Coordinate Work with the Owner.

C. Maintain the fire alarm and fire detection systems at all times during project.

D. Maintain a permanent means of egress during activities. Provide and maintain a temporary means of egress as required by the Fire Marshall.

1.6 CLOSEOUT AND PUNCH LIST

A. The Contractor shall carefully check his/her own work and that of any Subcontractor as the work is being performed. Unsatisfactory work shall be corrected immediately.

B. When the Contractor determines that he is substantially complete, that is, has less than one percent of his Contract remaining to be completed, he shall prepare for submission to the Consultant, a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all work in accordance with the Contract Documents.

C. Upon receipt of the Contractor‟s list of items to be completed or corrected, the Consultant will promptly make a thorough inspection and prepare a "punch list" setting forth in accurate detail any items on the Contractor‟s list and any additional items that are not acceptable.

D. When the "punch list" has been prepared, the Consultant will arrange a meeting with the Contractor to identify and explain all punch list items and answer questions on the work that must be completed before final acceptance.

E. The Contractor shall correct all “punch list” items or shall cause the correction of the “punch list” items within a time frame to be established when the “punch list” is made. The time frame for the completion of the “punch list” shall not exceed the completion date of the Contract. Should the “punch list” not be completed within the specified time frame, the Owner may invoke the rights given under the General Conditions.

F. The Consultant shall not be expected to inspect any area more than once for the preparation of the “punch list” items. If, during an inspection, the Consultant discovers five (5) or more deficient conditions, then the area shall be declared “Not Ready” for Inspection.

G. All inspections and sampling required for asbestos abatement compliance will be performed by the Consultant.

1.7 CLEANING

A. Throughout the abatement period, the Contractor shall maintain the building and site free of rubbish, debris, surplus materials, and other items not required for the Work. Remove such materials from the site daily to prevent accumulations. Remove all construction debris from work areas, and remove all hazardous waste and asbestos waste as required by the most current federal, state, and local regulations and the requirements of the specifications.

1.8 EMERGENCY CALLS

A. The Contractor shall provide the Owner with a telephone number where the Contractor or Contractor's Representative can be reached during non-working hours.

B. At the direction of a duly authorized representative of the Owner, the Contractor may be required to dispatch all necessary personnel and equipment to any point on the work site to clear obstructions or make safe any conditions deemed necessary by the Owner or Consultant.

1.9 ADDITIONAL GENERAL REQUIREMENTS

A. The Abatement Contractor shall employ an English-speaking competent Asbestos Abatement Supervisor with at least three (3) years experience on projects of similar scope and magnitude who shall be responsible for all work involving asbestos abatement as described in the Specifications and defined in the applicable regulations, and have full-time daily supervision of the same. The Supervisor shall be the "Competent Person" as defined by OSHA regulations. The Contractor shall provide, on-site, at least one English-speaking foreman at all times when work is in progress. The supervisor and foreman must be thoroughly experienced in asbestos-containing materials removal work, knowledgeable of all applicable federal, state, and local regulations and capable of skillfully executing all work promptly, efficiently and in compliance with all requirements of these specifications. The Owner reserves the right to have any supervisory or foreman personnel removed from the project if they do not demonstrate the requisite qualifications.

B. The Contractor shall allow work performed under this contract to be inspected, if required, by local, state, federal, and any other authorities having jurisdiction over such work. The Contractor shall immediately notify the Owner and shall maintain written evidence of such inspection for review by the Owner.

C. The Contractor shall incur the cost of all fines resulting from regulatory non-compliance as issued by federal, state, and local agencies. The Contractor shall incur the cost of all work requirements mandated by federal, state, and local agencies as a result of regulatory non-compliance or negligence.

D. The Contractor shall immediately notify the Owner of the delivery of all permits, licenses, certificates of inspection, approval or occupancy, etc., and any other such instruments required under codes by authorities having jurisdiction, regardless of to who issued, and shall cause them to be displayed to the Owner and Consultant for verification and recording.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The Contractor shall present a working schedule to the Owner. Variations, amendments, and corrections to the schedule will be discussed, and the Owner will inform the Contractor of additions or changes in the scheduling requirements for the project.

B. The Contractor shall submit any revised schedule no later than three days following initial schedule submission. Upon approval from the Owner, the Contractor will receive a "Notice to Proceed" with the work of the Contract.

C. Any subsequent changes in the work schedule must be approved by the Owner.

D. Refer to all other applicable sections of the specification for coordination with other trades. The Contractor shall coordinate work with all other activities at this occupied site.

1.2 TIME FOR COMPLETION AND WORKING HOURS

A. Upon award of contract from the Owner, the Contractor shall immediately order materials, supplies, and components for the work of this project.

B. The Contractor shall begin the work immediately upon receipt of the written "Notice to Proceed" from the Owner. The date of the commencement of the work is termed the "Abatement Start Date." The Contractor will be required to complete all work of this Contract within the time period stipulated in the finalized schedule. The last day in the schedule is termed as "Contract Completion Date".

C. If conditions arise that are beyond the control of the Contractor and force delays in the performance of the Work, the Owner shall immediately be notified. The Contractor shall state the reason for the delay and shall estimate the expected duration of the delay. Any application for an extension of the Contract completion date shall be made under proper change order procedures. The acceptance of the cause for delay and change order is subject to the Owner's review and approval.

D. Work hours will be established in coordination with the Owner.

E. Any extra hours or days per week worked by the Contractor or Sub-Contractors shall be at no extra cost to the Owner. Denial of extra hours or days per week by the Owner shall not be grounds for extra time allotted to the overall Contract time.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

PART 1 – GENERAL

1.1 SUMMARY

A. A unit price is an amount proposed by the Contractor and stated on the proposal as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the project Scope of Work is altered.

B. Unit prices include material, any direct or indirect expenses of the Contractor or Sub-Contractor, profit, insurance, bonding, and any applicable taxes. The same unit price shall apply whether the work is added or deducted.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 FINAL CLEANING

A. Unless otherwise specified under Sections of this Specification, the Contractor shall perform final cleaning operations specified prior to final inspection.

B. Maintain the project site free from accumulations of waste, debris and rubbish caused by operations. At the completion of the work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave the project clean and ready for work of others under separate contract.

C. Cleaning shall include all surfaces, interior and exterior, in which the Contractor has had access.

D. Use only those materials that will not create hazards to health or property.

1.3 ABATEMENT CLOSEOUT DOCUMENTS

A. Submit to Martinez Couch & Associates, LLC, final completed copies of the Waste Shipment Records, signed by all transporters and the designated disposal site owner/operator.

B. Submit to Martinez Couch & Associates, LLC, copies of all notifications & permits and all worker certifications (certificates, training, medical, and fit-test).

C. The Contractor must be able to provide Certified Payroll documentation to Martinez Couch & Associates, LLC, or its Representative or Project Auditors upon formal request.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

DIVISION II

SPECIAL CONDITIONS

FOREWORD

Supplementing Division I of the Specifications for the work to be performed under this Contract, DIVISION II, SPECIAL CONDITIONS, shall apply particularly to this Contract.

The enforcement of the requirements of any of the Special Conditions shall not be construed as waiving any of the rights of the Owner, contained in any of the other provisions of the Contract.

The Contract documents, including without limitation, these Special Conditions, shall be interpreted and construed as far as is reasonably possible to be in addition to, supplementary to and consistent with each other.

PART 1 - GENERAL

1.1 SUMMARY

A. Provide selective demolition as necessary and/or directed to remove existing flooring.

1.2 PROJECT CONDITIONS

A. Occupancy:

1. Areas of the building in which selective demolition will occur will be unoccupied during work.

B. Existing Conditions:

1. After the project has begun, the Contractor is responsible for the condition of the structures to be selectively demolished.

2. Unforeseen Conditions: Should unforeseen conditions be encountered that affect design or function of project, investigate and fully submit an accurate, detailed, written report to the office of the Owner. While awaiting a response, reschedule operations if necessary to avoid delay of the overall project.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and sealed. (Where applicable).

B. As practicable, arrange operations to reveal unknown or concealed conditions for examination and verification before removal or demolition.

C. Verify actual conditions to determine, in advance, whether removal or demolition of any element will result in structural deficiency, overloading, failure, or unplanned collapse.

3.2 PREPARATION

A. Traffic:

1. Do not obstruct walks or public ways without the written permission of governing authorities and of the Owner. Where routes are permitted to be closed, provide alternate routes, if required.

B. Protection:

1. Provide for the protection of persons passing around or through the area of demolition.
2. Perform demolition so as to prevent damage to adjacent improvements and facilities to remain.
3. Protect walls, floors, and other new or existing work from damage during demolition operations.

3.3 POLLUTION CONTROLS

A. Control as much as practicable the spread of dust and dirt.

B. Observe environmental regulations.

C. Do not allow water usage that may result in freezing or flooding.

D. Do not allow adjacent improvements to remain to become soiled by demolition operations.

3.4 DEMOLITION - GENERAL

Not Applicable.

3.5 DISPOSAL OF NON-CONTAMINATED MATERIALS

A. Promptly dispose of materials resulting from demolition operations. Non-contaminated material shall be disposed of as general waste or recycled as applicable. Do not allow materials to accumulate on site.

B. All rubbish and waste material from the Work shall be neatly stacked or kept in suitable containers and removed from the premises daily. The premises shall be kept clean and in an orderly condition at all times to the satisfaction of the Owner.

C. Transport materials resulting from demolition operations and legally dispose of off-site.

D. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

3.6 CLEANING

A. Throughout the construction period, the Contractor shall maintain the building and site free of rubbish, debris, surplus materials, and other items not required for the Work. Remove such material from the site daily to prevent accumulations. Remove all construction debris from work areas, and remove all hazardous waste and asbestos waste, as required, by the most current federal, state, and local regulations and the requirements of the specifications.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General Provisions of Contract, including Supplementary Conditions and other Division 1 Sections, apply to this Section.

B. Refer to other Sections of these Specifications to determine the type and extent of work therein affecting the work of this Section, whether or not such work is specifically mentioned herein.

1.2 SCOPE OF WORK

A. Work outlined in this section includes all that is necessary for the complete removal and disposal of asbestos-containing materials (ACMs) identified in the areas as detailed below for 23 Caroline Street in Milford, CT. The Contractor is responsible for verification of all quantities of ACM scheduled for removal. This verification shall include an on-site walk-through inspection of the work area. The project is detailed in the following table.

TABLE 1: LIST OF ACMs

MATERIAL	LOCATION	ESTIMATED QUANTITY
Flooring	Bathroom next to master bedroom Including entrance	30 square feet
Transite siding	Exterior Front face of porch and right side of house	50 square feet
Flashing tar	Exterior At junction of porch roof to house	6 square feet
Tar sealant	Exterior Rear roof perimeter	60 linear feet
	Exterior At rolled roofing seams	25 linear feet

1.3 DEFINITIONS

The following definitions relative to asbestos abatement apply:

1. ABATEMENT - Procedures to control fiber releases from asbestos-containing materials; includes removal, encapsulation, and enclosure.

2. AIR MONITORING - The process of measuring the airborne fiber concentration within an area or within a person‟s breathing zone.

3. AMENDED WATER - Water to which a surfactant has been added.

4. ASBESTOS - The name given to a number of naturally occurring fibrous silicates. This includes the serpentine forms and the amphiboles and includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite, or any of these forms, which have been chemically altered.

5. ASBESTOS PROJECT MONITOR (APM) - A professional capable of conducting air monitoring and analysis of samples for airborne fiber concentrations. This individual should be an industrial hygienist, an environmental scientist, or an engineer with experience in asbestos air monitoring and worker protection equipment and procedures. This individual should have demonstrated proficiency in conducting air sample collection in accordance with 29 CFR 1910.1001 and 29 CFR 1926.1101.

6. ASBESTOS WORK AREA - A regulated area as defined by OSHA 29 CFR 1926.1101 where asbestos abatement operations are performed which is isolated by physical barriers to prevent the spread of asbestos dust, fibers, or debris. The regulated area shall comply with requirements of regulated area for demarcation, access, respirators, prohibited activities, competent persons and exposure assessments and monitoring.

7. ASBESTOS FIBERS – Those asbestos particles with a length greater than five (5) microns and a length to diameter ratio of 3:1 or greater.

8. CLEAN ROOM - An uncontaminated area or room, which is a part of the worker decontamination enclosure with provisions for storage of workers' street clothes and protective equipment.

9. CLEARANCE SAMPLING - Final air sampling performed aggressively after the completion of the abatement project in a regulated area. Clearance sampling can be conducted by either of the following two methods:

(A) Air samples collected by the air sampling professional having a fiber concentration of less than 0.01 fibers/cc of air in each of five (5) samples collected inside the containment will denote acceptable clearance sampling by Phase Contrast Microscopy (PCM).

(B) Five air samples collected inside the containment by the air sampling professional having an average asbestos concentration of less than 70 structures per square millimeter of air will denote acceptable clearance sampling for Transmission Electron Microscopy (TEM).

10. COMPETENT PERSON - As defined by 29 CFR 1926.1101, a representative of the Abatement Contractor who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure. In addition has authority to take prompt corrective measures to eliminate such hazards during asbestos removal. Competent person shall be properly trained in accordance with Environmental Protection Agency‟s (EPA) Model Accreditation Plan.

11. CURTAINED DOORWAY - A device to allow ingress and egress from one area to another while permitting minimal air movement between the areas. Two curtained doorways spaced a minimum of six feet apart can form an airlock.

12. DECONTAMINATION ENCLOSURE SYSTEM - A series of connected areas, with curtained doorways between any two adjacent areas, for the decontamination of workers and equipment. A decontamination enclosure system always contains at least one airlock and is adjacent and connected to the regulated area, where possible.

13. ENCAPSULANT - A liquid material which can be applied to asbestos-containing materials which controls the possible release of asbestos fibers from the materials either by creating a membrane over the surface (bridging encapsulant) or penetrating the material and binding its components together (penetrating encapsulant).

14. EQUIPMENT ROOM – Any contaminated area or a room that is part of the worker decontamination enclosure with provisions for storage of contaminated clothing and equipment.

15. FIXED OBJECT - Unit of equipment or furniture in the work areas that cannot be removed from the work area.

16. FRIABLE ASBESTOS MATERIALS - Any material that contains more than 1% asbestos by weight, that can be crumbled, pulverized or reduced to powder by hand pressure.

17. GLOVE BAG - A manufactured polyethylene bag type of enclosure with built-in gloves such as is placed with an airtight seal around asbestos-containing material and which permits the asbestos-containing materials contained by the bag to be removed

without releasing asbestos fibers to the atmosphere. The use of glove bag is permitted for removal and repair of small amount (less than 3 linear feet/3 square feet) of ACM.

18. HEPA FILTER - High Efficiency Particulate Air (HEPA) filter in compliance with ANSI Z9.2-1979.

19. HEPA VACUUM EQUIPMENT - Vacuum equipment equipped with a HEPA filter system for filtering the effluent air from the unit.

20. MOVABLE OBJECT - Unit of equipment or furniture in the work area that can be removed from the work area.

21. NEGATIVE AIR PRESSURE EQUIPMENT - A portable local exhaust ventilation system equipped with HEPA filtration used to create negative pressure in a regulated area (negative with respect to adjacent unregulated areas) and capable of maintaining a constant, low velocity air flow into regulated areas from adjacent unregulated areas.

22. NESHAPS - National Emissions Standard for Hazardous Air Pollutants regulations enforced by the EPA.

23. PERMISSIBLE EXPOSURE LEVEL (PEL) - The average airborne concentration of asbestos fibers to which an employee is allowed to be exposed over an eight-hour period. The PEL established by OSHA 29 CFR 1926.1101 is 0.1 fibers per cubic centimeter of air averaged over an eight-hour time period. An airborne fiber concentration of 1.0 fibers /cc averaged over a sampling period of 30 minutes is the Excursion Limit. The Contractor is responsible for maintaining work areas in a manner that this standard is not exceeded.

24. REGULATED AREA - An area established by the employer to demarcate where Class I, II, and III asbestos work is conducted and any adjoining area where debris and waste from such asbestos work accumulate, and a work area within which airborne concentrations of asbestos fibers may exceed the PEL.

25. SHOWER ROOM - A room between the clean room and the equipment room in the work decontamination enclosure with hot and cold running water and suitably arranged for employee showering during decontamination. The shower room is located in an airlock between the contaminated area and the clean area.

1.4 SUBMITTALS

A. The Contractor shall submit the following to the Owner prior to the start of the project:

1. Evidence that the Contractor is certified to perform asbestos abatement work in the State of Connecticut.

2. Schedule to the Owner, which defines a timetable for executing and completing the project, including set-up, removal, cleanup, decontamination, and air clearance monitoring.

3. The identity and licensing of the hauling contractor and the landfill to be used.

4. Connecticut certificates of licensure (current) and training (both initial and current refresher), current respirator fit test records, and current medical records for each employee who may be on the project site. No individual shall provide services as an asbestos abatement site supervisor or as an asbestos abatement worker without a license to do so issued by the CTDPH.

5. Signed copy of the Certificate of Workers Acknowledgment found at the end of this section for each worker who is to be at job site.

6. Detailed product information on all materials and equipment proposed for asbestos abatement work on this project.

B. The following shall be available onsite during the work:

1. Training, State certification, respirator fit test, and medical records for employees to start work.

C. The following shall be submitted to the Owner (Martinez Couch & Associates, LLC) at the completion of work:

1. Completed Punch List.

2. Completed copies of Waste Shipment Records (WSR).

1.5 REGULATIONS AND STANDARDS

A. The Contractor shall be solely responsible for conducting this project and supervising all work in a manner which will be in conformance with all federal, state, and local regulations and guidelines pertaining to asbestos abatement. Specifically, the Contractor shall comply with the requirements of the following:

1. U.S. Environmental Protection Agency (USEPA) National Emissions Standards for Hazardous Air Pollutants (NESHAP) Regulations (40 CFR 61, Subpart M);

2. Occupational Safety and Health Administration (OSHA) Asbestos Regulations (29 CFR 1910.1001 and 1926.1101);

3. State of Connecticut Department of Public Health (CTDPH) Standards for Asbestos Abatement Sections 19a-332a-1 through 19a-332a-16 inclusive and Sections 20-440-1 through 20-440-9 inclusive;

4. State of Connecticut Department of Energy & Environmental Protection (CTDEEP) Regulations, Section 22a-209-8(i) and Section 22a-220 of the Connecticut General Statute.

5. Connecticut Basic Building Code (BOCA)

6. National Fire Protection Association (NFPA) Life Safety Code;

7. Local health and safety codes, ordinances or regulations pertaining to asbestos abatement and all national codes and standards including Association for Standards of Testing and Materials (ASTM), American National Standards Institute (ANSI), and Underwriters Laboratories (UL).

8. Occupational Safety and Health Administration (OSHA) (29 CFR 1910 Subpart D) and (29 CFR 1926 Subpart M) Fall Protection.

1.6 EXEMPTIONS

A. Any deviations from these Specifications require the written approval and authorization from the Owner and Consultant Asbestos Project Designer.

B. Any deviation in work practices identified in CTDPH Standards for Asbestos Abatement, Sections 19a-332a-1 to 19a-332a-23, Sections 20-440-1 to 20-440-9, Section 20-441, and Section 19a-332e-1 to 19a-332e-2, <u>must</u> be requested in writing and approved in writing by the CTDPH.

1.7 FINAL VISUAL INSPECTION AND CLEARANCE AIR SAMPLING

A. Following the completion of the final cleaning phase of the work in a contained work area, the Consultant shall conduct a final visual inspection of the area. The Contractor shall be responsible for meeting final visual criteria, which is the absence of visible debris, as specified in CTDPH regulation 19a-332a-12(b).

B. Following the completion of the final visual inspection, and upon which time the Consultant agrees that the Contractor has met the final visual criteria and the work area has been encapsulated, the Consultant will collect final clearance air samples in work area(s) as required. The Owner shall be responsible for payment of the sampling and analysis of the first round of final air clearance samples only for a particular work area. The Contractor shall be responsible for payment of all costs associated with the collection and analysis of additional final air clearance samples if the first round samples fail to meet the designated clearance criteria of 0.010 fibers/cubic centimeter (f/cc) by phase contrast microscopy (PCM) or <70 structures per square millimeter (s/mm) by transmission electron microscopy (TEM).

1.8 NOTIFICATIONS, POSTINGS, SUBMITTALS, AND PERMITS

A. The Contractor shall make the following notifications and provide submittals to the following agencies prior to the commencement of removal work. This notification is required ten (10) calendar days prior to the start of the abatement project:

1. State of Connecticut
   Department of Public Health
   Indoor Air Program
   410 Capitol Avenue
   P.O. Box 340308
   Hartford, CT 06134-0308

   Note: Required for abatement occurring in a School facility. Also satisfies the requirement to notify the EPA.

2. State of Connecticut
   Department of Energy & Environmental Protection
   Health Services and Solid Waste management Unit
   79 Elm Street
   Hartford, CT 06106
   (Only if asbestos waste is disposed of in Connecticut)

B. The minimum information included in the notification to these agencies includes:

1. Name and address of site owner/operator.

2. Site location.

3. Amount of friable and non-friable asbestos-containing materials to be removed.

4. Work schedule, including proposed start and completion dates.

5. Asbestos removal procedures to be used.

6. Name and location of disposal site for generated asbestos waste, residue, and debris.

1.9 WORK SITE SAFETY PLAN

A. The Contractor shall establish a set of emergency procedures and shall post them in a conspicuous place at the work site. The safety plan should include provisions for the following:

1. Evacuation of injured workers.

2. Emergency and fire exit routes from all work areas.

3. Emergency first aid treatment.

4. Local telephone numbers for emergency services including ambulance, fire, and police.

5. Methods to notify appropriate personnel in the event of a fire or other emergency requiring evacuation of the site or area.

6. Site safety plan for fall protection.

B. The Contractor is responsible for training all workers in these procedures.

1.10 CONTROL OVER REMOVAL WORK

A. At the discretion of the owner, all work procedures may be continuously monitored by the Consultant‟s Asbestos Project Monitor (APM) to determine that areas outside the designated work area(s) have not been contaminated.

B. Prior to work on any given day, the Contractor's designated "Competent Person" shall discuss the day's work schedule with the APM to evaluate job tasks with respect to safety procedures and requirements specified to prevent contamination outside the work area. This includes a visual survey of the work area(s) and the decontamination enclosure systems. (if applicable)

C. The Contractor shall maintain control of and be responsible for access to all work areas to ensure the following requirements:

1. Non-essential personnel are prohibited from entering the area.

2. All authorized personnel entering the work area shall read the "Worker Protection Procedures" which are posted at the entry points to the enclosure system, and shall be equipped with properly fitted respirators and protective clothing.

3. All personnel who are exiting from the decontamination enclosure system shall be properly decontaminated.

4. Asbestos waste that is taken out of the work area must be properly bagged and labeled in accordance with these specifications. The surface of the bags shall be decontaminated. Asbestos waste leaving the enclosure system must be immediately transported off site or immediately placed in locked, posted temporary storage on site, and removed within 24 hours of the project conclusion. The Contractor will seek permission of the Owner to place a temporary dumpster at a suitable location (if applicable).

5. Any material, equipment, or supplies that are brought out of the decontamination enclosure system shall be cleaned and decontaminated by wet cleaning and/or HEPA vacuuming of all surfaces.

1.11 PROPER WORKER PROTECTION

A. This section describes the equipment and procedures required for protecting workers against asbestos contamination and other workplace hazards except for respiratory protection.

B. All workers are to be accredited and certified as Asbestos Abatement Workers as required by the CTDPH.

C. The Contractor is required to be certified, accredited, and licensed as required by the CTDPH.

D. In accordance with 29 CFR 1926.1101, all workers shall receive a training course covering the dangers inherent in handling asbestos, the dangers of breathing asbestos dust, proper work procedures, and proper worker protective measures. This course must include but is not limited to the following:

1. Methods of recognizing asbestos.

2. Health effects associated with asbestos.

3. Relationship between smoking and asbestos in producing lung cancer.

4. Nature of operations that could result in exposure to asbestos.

5. Importance of and instruction in the use of necessary protective controls, practices and procedures to minimize exposure including:
   a. Engineering controls
   b. Work practices
   c. Respirators
   d. Housekeeping procedures
   e. Hygiene facilities
   f. Protective clothing
   g. Decontamination procedures
   h. Emergency procedures
   i. Waste disposal procedures

6. Purpose, proper use, fitting, instructions, and limitations of respirators as required by 29 CFR 1910.134.

7. Appropriate work practices for the work.

8. Requirements of medical surveillance program.

9. Review of 29 CFR 1926.

10. Pressure differential systems.

11. Work practices including hands on or on-job training.

12. Personal Decontamination procedures.

13. Air monitoring, personal and area.

E. The Contractor shall provide medical examinations for all workers who may encounter an airborne fiber level of 0.1 f/cc or greater for an eight-hour Time Weighted Average (TWA). In the absence of specific airborne fiber data, provide

medical examinations for all workers who will enter the work area for any reason. Examination shall at a minimum meet OSHA requirements as set forth in 29 CFR 1926.1101. In addition, provide an evaluation of the individual‟s ability to work in environments capable of producing heat stress in the worker.

F. Submit the following to the Owner/Consultant for review. The Contractor shall not start work until the Owner/Consultant reviews the submittals and indicates that they are acceptable.

1. Certificates from an EPA-approved AHERA Abatement Workers course for each worker as evidence that each Asbestos Abatement Worker is accredited as required by the AHERA Regulation 40 CFR 763 Appendix C to Subpart E, April 30, 1987.

2. Evidence that the Contractor is certified to perform asbestos abatement work by the State of Connecticut Department of Public Health.

3. An original signed copy of the Certificate of Worker's Acknowledgment found at the end of this section, for each worker who is to be at the job site or enter the Work Area.

4. Documents verifying that each worker has had a medical examination within the last 12 months as part of compliance with OSHA medical surveillance requirements. Submit, at a minimum, for each worker the following:
   a. Name and Social Security Number.
   b. Physicians Written Opinion from examining physician including at a minimum the following:
      1) Whether worker has any detected medical conditions that would place the worker at an increased risk of material health impairment from exposure to asbestos.
      2) Any recommended limitations on the worker or on the use of personal protective equipment such as respirators.
      3) Statement that the worker has been informed by the physician of the results of the medical examination and of any medical conditions that may result from asbestos exposure.

5. Information that was provided to physician in compliance with 29 CFR 1926.1101.

6. A statement that the worker is able to wear and use the type of respiratory protection proposed for the project, and is able to work safely in an environment capable of producing heat/cold stress in the worker.

G. Certification signed by an officer of the company and notarized which states that exposure measurements, medical surveillance, and worker training records are being kept in conformance with the requirements of OSHA 29 CFR 1926.

1.12 CONTRACTOR'S AIR SAMPLING RESPONSIBILITY

A. The Contractor is responsible for monitoring airborne asbestos fiber concentrations in the workers' breathing zones and to establish conditions and work procedures for maintaining compliance with OSHA Regulations 29 CFR 1910.1001, and 1926.1101.

B. The air sampling procedures shall ensure proper documentation of all personal air-sampling results. Documentation for personal sampling must be available at the job site for review by federal and/or state regulatory agencies.

C. All air sampling shall be conducted in accordance with methods described in OSHA Standards 29 CFR 1910.1001 and 1926.1101. The flow rate for air samples will not be less than 0.5 liters/minute and must not exceed 2.5 liters/minute.

1.13 RESTRICTIONS ON CONTRACTOR'S USE OF GROUNDS

A. The Contractor shall confine his/her operations to the actual work site, access routes and storage areas designated by the Owner. The Contractor may place a dumpster at a place designated by the Owner.

B. The Contractor shall have sole responsibility for providing all materials, equipment, or tools and any storage required shall be at the Contractor's own risk. The Owner will not assume responsibility for any loss of materials, equipment, or tools stored on its property.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.

B. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Material that becomes contaminated with asbestos shall be decontaminated or disposed of as asbestos waste.

C. Polyethylene sheet in a roll size to minimize the frequency of joints shall be delivered to the job site with factory label indicating 4 or 6 mil thickness.

D. Polyethylene disposable bags shall be six (6) mil thick with pre-printed labels.

E. Tape and adhesive spray will be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.

F. Surfactant (wetting agent), shall consist of fifty (50) percent polyoxyethylene ether and fifty (50) percent polyoxyethylene ester, or equivalent, and shall be mixed with water to provide a concentration of one (1) ounce surfactant to five (5) gallons of water or as directed by manufacturer.

G. Removal encapsulant shall be non-flammable factory prepared penetrating chemical encapsulant found acceptable to Consultant. Usage shall be in accordance with manufacturer's printed technical data.

H. The Contractor shall have available spray equipment capable of mixing wetting agent with water and capable of generating sufficient pressure and volume and having sufficient hose length to reach all areas where asbestos is present.

I. Impermeable containers are to be used to receive and retain any asbestos- containing or contaminated materials until disposal at an acceptable disposal site. (The containers shall be labeled in accordance with OSHA Standard 29 CFR 1926.1101) Containers must be both air and watertight.

J. Labels and signs, as required by OSHA Standard 29 CFR 1926.1101 will be used.

K. Encapsulant shall be bridging or penetrating type which has been found acceptable to the Consultant. Usage shall be in accordance with manufacturer's printed technical data.

L. A high efficiency particulate air (HEPA)-filtered local exhaust ventilation shall be utilized during the installation of enclosures and supports where asbestos-containing materials may be disturbed.

2.2 TOOLS AND EQUIPMENT

A. The Contractor shall provide all tools and equipment necessary for asbestos removal.

B. The Contractor's air monitoring professional shall have air-monitoring equipment of type and quantity to monitor operations and conduct personal exposure monitoring per OSHA requirements.

C. The Contractor shall have available sufficient inventory of dated purchase orders for materials necessary for the job including protective clothing, respirators, filter cartridges, polyethylene sheeting of proper size and thickness, tape and air filters.

D. The Contractor shall have available power cables or power sources such as generators (where required).

E. Exhaust air filtration system units shall contain HEPA filter(s) capable of sufficient air exhaust to create negative pressure of at least 0.02 inches of water column within each enclosure with respect to outside areas. Equipment shall be checked for proper operation by smoke tubes or differential pressure gauge before the start of each shift and at least twice during the shift. Adequate exhaust air shall be provided for a minimum of four (4) air changes per hour within the enclosure. No air movement system or air filtering equipment shall discharge unfiltered air outside, nor shall filtered air units be exhausted indoors from the work area.

F. Vacuum units, of suitable size and capacities for the project, shall have HEPA filter(s) capable of trapping and retaining at lead 99.97 percent of all monodispersed particles of 0.3 micrometers in diameter or larger.

G. The Contractor will have reserve units so that the exhaust air filtration system will operate continuously.

2.3 ELECTRICAL

A. If the Contractor elects to furnish and install a portable ground fault circuit interrupter (GFCI) Power Supply Board and receptacles, it shall include the following:

1. All circuits individually GFCI-protected.

2. Weatherproof enclosure NEMA 3 (rain-tight) with receptacle covers.

3. Construction durable, 16-gauge steel construction.

4. At least two 20-amp circuits (for APM).

5. Main circuit breaker.

5. Components UL listed.

6. At least two 20-amp circuits (for Decontamination Facility).

B. The Contractor shall furnish and install wiring as follows:

1. Size the wire to limit voltage drop to a maximum of 3% with length of run.

C. The Contractor will supply additional lighting for all abatement work areas if necessary to provide sufficient lighting.

D. As necessary, the Contractor will de-energize, lockout, and tag existing electrical components within the work area at their closest main source.

E. The Contractor shall provide all electrical connections and equipment necessary to supply “bead/shot” machine.

F. The Owner will furnish electrical power for the project.

PART 3 - EXECUTION

3.1 WORKER PROTECTION

A. General:

1. All asbestos abatement work shall be performed in accordance with 29 CFR 1910.1001, 29 CFR 1926.1101 and State of Connecticut regulations as specified herein. Personnel shall wear and utilize protective clothing and equipment as specified herein. Eating, smoking, drinking, chewing gum, or applying cosmetics shall not be permitted in the asbestos control area. Personnel of other trades not engaged in the abatement of asbestos shall not be allowed in the work area unless all the personnel protection provisions of this Specification are complied with by the trade personnel.

2. Engineering controls shall be used to minimize airborne fiber concentrations within the work area. A combination of personal protective equipment and work practices shall also be used to further reduce employee exposure to asbestos fibers.

3. The Contractor shall provide all authorized visitors with respirators, new filters, protective clothing, headgear, eye protection, footwear, and hard hats as in the procedures described herein and afford them the use of all facilities to keep them free of contamination from asbestos fibers.

4. The Contractor shall provide the decontamination facility for worker and equipment decontamination as well as the results of the personal air monitoring.

B. Respiratory Protection:

1. The Contractor shall select and provide at no cost to his/her employees respirators, which shall provide adequate protection to the employee as specified by Section 1910.1001(g) Table D-1 and Section 1926.1101(h) Table D-4.

2. Respiratory protection shall be worn by all persons potentially exposed to elevated airborne concentrations of asbestos fibers from the initiation of the asbestos abatement project until all areas have been given clearance. Clearance shall be conducted by the APM.

3. The Contractor shall provide Powered Air Purifying Respirators (PAPR) or Type C (continuous flow or pressure demand) supplied air respirators to all workers at the job site. If it is established, through collection and analysis of personal air samples in accordance with the OSHA Reference Method (ORM) (See U.S. Department of Labor; Occupational Safety and Health Administration; Occupational Exposure to Asbestos; Title 29 CFR 1910.1001, "General Industry Standard." Title 29 CFR 1926.1101, "Construction Standard") that this respiratory protection is more than sufficient the Contractor may provide half face-piece air purifying respirators.

   a. Once the exposure limits have been established, the respirators presented in 29 CFR 1910.1001 that afford adequate protection at such upper concentrations of airborne asbestos fibers shall be used.

   b. The minimum personal sampling period shall be seven hours at a flow rate of 0.5 to 2.5 liters per minute. The samples shall be collected within the workers‟ breathing zone. Personal sampling shall be the responsibility of the Contractor. Personal sampling results shall be available on site no later than 24 hours after sampling.

   c. The filters provided for both the cartridge respirators and the PAPR's shall be National Institute for Occupational Safety and Health (NIOSH) approved for asbestos fibers.

C. Protective Clothing:

1. The Contractor shall provide to all workers, foreman and superintendents, protective disposable clothing consisting of full body coveralls, head covers, and 18-inch high boot type covers or reusable footwear.

2. The Contractor shall provide eye protection and hard hats, as required, by job conditions and safety regulations.

3. Reusable footwear, hard hats and eye protection devices shall be left in the "contaminated equipment room" until the end of the asbestos abatement work.

4. Upon completion of asbestos abatement work, the footwear shall be disposed of as contaminated waste or cleaned thoroughly inside and out using soap and water before removing from work area or from equipment and access area.

5. All disposable protective clothing shall be discarded and disposed of as asbestos waste when the wearer exits from the workspace to the outside through the decontamination facilities.

6. The color of the disposable clothing worn outside the work area shall be a different color than the disposable clothing worn inside the work area.

D. Decontamination Procedures:

1. Each worker and authorized visitor without exception shall, upon entering the job site: remove street clothes in the clean change room and put on an appropriate respirator with new filters, and clean disposable protective clothing before entering the equipment room or the work area, except that workers intending to re-wear previously worn protective clothing stored in the equipment room shall enter the equipment room wearing only respirators.

2. Each time he/she leaves the work area, each worker and authorized visitor shall:

   a. Vacuum gross contamination from clothing before leaving the work area.

   b. Proceed to the equipment room and remove all clothing except respirator.

   c. Still wearing the respirator, proceed unclothed into the showers.

   d. Clean the outside of the respirator with soap and water while showering.

   e. Remove filters, wet them, and dispose of filters in the container provided for that purpose.

   f. Wash and rinse the inside of the respirator. After showering, dry off with disposable towels.

3. Following showering and drying off, each worker and authorized visitor shall proceed directly to the clean change room and dress in street clothes at the end of the day's work, or before eating, smoking, or drinking.

4. Contaminated reusable work footwear shall be stored in the equipment room when not in use in the work area. Upon completion of asbestos abatement work, footwear shall be disposed of as contaminated waste or cleaned inside and out using soap and water before removing these items from the work area

or from the equipment and access area. Contaminated protective clothing shall be stored in the equipment room for reuse or placed in receptacles for disposal with other asbestos-contaminated materials.

3.2 WORK AREA PREPARATION

A. Where necessary, within regulated areas, shut down electrical power, including receptacles and light fixtures. Under no circumstances during the abatement process will existing lighting fixtures inside the regulated area be permitted to be operating. Provide GFCI devices, temporary power, and temporary lighting installed in compliance with the applicable electrical codes and by a licensed electrician. Electrical receptacles inside work area may not be used unless they are protected by GFCI devices.

B. Shut down and/or isolate heating, cooling, and ventilation air systems or zones to prevent contamination and fiber dispersal to other areas of the structure. During the work, vents within the work area shall be sealed with duct tape and polyethylene sheeting.

C. Seal off all openings, including, but not limited to, separations to occupied areas, windows, corridors, doorways, skylights, ducts, grills, diffusers, and any other penetration of the work areas, with polyethylene sheeting a minimum of six (6) mil thick, sealed with duct tape.

D. Remove moveable objects within the proposed work area to the extent possible before the work starts.

E. Pre-clean fixed objects within the work areas, using HEPA vacuum equipment and/or wet cleaning methods as appropriate, and enclose with a minimum six (6) mil plastic sheeting sealed with duct tape.

F. Clean the proposed work areas using HEPA vacuum equipment or wet cleaning methods as appropriate. Do not use methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters.

G. Install adequate number of HEPA ventilation units to achieve the required number of at least 4 air changes per hour and exhaust units to the exterior of the building.

3.3 DECONTAMINATION SYSTEM

A. The Contractor shall establish a decontamination enclosure (decon) contiguous to the work area consisting of equipment room, shower room, and clean room in series. The only access between contaminated and uncontaminated areas shall be through this decontamination enclosure.

B. Access between rooms in the decontamination system shall be through double-flap curtained openings. The clean room, shower room and the equipment room within the decontamination enclosure shall be completely sealed ensuring that the sole source of airflow through this area originates from uncontaminated areas outside the work area.

C. Construct the decontamination system with PVC, metal, or other equivalent rigid framing and cover both sides with a double layer of six (6) mil polyethylene sheeting, spray glued and taped at the joints.

3.4 MAINTENANCE OF THE WORK AREA

A. Acceptance of Asbestos Control Area: The Contractor shall not begin removal unless the APM is in attendance. The control area must be constructed, the decontamination facility prepared and the supplies to be used assembled, barriers properly constructed, openings sealed, and other preparations made to allow the removal operation to proceed. If conditions are not acceptable, the Contractor shall correct deficiencies to comply with the specifications.

3.5 ASBESTOS REMOVAL PROCEDURE - GENERAL

A. The Contractor shall have a designated "Competent Person" on the job at all times to ensure establishment of a proper enclosure system and proper work practices throughout project.

B. Abatement work will not commence until authorized by on-site APM (if applicable).

C. Spray asbestos materials with amended water using airless spray equipment or apply approved removal wetting agent to reduce the release of fibers during removal operation. The Consultant shall pre-approve the use of amended water as the wetting agent.

D. In order to maintain indoor airborne asbestos fiber concentrations to the minimum, the wet asbestos must be removed in manageable sections.

E. Fill disposal containers as removal proceeds, seal filled containers and clean containers before removal to equipment decontamination system. Wet clean each container thoroughly, double bag and apply caution label. Ensure that workers do not exit the work area thorough the equipment decontamination enclosure.

F. After completion of stripping work, all surfaces from which asbestos has been removed shall be wet brushed, using a nylon brush, wet wiped, and sponged or cleaned by an equivalent method to remove all visible material. During this work, the surfaces being cleaned shall be kept wet.

G. Remove and containerize all visible accumulations of asbestos-containing and/or asbestos-contaminated debris. During cleanup, utilize brooms, rubber dustpan, and rubber squeegees. Dry sweeping is forbidden at all times.

H. Sealed disposal containers, and all equipment used in the work area, shall be included in the cleanup and shall be removed from work areas via the equipment decontamination enclosure at an appropriate time in the cleaning sequence. All asbestos waste shall be placed in 6-mil polyethylene disposal bags and shall be double bagged in the equipment decontamination enclosure before removal from the site.

I. At any time during asbestos removal, should the APM suspect contamination of areas outside the work area(s), he/she shall cause all abatement work to stop until the Contractor takes steps to decontaminate these areas and eliminate the causes of such contamination. Unprotected individuals shall be prohibited from entering suspected contaminated areas until air sampling and visual inspections certify decontamination.

J. After completion of the initial final cleaning procedure but prior to encapsulation, a pre-sealant inspection shall be conducted by the APM. The pre-sealant inspection shall verify that ACM and residual dust has been removed from the work area.

3.6 ASBESTOS REMOVAL PROCEDURE – FLOORING

A. Prior to beginning the removal of any resilient floor covering, remove all movable objects from the work area. If applicable, remove the counters and radiators to access the floor tile and mastic that go underneath those items.

B. Remove resilient floor covering using the following procedure:

1. Remove binding strips, all vinyl cove base, or other restrictive molding from doorways, walls, etc. clean and dispose of as demolition waste unless contaminated with ACMs. Dispose of any materials that have floor mastic on them as asbestos-containing waste. The contractor may have to perform selective destructive demolition, such as removing partition walls, to access the tile.
2. Wet the floor with amended water, removal encapsulant, or detergent solution, so that entire surface is wet. Do not allow puddle or run off to other areas. If a removal encapsulant is used, use in strict accordance with manufacturer's instructions. If necessary, cover with sheet polyethylene to allow humidity to release flooring materials from floor. Allow time for humidity and water or removal encapsulant to loosen flooring materials prior to removal.
3. Keep floor continuously wet throughout removal operation.
4. Remove tiles using a manual or powered spade, or stripping machine. Continuously mist floor in area where machine is working with amended

water, removal encapsulant or detergent solution. Wet any debris generated as necessary to keep continuously wet.

5. Underlayment or similar porous sub-flooring material shall be removed to extents feasible and disposed of as asbestos containing waste.

C. Debris and Waste

1. Pick up flooring, stack, place in lined boxes or place in labeled disposal bags. At the Contractor's option tiles may be placed directly into durable leak-tight containers.
2. Shovel broken flooring and debris into nylon reinforced grain bags that are placed in a disposal bag, or place directly in steel leak-tight drums.
3. Place bagged waste in a second disposal bag during decontamination and dispose of as asbestos waste.

D. After completion of all ACM removal work, the Contractor shall conduct final cleaning.

3.7 ASBESTOS REMOVAL PROCEDURE – TRANSITE SIDING

A. The Contractor shall have a designated "Competent Person" on the job at all times to ensure proper work practices throughout project.

B. GFCI devices shall be utilized for all electrical connections made as part of this project.

C. Establish regulated area to restrict access to only those authorized personnel.

D. A remote personal decontamination facility shall be erected onsite and as near as possible to the regulated area, and shall consist of 1 stage and constructed according to 1926.1101(j)(2).

E. Install one layer of 6-mil polyethylene sheeting to ground beneath panels as a drop cloth extending at least 10 feet from base of structure and secured in place.

F. Workers shall don the proper PPE prior to beginning the removal.

G. Remove siding panels using the following procedure:

1. Lightly wet each panel with amended water at location of fastener, ensuring that excess water is not used resulting in run-off.

2. Unbolt/unfasten or carefully pry panels from wall <u>exercising caution to not break panels.</u>

3. Carefully lower each panel and place into lined boxes or place in labeled disposal bags. At the Contractor's option tiles may be placed directly into durable leak-tight containers. Adequately wet panels with amended water, ensuring that excess water is not used resulting in run-off. Seal poly with spray glue and duct tape for disposal as asbestos waste.

4. Label all asbestos waste in accordance with OSHA 29 CFR 1926.1101(k)(8) as appropriate.

H. All waste must be properly bagged, labeled, and securely containerized by the end of each work day.

I. After completion of all asbestos containing material removal work the Contractor shall conduct final cleaning, utilizing wet methods and HEPA vacuuming. In addition, drop cloth shall be disposed of as asbestos waste.

J. After all removal and cleaning procedures have been completed, the project monitor will visually determine that no dust, debris, or residue is present in the work area.

3.8 ASBESTOS REMOVAL PROCEDURE – ROOFING TARS

A. The Contractor shall have a designated "Competent Person" on the job at all times to ensure proper work practices throughout project.

B. Contractor shall supply water, and a generator for electricity.

C. GFCI devices shall be utilized for all electrical connections made as part of this project.

D. Install one layer of 6-mil poly sheeting to the ground on each side of the building where removal is taking place as a drop cloth. Drop cloth shall extend at a minimum, at least 10 feet from the base of the building.

E. Establish regulated area to restrict access to only those authorized personnel.

F. A remote personal decontamination facility shall be erected onsite and as near as possible to the regulated area, and shall consist of 1 stage and constructed according to 1926.1101(j)(2).

G. Workers shall don the proper PPE prior to beginning the removal.

H. Remove roofing materials using the following procedure:

1. Wet the material to be removed with amended water or detergent solution, so that entire surface is adequately wet. Do not allow puddle or run-off to other areas.
2. Cut out roofing material into manageable sections. At no time shall the contractor grind, abrade, or sand the material which will create visible emissions.
3. Lower sections of roofing to the ground and place into containers or open top roll-off lined with a minimum of 2 layers of 6-mil polyethylene sheeting for disposal. Do not drop waste from roof.
4. Keep roofing material continuously wet throughout removal operation.
5. Continuously mist area where removal is being performed with amended water, removal encapsulant or detergent solution. Area where roofing has been removed must be kept continuously wet until after the completion of removal.
6. Label and properly dispose of roofing materials as asbestos waste.

I. Roofing material must be removed intact and placed into a labeled container for disposal.

J. After completion of all asbestos containing materials removal work, the Contractor shall conduct final cleaning utilizing wet methods and HEPA vacuuming.

K. After all removal and cleaning procedures have been completed, the project monitor will visually determine that no dust, debris, or residue is present in or around the work area.

3.9 CONSULTANT AND SUSPENSION OF WORK

A. Martinez Couch & Associates, LLC has designated FSS to perform the duties of the Consultant for this Contract. The Consultant will also act as the APM for the project.

B. The removal work shall be reviewed by the Consultant. The Contractor will request an inspection at least 24 hours in advance of requiring the inspection.

C. During the progress of the work, the Consultant, following approval by the Owner, shall have the right to make any changes, alterations, additions or omissions in the work or Specifications in accordance with the General Conditions.

D. The Consultant will recommend that the Owner order a suspension of work based on a determination of risk of adverse health and safety impacts on the environment, workers, or the general public, or failure to comply with the Specifications/regulations. The Contractor and the Owner will be notified in writing of the reason and of the recommended resolution.

E. At the discretion of the Owner, the Consultant will provide oversight and visual inspection services throughout the Contract's duration. It shall be the Contractor's responsibility to comply with pertinent work standards and regulations.

F. Upon completion of work in a defined work area, the Consultant will conduct a final visual inspection for the purpose of evaluating work completion. Unsatisfactory conditions shall be immediately corrected in a manner specified by the Consultant and the contract documents. Final payments shall be approved only after the Owner receives all properly completed Waste Shipment Record Forms and other required documentation and records.

3.10 CONSULTANTS' AIR SAMPLING RESPONSIBILITIES

A. Air sampling shall be conducted by the Consultant to ascertain the integrity of controls that protect the building from asbestos contamination.

B. Consultant's APM shall collect and analyze air samples during the following time periods:

1. Pre-Abatement Period: The APM may collect samples prior to abatement work to establish baseline readings. These samples will be collected in and around the proposed work areas. Pre-abatement air samples shall be collected as required to obtain a volume of 1,200 liters. Pre-abatement and during abatement Samples shall be analyzed by PCM methodology using the NIOSH 7400 protocol.

2. Abatement Period: The APM may collect samples when onsite on a daily basis during the work period. A sufficient number of area samples shall be taken outside of the work area to judge the degree of cleanliness or contamination of the building during removal. Additional samples may be taken inside the work area at the discretion of the APM.

3. Post-Abatement Period: As required by the regulation, the APM shall conduct air sampling following the final cleanup phase of the project, once the "no visible residue" criterion, as established by the project monitor, has been met. Five (5) samples shall be collected inside the work area utilizing aggressive methods to comply with the State of Connecticut Department of Public Health Standards for Asbestos Abatement, sections 19a-332a-12. Analysis of the samples to determine airborne concentrations of asbestos shall be conducted by Transmission Electron Microscopy (TEM) method with an upper limit of 70.0 structures per square millimeter (s/mm^2) as an average concentration of airborne fibers in five (5) samples; or by Phase Contrast Microscopy (PCM) to show that the concentration of fibers for each of the five (5) samples is less than or equal to a limit of quantitation for PCM

- 0.01 fibers per cubic centimeter (0.01 f/cc) of air in accordance with the above regulations.

C. At the direction of the Owner, the APM shall provide ongoing evaluation of the air quality within the building during removal, using his/her best professional judgments with respect to the State of Connecticut Department of Public Health guideline of 0.010 fibers/cc and the background air quality established during the pre-abatement period.

D. If the APM determines that the building air quality has become contaminated from the project, he/she shall immediately inform the Contractor to cease all removal operations and implement a work stoppage clean up procedure. The Contractor shall conduct a thorough cleanup of the areas of the building designated by the Consultant. No further removal work can take place until the APM has assessed that the building air has been decontaminated.

3.11 CONSULTANT'S INSPECTION RESPONSIBILITIES

A. Inspections shall be conducted by the APM as required, throughout the progress of the abatement project. Inspections shall be conducted in order to document the progress of the abatement work as well as the procedures and practices employed by the Contractor.

B. The APM shall perform the following inspections during the course of abatement activities:

1. Pre-commencement Inspection (optional). Pre-commencement inspections may be performed at the time requested by the Contractor. The APM shall be informed sufficiently in advance of the time the inspection is needed. During the course of the pre-commencement inspection, the APM shall inspect the containment and surrounding work areas. This shall include, but not be limited to, inspection of barrier integrity, worker decontamination facility, utilization of power sources, and location and capacity of negative air filtration devices. If, during the course of the pre-commencement inspection, deficiencies are found, the Contractor shall perform the necessary adjustments in order to obtain compliance.

2. Work Area Inspections. Work area inspections may be conducted on a daily basis at the discretion of the Owner/Consultant. During the course of the work inspections, the APM shall observe the Contractor's removal procedures, verify barrier integrity, monitor negative air filtration devices, assess project progress, and inform the Contractor of specific remedial activities if deficiencies are noted.

3. Pre-sealant Final Visual Inspection. A pre-sealant inspection for each work area shall be conducted by the APM upon the request of the Contractor. The pre-sealant inspection shall be conducted after completion of the initial cleaning procedures, but prior to encapsulation. The pre-sealant inspection shall verify that no visible ACM or residual debris remain in the work area. If, during the course of the pre-sealant inspection, the APM identifies visible residual ACM or debris, the Contractor shall re-clean the work area until it is deemed acceptable by the APM.

3.12 WASTE DISPOSAL

A. All waste material shall be promptly wetted and placed in 6-mil polyethylene bags, wrapped in two layers of 6-mil polyethylene plastic sheeting, or place into labeled disposal bags as it is generated. At the Contractor's option materials may be placed directly into durable leak-tight containers. A sufficient number of waste bags and/or plastic sheeting shall be located in the immediate work area (unused bags in the equipment room of the decontamination facility must be thoroughly cleaned or disposed of as contaminated waste). The Contractor shall count or measure the volume of each filled container leaving the work area, and maintain a written record of such. The Contractor shall provide Project Engineer (Martinez Couch & Associates, LLC) with all copies of waste manifest documents in a timely manner.

B. Warning labels, having waterproof print and permanent adhesive, shall be affixed to the sides of all waste bags or transfer containers. Warning labels shall be conspicuous and legible, and contain the following words in accordance with OSHA 1926.1101:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

In addition to the above, affix „waste generator label‟ to include the generator‟s name and address on each waste container. Waste transport vehicles will have appropriate U.S. Department of Transportation signage on them for transportation of asbestos waste materials.

C. A fine water spray shall be used to keep the unbagged or unwrapped waste damp at all times.

D. Sealed waste shall be removed from the work area and stored in an on-site, enclosed, lined, and lockable dumpster or transported to the landfill. The temporary storage dumpster area shall be prominently identified and be kept locked.

E. Once a truckload of waste containers has accumulated, the Contractor shall arrange for transportation to the landfill. No temporary co-mingling of asbestos waste from this project with that from another site will be allowed.

F. Waste Transportation and Disposal Regulations:

1. It is the responsibility of the Contractor to determine and ensure compliance with the current waste handling regulations applicable to the work site and the current regulations for waste transportation to and disposal at each ultimate landfill. The Contractor shall comply fully with these regulations and with all U.S. Department of Transportation, EPA, and State of Connecticut Department of Energy and Environmental Protection (CTDEEP) requirements.

2. If required, the Contractor (or Subcontractor), at no additional cost, shall maintain a valid hazardous waste transporter's permit and identification number, and document and fully comply with any hazardous waste manifesting requirements.

G. Waste Disposal Procedure:

1. The Contractor shall incorporate in his/her proposal the estimated quantity of asbestos waste disposal to be generated during the work; the proposed final waste site; the estimated number of separate waste shipments (loads), and the

current estimated transportation and landfill disposal fees (per cubic yard). Non-contaminated waste transport and disposal shall be solely the Contractor's responsibility. The Contractor shall review each of these items and resolve any discrepancies or deficiencies during the pre-construction site meeting.

2. The Contractor shall package, label, and remove all asbestos waste as specified in the specifications. Packaging shall be accomplished in a manner that minimizes waste volume, but so that waste containers will not tear or break.

3. The Contractor shall verify the total volume of waste material to be removed from the site (total count of waste containers and total volume estimate to the nearest 0.5 cubic yard), and insert the quantity on the Waste Shipment Record and on a hazardous waste manifest if required.

4. The Contractor shall provide legal transportation of this waste to the ultimate disposal landfill; and have the waste hauler and the landfill owner complete all other required manifests, dump slips, or other forms. The completed and fully signed (by all required parties) original of the Waste Shipment Record, and copies of the other forms, shall be returned within thirty (30) calendar days to the Owner for payment approval. No payments will be approved, or made for incomplete Waste Shipment Records.

5. All disposal of asbestos-containing and/or asbestos-contaminated material must be in compliance with requirements of and authorized by the Solid Waste Management Division, State of Connecticut Department of Energy and Environmental Protection (CTDEEP).

H. Waste Disposal Fees:

1. All Contractor contaminated waste handling costs, such as waste packaging, on-site/off-site storing/handling, transport/disposal, permitting, record keeping, and non-contaminated waste handling must be included in the Contractor's proposal as applicable to removal of asbestos materials and/or performance of the related abatement activities.

3.13 PROJECT RESTORATION

A project walk-through shall be conducted after the abatement portion of the project to identify areas or equipment damaged during the work. If the Owner determines that the damage is caused by acts or omissions of the Contractor, a punch list shall be developed. The Contractor shall be responsible for repair or replacement, or at the discretion of the Owner, payment for the work of another Contractor to complete the punch list. A second walk through shall be conducted after completion of punch list items.

END OF SECTION

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME _____ DATE _____

PROJECT ADDRESS _____

CONTRACTOR'S NAME _____

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCER. IF YOU SMOKE AND INHALE ASBESTOS FIBERS THE CHANCE THAT YOU WILL DEVELOP LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the Owner for the above project requires that: You be supplied with the proper respirator and be trained in its use; You be trained in safe work practices and in the use of the equipment found on the job; You receive a medical examination; These things are to have been done at no cost to you.

RESPIRATORY PROTECTION: You must have been trained in the proper use of respirators, and informed of the type respirator to be used on the above referenced project. You must be given a copy of the written respiratory protection manual issued by your employer. You must be equipped at no cost with the respirator to be used on the above project.

TRAINING COURSE: You must have been trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and area protective measures. The topics covered in the course must have included the following:

Physical characteristics of asbestos
Health hazards associated with asbestos
Respiratory protection
Use of personal protective equipment
Pressure Differential Systems
Work practices including hands on or on-job training
Personal decontamination procedures
Air monitoring, personal and area

MEDICAL EXAMINATION: You must have had a medical examination within the past 12 months at no cost to you. This examination must have included: health history, pulmonary function tests and may have included an evaluation of a chest x-ray.

By signing this document you are acknowledging only that the Owner of the building you are about to work in has advised you of your rights to training and protection relative to your employer, the Contractor.

Signature _____

Printed Name _____

Social Security # _____

Witness _____

SECTION 03 30 00

CAST IN PLACE CONCRETE

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 ACTION SUBMITTALS

A. Product Data: For each product.

B. Concrete Design Mixtures: For each mixture.

C. Steel Reinforcement Shop Drawings Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.3 QUALITY ASSURANCE

A. Ready-Mixed Concrete Producer Qualifications: ASTM C 94.

B. Comply with ACI 301, "Specification for Structural Concrete"; ACI 117, "Specifications for Tolerances for Concrete Construction and Materials"; and CRSI "Manual of Standard Practice."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on reinforcement.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed. All reinforcing steel shall be epoxy coated in accordance with ASTM A775

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, as drawn, flat sheet.

C. Portland Cement: ASTM C 150, Type I or II.

D. Fly Ash: ASTM C 618, Type C or F.

E. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

F. Silica Fume: ASTM C 1240, amorphous silica.

G. Aggregates: ASTM C 33, uniformly graded.

A. Maximum Aggregate Size for Concrete in Insulating Concrete Forms: 3/4 inch (19 mm).

H. Air Entraining Admixture: ASTM C 260.

I. Chemical Admixtures: ASTM C 494, water reducing and accelerating or retarding as applicable to project conditions. Do not use calcium chloride or admixtures containing calcium chloride.

J. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulose fiber.

K. Vapor Retarder: Reinforced sheet, ASTM E 1745, Class A.

L. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

M. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

N. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.2 CONCRETE MIXES

A. Comply with ACI 301 requirements for concrete mixtures.

B. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:

A. Minimum Compressive Strength: As noted on drawings at 28 days.
B. Maximum Water-Cement Ratio: 0.45.
C. Slump Limit: 5 inches (125 mm) with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
D. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of floor slabs to receive steel trowel finish to exceed 3 percent.
E. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of Portland cement, which would otherwise be used, by not less than 25 percent.

F. For concrete exposed to deicing chemicals, limit use of fly ash to 25 percent replacement of Portland cement by weight and granulated blast-furnace slag to 40 percent of Portland cement by weight; silica fume to 10 percent of Portland cement by weight.

C. Measure, batch, mix, and deliver concrete according to ASTM C 94.

A. When air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 CONCRETING

A. Construct formwork according to ACI 301 and maintain tolerances and surface irregularities within ACI 347R limits of Class A, 1/8 inch (3.2 mm) for concrete exposed to view and Class C, 1/2 inch (13 mm) for other concrete surfaces.

B. Place vapor retarder on prepared subgrade, with joints lapped 6 inches (150 mm) and sealed.

C. Comply with CRSI "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

D. Place concrete in a continuous operation and consolidate using mechanical vibrating equipment.

E. Protect concrete from physical damage, premature drying, and reduced strength due to hot or cold weather during mixing, placing, and curing.

F. Formed Surface Finish: Smooth-formed finish for concrete exposed to view, coated, or covered by waterproofing or other direct-applied material; rough-formed finish elsewhere. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

G. Slab Finishes: Comply with ACI 302.1R for screeding and finishing operations for concrete surfaces. Do not wet concrete surfaces. Provide the following finishes:

A. Scratch finish for surfaces to receive mortar setting beds.
B. Float finish for interior steps and ramps and surfaces to receive waterproofing, roofing, or other direct-applied material.
C. Troweled finish for floor surfaces and floors to receive floor coverings, paint, or other thin film-finish coatings.
D. Trowel and fine-broom finish for surfaces to receive thin-set tile.
E. Non-slip broom finish to exterior concrete platforms, steps, and ramps.

H. Cure formed surfaces by moist curing for at least seven days.

I. Begin curing concrete slabs after finishing. Keep concrete continuously moist for at least seven days. Apply membrane-forming curing and sealing compound to slabs permanently exposed to view.

J. Contractor will engage a testing agency to perform field tests and to submit test reports.

K. Protect concrete from damage. Repair surface defects in formed concrete and slabs.

3.2 FIELD QUALITY CONTROL

A. Special Inspections & Testing Agency: Contractor will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare and submit test reports.

B. Concrete Tests

A. Testing Frequency: Obtain one composite sample for each pour of each concrete mixture

a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

B. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

C. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete;one test for each composite sample, but not less than one test for each pour of each concrete mixture.

D. Compression Test Specimens: ASTM C 31/C 31M.

a. Cast and laboratory cure four sets of two standard cylinder specimens for each pour.

E. Compressive-Strength Tests: ASTM C 39/C 39M; test two sets of two laboratory-cured specimens at 7 days and two sets of two specimens at 28 days.

a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.

b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

F. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

G. Test results shall be reported in writing to MCA and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency,

location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

H. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by MCA but will not be used as sole basis for approval or rejection of concrete.

I. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by MCA. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by MCA.

J. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

K. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION

SECTION 05 12 00

STRUCTURAL STEEL 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 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.

C. Field quality control and special inspection reports.

1.3 QUALITY ASSURANCE

A. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 341 and AISC 341s1.
3. AISC 360.
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A490 Bolts."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

A. W-Shapes: ASTM A 572/992, Grade 50.

B. Channels, Angles, Plates, Bars and other miscellaneous shapes: ASTM A 36.

C. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

D. Steel Pipe: ASTM A 53, Type E or S, Grade B.

2.2 ACCESSORIES

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

B. Anchor Rods: ASTM F 1554, Grade 36.

1. Configuration: Straight.
2. Nuts: ASTM A 563 heavy hex carbon steel.
3. Plate Washers: ASTM A 36 carbon steel.
4. Washers: ASTM F 436, Type 1, hardened carbon steel.

C. Primer: Fabricator's standard lead and chromate-free, non-asphaltic, rust-inhibiting gray primer.

D. Grout: ASTM C 1107, non-metallic, non-shrink, factory packaged.

2.3 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

B. Welded Connections: Comply with AWS D1.1 and AWS D1.8 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

C. Shop Priming: Prepare surfaces according to SSPC-SP 2, "Hand Tool Cleaning"; or SSPC-SP 3, "Power Tool Cleaning." Shop prime steel to a dry film thickness of at least 1.5 mils (0.038 mm). Do not prime surfaces to be embedded in concrete or mortar or to be field welded.

D. Galvanizing: All permanently exposed structural steel members shall be hot dip galvanized in accordance with ASTM A123.

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

A. Special Inspections/Testing Agency: Contractor will engage a qualified testing agency and special inspector to perform tests and inspections and submit reports for the following:
   1. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
   2. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base, Bearing and Leveling Plates: Clean concrete and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of base plate.
   3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.

C. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

D. Do not use thermal cutting during erection unless approved by Engineer of Record. Finish thermally cut sections within smoothness limits in AWS D1.1.

E. High-Strength Bolts: Install high-strength bolts according to RCSC "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

   1. Joint Type: Snug tightened.

F. Welded Connections: Comply with AWS D1.1and AWS D1.8 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

3.4 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

SECTION 06 10 00

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. Section Includes:

1. Framing with dimension lumber.
2. Wood blocking and nailers.

B. Related Requirements:

1. Section 061063 "Exterior Rough Carpentry."
2. Section 061533 "Wood Patio Decking" for elevated decks, including support framing.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) size or greater but less than 5 inches nominal (114 mm actual) size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

1.4 ACTION 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. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less; 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

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 that 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.

1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: No. 2 grade.

1. Application: Interior partitions not indicated as load bearing.
2. Species: Douglas Fir North, NLGA
3. Grade: No. 2
4. Minimum Properties
   a. Modulus of Elasticity – 1,700,000 PSI
   b. Extreme Fiber in Bending – 875 PSI
   c. Horizontal Shear – 95 PSI
   d. Tension Parallel to Grain – 825 PSI
   e. Compression Perpendicular to Grain – 385 PSI
   f. Compression Parallel to Grain – 1,050 PSI

B. Load-Bearing Partitions: Meet requirements of drawing specified Structural Lumber but not less than requiresments specified in this paragraph.
1. Application: Exterior walls and interior load-bearing partitions.
2. Species: Douglas Fir North, NLGA
3. Grade: No. 2
4. Minimum Properties
   a. Modulus of Elasticity – 1,700,000 PSI
   b. Extreme Fiber in Bending – 875 PSI
   c. Horizontal Shear – 95 PSI
   d. Tension Parallel to Grain – 825 PSI
   e. Compression Perpendicular to Grain – 385 PSI
   f. Compression Parallel to Grain – 1,050 PSI

C. Joists, Rafters, and Other Framing: Meet requirements of drawing specified Structural Lumber.

2.4 NON-STRUCTURAL PLYWOOD SHEATHING

A. Plywood Sheathing: DOC PS 1, Exposure 1 sheathing
   1. Nominal Thickness: As indicated on drawings.
   2. Grade: B-B

2.5 WALL, FLOOR AND ROOF SHEATHING

A. Sheathing as per local and national governing industry standards
   1. Application: Wall Sheathing – DOC PS 1, Exterior Sheathing
      a. Nominal Thickness: 5/8”
      b. Number of Inner Plies: 4
      c. Grade: CDX
   2. Application: Roof Decking – DOC PS 1, Exterior Sheathing
      a. Nominal Thickness: 5/8”
      b. Number of Inner Plies: 4
      c. Grade: CDX

2.6 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

   1. Blocking.
   2. Nailers.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

   1. Hem-fir (north); NLGA.
   2. Mixed southern pine or southern pine; SPIB.
   3. Spruce-pine-fir; NLGA.
   4. Hem-fir; WCLIB or WWPA.
   5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

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.

2.7 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.8 METAL FRAMING ANCHORS

A. Refer to drawings for requirements of metal framing anchor products.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

D. Stainless-Steel Sheet: ASTM A 666, Type 316.

1. Use for exterior locations and where indicated.

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

F. Do not splice structural members between supports unless otherwise indicated.

G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.

I. Sort and select lumber so that natural characteristics do 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.

J. 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.

K. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

L. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).

M. Use steel common 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. Drive nails snug but 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 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide double bottom plate and double top plates using members of 2-inch nominal (38-mm actual) thickness whose widths equal that of studs. Fasten plates to supporting construction unless otherwise indicated.

1. For exterior walls, provide wood studs as indicated on drawings spaced as indicated on drawings.
2. For interior partitions and walls, provide wood studs as indicated on drawings spaced as indicated on drawings.
3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches (2438 mm) high, using members of 2-inch nominal (38-mm actual) thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs. Provide double jamb studs and headers with depths as indicated on drawings.

3.4 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches (38 mm) of bearing on wood or metal, or 3 inches (76 mm) on masonry. Attach floor joists as indicated on drawings.

B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches (1200 mm).

C. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than 2 inches (50 mm) from top or bottom.

D. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist at ends of joists unless nailed to header or band.

E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches (102 mm) or securely tie opposing members together. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist over supports.

F. Provide solid blocking between joists under jamb studs for openings.

G. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

   1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

H. Provide bridging of diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- (19-by-64-mm actual-) size lumber, double-crossed and nailed at both ends to joists, at intervals of 96 inches (2438 mm) o.c., between joists.

3.5 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

   1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate, and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- (19-by-184-mm actual-) size or 2-by-4-inch nominal- (38-by-89-mm actual-) size stringers spaced 48 inches (1200 mm) o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors as indicated on drawings. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches (50 mm) deeper. Bevel ends of jack rafters for full bearing against valley rafters.
2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches (50 mm) deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal- (19-by-140-mm actual-) size boards between every third pair of rafters, but not more than 48 inches (1219 mm) o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.6 STAIR FRAMING INSTALLATION

A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:

1. Size: 2-by-12-inch nominal (38-by-286-mm actual) size, minimum.
2. Material: Solid lumber.
3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 5 inches (127 mm) of effective depth.
4. Spacing: At least three framing members for each 36-inch (914-mm) clear width of stair.

B. Provide stair framing with no more than 3/16-inch (4.7-mm) variation between adjacent treads and risers and no more than 3/8-inch (9.5-mm) variation between largest and smallest treads and risers within each flight.

3.7 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 enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 06 10 63

EXTERIOR 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. Section Includes:

1. Exterior dimension lumber.
2. Exterior dimension timber.
3. Exterior posts.
4. Plywood Sheathing (Non Structural)
5. Wood fences.

B. Related Requirements:

1. Section 061533 "Wood Patio Decking."

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Timber: Lumber of 5 inches nominal or greater in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

B. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.

C. Evaluation Reports: For preservative-treated wood products, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Lumber Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.

1. Factory mark each item with grade stamp of grading agency.
2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. 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 wood products.
4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 19 percent.
2. Dimension Lumber: 19 percent.
3. Timber. 19 percent.

2.2 LUMBER

A. Hand select wood for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.

B. Dimension Lumber: No. 2 grade Douglas Fir species (NeLMA, NLGA, WCLIB, or WWPA); Lumber shall meet the requirement of structural lumber indicated on drawings.

2.3 POSTS

A. Dimension Lumber Posts: No. 2 grade Douglas Fir species (NeLMA, NLGA, WCLIB, or WWPA); Lumber shall meet the requirement of structural lumber indicated on drawings.

B. Timber Posts: No. 2 grade Douglas Fir species (NeLMA, NLGA, WCLIB, or WWPA); Lumber shall meet the requirement of structural lumber indicated on drawings.

2.4 NON-STRUCTURAL PLYWOOD SHEATHING

A. Plywood Sheathing: DOC PS 1, Exterior sheathing
1. Nominal Thickness: As indicated on drawings.
2. Grade: Marine – For permanently installations permanently exposed to the elements

2.5 PRESERVATIVE TREATMENT

A. Pressure treat boards and dimension lumber with waterborne preservative according to AWPA U1; Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

B. Pressure treat timber with waterborne preservative according to AWPA U1; Use Category UC4a.

1. Treatment with CCA shall include post-treatment fixation process.

C. Pressure treat poles with waterborne preservative according to AWPA U1; Use Category UC4a.

1. Treatment with CCA shall include post-treatment fixation process.

D. Preservative Chemicals: Acceptable to authorities having jurisdiction.

1. Do not use chemicals containing arsenic or chromium.

E. Use process for boards and dimension lumber that does not include water repellents or other substances that might interfere with application of indicated finishes.

F. After treatment, redry dimension lumber to 19 percent maximum moisture content.

G. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.

1. For items indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

H. Application: Treat all wood unless otherwise indicated.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Use fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or ASTM F 2329 unless otherwise indicated.
2. For pressure-preservative-treated wood, use stainless-steel fasteners.
3. For redwood, use hot-dip galvanized-steel fasteners.

B. Nails: ASTM F 1667.

C. Power-Driven Fasteners: ICC-ES AC70.

D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.

E. Carbon-Steel Bolts: ASTM A 307 with ASTM A 563 hex nuts and, where indicated, flat washers all hot-dip zinc coated.

F. Stainless-Steel Bolts: ASTM F 593, Alloy Group 1 or 2; with ASTM F 594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.

G. Postinstalled Anchors: Stainless-steel, chemical or torque-controlled expansion anchors 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 according to ASTM E 488, conducted by a qualified independent testing and inspecting agency.

1. Stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 METAL ACCESSORIES

A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G185 coating designation.

B. Stainless-Steel Sheet: ASTM A 666, Type 316.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prime wood indicated to be painted, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Section 099000 "Paintings and Coatings."

B. Stain wood indicated to be stained, including both faces and edges. Cut to required lengths and stain ends.

3.2 INSTALLATION, GENERAL

A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.

B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.

C. Install metal framing anchors to comply with manufacturer's written instructions.

D. Do not splice structural members between supports unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

G. Apply copper naphthenate field treatment to comply with AWPA M4, to cut surfaces of preservative-treated lumber.

H. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. ICC-ES AC70 for power-driven fasteners.
2. "Fastening Schedule 2304.9.1 in ICC's International Building Code and per Connecticut State Building Code.

I. Use common wire nails unless otherwise indicated. Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.

END OF SECTION

SECTION 06 15 33

WOOD PATIO DECKING

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. Wood decking.
2. Stairs for elevated decks.
3. Railings for elevated decks.

B. Related Requirements:
1. Refer to drawings for sheet metal flashings on tops of deck framing and ledgers

1.3 DEFINITIONS

A. Boards: Lumber of less than 2 inches nominal in thickness and 2 inches nominal or greater in width.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Timber: Lumber of 5 inches nominal or greater in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.

1.4 ACTION SUBMITTALS

A. Product Data: For preservative-treated wood products, and metal framing anchors.

1. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. For metal framing anchors. Include installation instructions.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by ALSC's Board of Review.
2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.

C. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood products.
2. Expansion anchors.
3. Metal framing anchors.
4. Decking fasteners.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.

1. Factory mark each item with grade stamp of grading agency.
2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.

3. 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 wood products.
4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 19 percent.
2. Dimension Lumber: 19 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness.
3. Timber. 19 percent.

2.2 WOOD DECKING AND STAIR TREADS

A. Hand select wood for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.

B. Dimension Lumber Decking: No. 2 grade and any of the following species:

1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
3. Mixed southern pine; SPIB.

C. Board Decking: Shall be 1-1/4-inch actual thickness radius-edged decking as indicated or to match existing construction dimensions and be of any of the following species and grades:

1. Douglas fir-larch or Douglas fir-south, Patio 1 or Patio 2; WWPA.
2. Douglas fir-larch, Select Dex; WCLIB.
3. Douglas fir-larch (North), Select Patio; NLGA.
4. Hem-fir, Patio 1; WWPA.
5. Hem-fir, Select Dex; WCLIB.
6. Hem-fir (North), Select Patio; NLGA.
7. Southern pine, Premium; SPIB.

D. Board Stair Treads: Shall be 1-1/4-inch actual thickness as indicated or to match existing construction dimensions, stepping with half-round or rounded-edge nosing and one of the following species and grades:

1. Douglas fir, C & Btr VG (Vertical Grain) stepping; NLGA, WCLIB, or WWPA.
2. Hem-fir, C & Btr VG (Vertical Grain) stepping; NLGA, WCLIB, or WWPA.

2.3 WOOD RAILINGS

A. Hand select wood for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.

B. Dimension Lumber Railing Members: No. 2 grade and any of the following species:

1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
3. Mixed southern pine; SPIB.
4. Spruce-pine-fir or spruce-pine-fir (South); NeLMA, NLGA, WCLIB, or WWPA.

C. Railing Boards: Any of the following species and grades:

1. Douglas fir, C & Btr finish or C Select; NLGA, WCLIB, or WWPA.
2. Hem-fir, C & Btr finish or C Select; NLGA, WCLIB, or WWPA.
3. Southern pine, B & B finish; SPIB.

D. Balusters: 2-inch nominal square, clear, kiln-dried, solid, pressure-preservative-treated Douglas fir or Southern Pine

E. Newel Posts: Clear, kiln-dried, pressure-preservative-treated, Douglas fir pressure-preservative-treated, southern pine, turned newel posts of pattern and size indicated.

2.4 DIMENSION LUMBER FRAMING

A. Deck and Stair Framing: No. 2 grade and the following species:
1. Douglas fir-larch; WCLIB or WWPA.
2. Douglas fir-south; WWPA.
3. Douglas fir-larch (North); NLGA.

B. Deck and Stair Framing: Any species and grade with a modulus of elasticity of at least 1,700,000 psi and an extreme fiber stress in bending of at least 1050 psi for 2-inch nominal thickness and 12-inch nominal width for single-member use.

2.5 POSTS

A. Dimension Lumber Posts: No. 2 grade and the following species:
1. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.

B. Timber Posts: Douglas fir-larch, Douglas fir-larch (North), No. 1; NeLMA, NLGA, SPIB, WCLIB, or WWPA.

2.6 PRESERVATIVE TREATMENT

A. Pressure treat boards and dimension lumber with waterborne preservative according to AWPA U1; Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

B. Pressure treat timber with waterborne preservative according to AWPA U1; Use Category UC4a.

C. Pressure treat poles with waterborne preservative according to AWPA U1; Use Category UC4a.

D. Preservative Chemicals: Acceptable to authorities having jurisdiction.

1. Do not use chemicals containing arsenic or chromium.

E. Use process for boards and dimension lumber that does not include water repellents or other substances that might interfere with application of indicated finishes.

F. After treatment, redry boards, dimension lumber, timber, and poles to 19 percent maximum moisture content.

G. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.

1. For items indicated to receive a stained or natural finish, mark each piece on surface that will not be exposed or omit marking and provide certificates of treatment compliance issued by inspection agency.

H. Application: Treat all wood unless otherwise indicated.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

1. Use stainless steel or fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or ASTM F 2329 unless otherwise indicated.
2. For pressure-preservative-treated wood, use stainless-steel fasteners.
3. For wood decking, use stainless-steel fasteners where fasteners are exposed to view.

B. Nails: ASTM F 1667.

C. Power-Driven Fasteners: ICC-ES AC70.

D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.

E. Carbon-Steel Bolts: ASTM A 307 with ASTM A 563 hex nuts and, where indicated, flat washers all hot-dip zinc coated.

F. Stainless-Steel Bolts: ASTM F 593, Alloy Group 1 or 2; with ASTM F 594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.

G. Postinstalled Anchors: Stainless-steel, chemical or torque-controlled expansion anchors 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 according to ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.8 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Simpson Strong-Tie Co., Inc.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated on Drawings. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G185 coating designation.

D. Stainless-Steel Sheet: ASTM A 666, Type 316.

E. Joist Hangers: As indicated at minimum shall be, U-shaped, with 2-inch-long seat and 1-1/4-inch-wide nailing flanges at least 85 percent of joist depth.

F. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.

G. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch-minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.

H. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports shall be as indicated.

2.9 CONCEALED DECKING FASTENERS

A. Deck Splines: Corrosion-resistant metal or plastic splines that fit in grooves routed into the sides of decking material and are fastened to deck framing with screws. Splines provide uniform spacing of decking material.

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. Blue Heron Enterprises, LLC.
b. Grabber Construction Products.
c. Ipe Clip Fastener Company Inc.
d. KK Mfg. Co., Inc.
e. Simpson Strong-Tie Co., Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime wood indicated to be painted, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Section 09 90 00 "Painting and Coatings."

C. Stain wood indicated to be stained, including both faces and edges. Cut to required lengths and stain ends. Comply with requirements in Section 09 93 00 "Staining and Transparent Finishing."

3.3 INSTALLATION, GENERAL

A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.

B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.

C. Install wood decking and stair treads with crown up (bark side down).

D. Secure decking to framing with deck splines or screws to match existing construction methods for decks to be rebuilt.

E. Install metal framing anchors to comply with manufacturer's written instructions.

F. Do not splice structural members between supports unless otherwise indicated.

G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Apply copper naphthenate field treatment to comply with AWPA M4, to cut surfaces of preservative-treated lumber.

J. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. ICC-ES AC70 for power-driven fasteners.
2. "Fastening Schedule" in ICC's International Building Code and as indicated on drawings.

K. Use common wire nails unless otherwise indicated. Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.

L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced and with adjacent rows staggered.

3.4 ELEVATED DECK JOIST FRAMING INSTALLATION

A. General: Install joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists where framed into wood supporting members by using wood ledgers as indicated or, if not indicated, by using metal joist hangers. Do not notch joists.

B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

C. Lap members framing from opposite sides of beams or girders not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

D. Provide solid blocking of 2-inch nominal thickness by depth of joist at intervals of 96 inches o.c., between joists.

3.5 STAIR INSTALLATION

A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:

1. Stringer Size: 2 by 12 inches nominal, minimum.
2. Notching: Notch stringers to receive treads, risers, and supports; leave at least 5 inches of effective depth.
3. Stringer Spacing: At least three stringers for each 36-inch clear width of stair.

B. Provide stair framing with no more than 3/8-inch variation between adjacent treads and risers and no more than 1/2-inch variation between largest and smallest treads and risers within each flight.

C. Treads and Risers: Secure as indicated on drawings.

3.6 RAILING INSTALLATION

A. Balusters: Fit to railings, glue, and screw in place. Countersink fastener heads, fill flush, and sand filler.

B. Newel Posts: Secure to stringers and risers with lag screws.

C. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with countersunk-head wood screws or rail bolts and glue.

END OF SECTION

SECTION 06 18 00

GLUED-LAMINATED CONSTRUCTION

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 framing using structural glued-laminated timber not indicated on drawings. In the event of conflict in provisions listed in this section with drawing provisions, the drawing provisions shall take precedence.

B. Related Requirements:

1. Section 061063 "Exterior Rough Carpentry" for dimension lumber items associated with structural glued-laminated timber.

1.3 DEFINITIONS

A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data on lumber, adhesives, fabrication, and protection.
2. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

B. Shop Drawings:

1. Show layout of structural glued-laminated timber system and full dimensions of each member.
2. Indicate species and laminating combination.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions in AITC 111.

B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

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. Weyerhaeuser Company, P.O. Box 9777 Federal Way, WA 98063-9777
   2. Boise Cascade Company, 1111 West Jefferson Street, P.O. Box 50 Boise, ID 83728-0001

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Structural glued-laminated timber and connectors shall withstand the effects of structural loads shown on Drawings without exceeding allowable design working stresses listed in AITC 117 or determined according to ASTM D 3737 and acceptable to authorities having jurisdiction.

2.3 STRUCTURAL GLUED-LAMINATED TIMBER

A. General: Provide structural glued-laminated timber that complies with AITC A190.1 and AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.

   1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that are not exposed in the completed Work.
   2. Provide structural glued-laminated timber made from single species.
   3. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
   4. Provide structural glued-laminated timber made with wet-use adhesive complying with AITC A190.1.

B. Species and Grades for Structural Glued-Laminated Timber: Douglas fir-larch or Southern pine that complies with structural properties, combination symbols, and beam stress classifications indicated on drawings.

C. Appearance Grade: Architectural, complying with AITC 110.

   1. For Premium and Architectural appearance grades, fill voids as required by AITC 110.

2.4 PRESERVATIVE TREATMENT

A. Preservative Treatment: Where preservative-treated structural glued-laminated timber is indicated, comply with AWPA U1, Use Category 3B.
   1. Do not incise structural glued-laminated timber or wood used to produce structural glued-laminated timber.

B. Preservative:
   1. Wolmanized Parrallam Plus PSL

C. After dressing members, apply a copper naphthenate field-treatment preservative to comply with AWPA M4 to surfaces cut to a depth of more than 1/16 inch (1.5 mm).

2.5 TIMBER CONNECTORS

A. Comply with drawing requirements.

2.6 MISCELLANEOUS MATERIALS

A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.7 FABRICATION

A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.

   1. Dress exposed surfaces as needed to remove planning and surfacing marks.

B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.

C. Where preservative-treated members are indicated, fabricate (cut, drill, surface, and sand) before treatment to greatest extent possible. Where fabrication must be done after treatment, apply a field-treatment preservative to comply with AWPA M4.

   1. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
   2. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.

D. End-Cut Sealing: Immediately after end cutting each member to final length and after preservative treatment, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.

E. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

2.8 FACTORY FINISHING

A. Wiped Stain Finish: Manufacturer's standard, dry-appearance, penetrating acrylic stain and sealer; oven dried and resistant to mildew and fungus.

1. Color: As indicated by manufacturer's designations

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.

B. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

C. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.

1. Predrill for fasteners using timber connectors as templates.
2. Finish exposed surfaces to remove planning or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
3. Coat cross cuts with end sealer.
4. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.
   a. Use copper naphthenate treatment.

D. Install timber connectors as indicated.

1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.
2. Install bolts with orientation as indicated or, if not indicated, as directed by MCA.

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by MCA.

3.4 PROTECTION

A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.

1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a painting shield.
2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION

SECTION 06 20 13

EXTERIOR FINISH 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. Section Includes:
   1. Exterior trim

B. Related Requirements:

   1. Section 06 10 00 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.
   2. Section 06 15 33 "Wood Patio Decking" for elevated decks including stairs and railings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors 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. Include chemical-treatment manufacturer's written instructions for finishing treated material.
   2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
   3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
   4. Include copies of warranties from chemical-treatment manufacturers for each type of treatment.

B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

C. Samples for Verification:

1. For each species and cut of lumber and panel products, with 1/2 of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.
2. For hardboard siding, 50 sq. in. for board types and 8 by 10 inches for panels.
3. For cellular PVC trim, with 1/2 of exposed surface finished; 50 sq. in..
4. For foam plastic moldings, with 1/2 of exposed surface finished; 50 sq. in..
5. For exterior wood columns, include quarter-section Samples of cap, base, and plinth; and 6-inch- long quarter-section Sample of shaft. Samples need not be same diameter as required columns.

1.4 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:

1. For lumber that is not marked with grade stamp.
2. For preservative-treated wood that is not marked with treatment-quality mark.
3. For fire-retardant-treated wood that is not marked with classification marking of testing and inspecting agency.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Cellular PVC trim.
4. Foam plastic moldings.

C. Sample Warranties: For manufacturer's warranties.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.7 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

1. For exterior ornamental wood columns, comply with manufacturer's written instructions and warranty requirements.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.8 WARRANTY

A. Manufacturer's Warranty for Cellular PVC Trim: Manufacturer agrees to repair or replace trim that fails due to defects in manufacturing within specified warranty period. Failures include, but are not limited to, deterioration, delamination, and excessive swelling from moisture.

1. Warranty Period: 25 years from date of Substantial Completion.

B. Manufacturer's Warranty for Columns: Manufacturer agrees to repair or replace columns that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Columns: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and the following grading rules:

1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
2. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
3. RIS: Redwood Inspection Service, "Standard Specifications for Grades of California Redwood Lumber."
4. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
5. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
6. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."

B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, mark grade stamp on end or back of each piece.

C. Softwood Plywood: DOC PS 1.

D. Hardboard: ANSI A135.4.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Water-Repellent Preservative Treatment by Nonpressure Process: AWPA N1; dip, spray, flood, or vacuum-pressure treatment.

1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC).
2. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
3. Application: Exterior trim.

B. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent respectively.
2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
4. Do not use material that is warped or does not comply with requirements for untreated material.
5. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.

    a. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

    a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.

7. Application: All exterior lumber and plywood.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: For applications indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction, and comply with testing requirements; testing by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Materials shall comply with testing requirements after being subjected to accelerated weathering according to ASTM D 2898.
2. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent respectively.

C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not contain colorants, and provide materials that do not have marks from spacer sticks on exposed face.

D. Do not use material that does not comply with requirements for untreated material or is warped or discolored.

E. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

1. For exposed lumber indicated to receive a stained or natural finish,.
2. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.

F. Application: All exterior lumber and plywood.

2.4 EXTERIOR TRIM

A. Lumber Trim for Semitransparent-Stained Finish Clear Finish:
1. Species and Grade: Southern pine, pressure-preservative treated; B & B; SPIB.
2. Maximum Moisture Content: 15 percent.
3. Finger Jointing: Not allowed.
4. Face Surface: Surfaced (smooth).

B. Lumber Trim for Opaque-Stained Finish:

1. Species and Grade: Redwood, Clear; RIS.
2. Species and Grade: Hem-fir, Prime or D finish; NLGA, WCLIB, or WWPA.
3. Species and Grade: Eastern white pine, eastern hemlock-balsam fir-tamarack, eastern spruce, or white woods; D Select (Quality); NeLMA, NLGA, WCLIB, or WWPA.
4. Species and Grade: Northern white cedar, 1 Common ; NeLMA or NLGA.
5. Maximum Moisture Content: 15 percent.
6. Finger Jointing: Not allowed.
7. Face Surface: Surfaced (smooth).
8. Factory Priming: Factory coated on faces and edges with exterior primer compatible with topcoats specified.

C. Moldings for Semitransparent-Stained Clear Finish Unfinished Applications: WMMPA WM 4, N-grade wood moldings, without finger jointing. Made from kiln-dried stock to patterns included in WMMPA WM 12.

1. Species: Redwood.
2. Brick-Mold Pattern: WM 180, 1-1/4 by 2 inches.
3. Drip-Cap Pattern: WM 197, 11/16 by 1-5/8 inches.
4. Bed-Mold Pattern: WM 75, 9/16 by 1-5/8 inches.
5. Screen-Bead Pattern: WM 144, 1/4 by 3/4 inch.

D. Moldings for Opaque-Stained Finish: WMMPA WM 4, P-grade wood moldings. Made from kiln-dried stock to patterns included in WMMPA WM 12.

1. Species: Redwood.
2. Finger Jointing: Not allowed.
3. Factory Priming: Factory coated on faces and edges with exterior primer compatible with topcoats specified.
4. Brick-Mold Pattern: WM 180, 1-1/4 by 2 inches.
5. Drip-Cap Pattern: WM 197, 11/16 by 1-5/8 inches.
6. Bed-Mold Pattern: WM 75, 9/16 by 1-5/8 inches.
7. Screen-Bead Pattern: WM 144, 1/4 by 3/4 inch.

E. MDO Trim: Exterior Grade B-B, MDO plywood.

F. Primed Hardboard Trim: High-temperature-cured, high-resin, wood-fiber composite; factory primed on faces and edges. Recommended by manufacturer for exterior use.

G. Cellular PVC Trim: Extruded, expanded PVC with a small-cell microstructure, recommended by manufacturer for exterior use, made from UV- and heat-stabilized, rigid material.
1. Density: Not less than 31 lb/cu. ft..
2. Heat Deflection Temperature: Not less than 130 deg F, according to ASTM D 648.
3. Coefficient of Thermal Expansion: Not more than 4.5×10^{-5} inches/inch x deg F.
4. Water Absorption: Not more than 1 percent, according to ASTM D 570.
5. Flame-Spread Index: 75 or less, according to ASTM E 84.

H. Foam Plastic Moldings: Molded product of shapes indicated, recommended by manufacturer for exterior use, with a tough outer skin on exposed surfaces; factory primed. Exposed surfaces shall not be shaped after molding.
1. Density: Not less than 20 lb/cu. ft..
2. Flame-Spread Index: Not more than 75 when tested according to ASTM E 84.
3. Thickness: Not more than 1/2 inch.
4. Width: Not more than 8 inches.
5. Patterns: As indicated by manufacturer's designations.

2.5 MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.

1. For face-fastening siding, provide ringed-shank siding nails unless otherwise indicated.
2. For redwood, provide hot-dip galvanized-steel fasteners.
3. For prefinished items, provide matching prefinished aluminum fasteners where face fastening is required.
4. For pressure-preservative-treated wood, provide hot-dip galvanized-steel fasteners.
5. For applications not otherwise indicated, provide hot-dip galvanized-steel or aluminum fasteners.

B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.

C. Adhesive for Cellular PVC Trim: Product recommended by trim manufacturer.

2.6 FABRICATION

A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.

B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends. Comply with requirements in Section 099000 “Paintings and Coatings."

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
3. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
4. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install flat-grain lumber with bark side exposed to weather.

B. Install cellular PVC trim to comply with manufacturer's written instructions.

C. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary.

1. Use scarf joints for end-to-end joints.
2. Stagger end joints in adjacent and related members.

D. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

E. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 STAIR AND RAILING INSTALLATION

A. Treads and Risers at Exterior Stairs: Secure treads and risers by gluing and nailing to carriages. Countersink nail heads, fill flush, and sand filler. Extend treads over carriages.

B. Balusters: Fit balusters to treads, glue, and nail in place. Countersink nail heads, fill flush, and sand filler. Let into railings and glue in place.

C. Newel Posts: Secure newel posts to stringers and risers with lag screws.

D. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with glue and countersunk-head wood screws or rail bolts.

3.6 ORNAMENTAL COLUMN INSTALLATION

A. Install columns to comply with manufacturer's written instructions. Comply with requirements below unless manufacturer's written instructions state otherwise.

B. Lay out column locations on soffits and beams and plumb down to locate column locations at supports.

C. Set plinths in location, shim as required to temporarily level, and scribe and trim as required so that top of plinths will sit level without use of shims. Fasten plinths in place to support using pins or fasteners as recommended by manufacturer.

D. Scribe and trim tops of columns to fit to soffits and beams. Maintain ventilation passages to interior of columns.

E. Seal ends of columns with two coats of wood sealer or primer.

F. Install column caps and flashing on columns and fasten to columns. Install caps and flashing so that loads are not imposed on caps and so that ventilation of column interior is not blocked.

G. Secure columns in place at top and bottom with fasteners recommended by manufacturer.

3.7 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.8 CLEANING

A. Clean exterior finish carpentry on exposed and semi exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.9 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 06 20 23

INTERIOR FINISH 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. Section Includes:

1. Interior trim, including non-fire-rated interior door and sidelight frames.
2. Fire-rated interior door and sidelight frames.
3. Interior plywood paneling.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.
2. Section 09 90 00 "Paintings and Coatings" for priming and painting of interior finish carpentry.

1.3 DEFINITIONS

A. MDF: Medium-density fiberboard.

B. MDO: Plywood with a medium-density overlay on the face.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors 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. Include chemical-treatment manufacturer's written instructions for finishing treated material.

2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
4. Include copies of warranties from chemical-treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For fire-retardant-treated wood, from ICC-ES.

B. Sample Warranty: For manufacturer's warranty.

1.6 QUALITY ASSURANCE

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.9 WARRANTY

A. Manufacturer's Warranty for Columns: Manufacturer agrees to repair or replace columns that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Columns: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and the following grading rules:

1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
2. NHLA: National Hardwood Lumber Association, "Rules for the Measurement and Inspection of Hardwood & Cypress."
3. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
4. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
5. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
6. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."

B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, mark grade stamp on end or back of each piece.

C. Softwood Plywood: DOC PS 1.

D. Hardboard: AHA A135.4.

E. MDF: ANSI A208.2, Grade 130.

F. Particleboard: ANSI A208.1, Grade M-2.

G. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

1. Color: White.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent respectively.

2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
4. Do not use material that is warped or does not comply with requirements for untreated material.
5. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.

    a. For exposed lumber indicated to receive a stained or natural finish. Mark end or back of each piece.

6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

    a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.

7. Application: All interior lumber and plywood.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: For applications indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction, and comply with testing requirements; testing by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

    1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent respectively.

C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not contain colorants, and provide materials that do not have marks from spacer sticks on exposed face.

D. Do not use material that does not comply with requirements for untreated material or is warped or discolored.

E. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

    1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

2. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.

F. Application: All interior lumber and plywood.

2.4 INTERIOR TRIM

A. Softwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
1. Species and Grade: White woods, 2 Common; WWPA.
2. Species and Grade: Douglas fir-larch or Douglas fir south, Prime or D finish; NLGA, WCLIB, or WWPA.
3. Maximum Moisture Content: 19 percent.
4. Finger Jointing: Not allowed.
5. Face Surface: Surfaced (smooth).

B. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):

1. Species and Grade: Red oak; A Finish; NHLA.
2. Maximum Moisture Content: 13 percent.
3. Finger Jointing: Not allowed.
4. Gluing for Width: Use for lumber trim wider than 6 inches.
5. Veneered Material: Use for lumber trim wider than 6 inches.
6. Face Surface: Surfaced (smooth).
7. Matching: Selected for compatible grain and color.

C. Lumber Trim for Opaque Finish (Painted Finish):
1. Species and Grade: White woods, 2 Common; WWPA.
2. Species and Grade: Spruce-pine-fir, 2 Common; NeLMA, NLGA, WCLIB, or WWPA.
3. Maximum Moisture Content: 19 percent.
4. Finger Jointing: Not allowed.
5. Face Surface: Surfaced (smooth).

D. Softwood Moldings for Transparent Finish (Stain or Clear Finish): WMMPA WM 4, N-grade wood moldings. Made to patterns included in WMMPA WM 12.

1. Species: Southern pine or Douglas fir.
2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
3. Finger Jointing: Not allowed.
4. Matching: Selected for compatible grain and color.
5. Base Pattern: WM 713, 9/16-by-3-1/4-inch ranch base.
6. Shoe-Mold Pattern: WM 126, 1/2-by-3/4-inch quarter-round shoe mold.
7. Casing Pattern: WM 327, 11/16-by-2-1/4-inch clamshell casing.
8. Mull-Casing Pattern: WM 983, 3/8-by-1-3/4-inch featheredge casing.
9. Stop Pattern: WM 856, 3/8-by-1-3/8-inch ranch stop.
10. Chair-Rail Pattern: WM 297, 11/16-by-3-inch chair rail.

E. Hardwood Moldings for Transparent Finish (Stain or Clear Finish): WMMPA HWM 2, N-grade wood moldings made to patterns included in WMMPA HWM 1.

1. Species: Red oak.
2. Kiln-dried softwood with exposed surfaces veneered with species indicated, may be used in lieu of solid wood.
3. Maximum Moisture Content: 9 percent.
4. Finger Jointing: Not allowed.
5. Matching: Selected for compatible grain and color.
6. Base Pattern: HWM 633, 7/16-by-3-1/4-inch ogee base.
7. Shoe-Mold Pattern: HWM 129, 7/16-by-11/16-inch quarter-round shoe mold.
8. Casing Pattern: HWM 328, 1/2-by-2-1/4-inch clamshell casing.
9. Mull-Casing Pattern: HWM 989, 3/16-by-2-inch square-edge casing.
10. Stop Pattern: HWM 856, 3/8-by-1-3/8-inch ranch stop.
11. Chair-Rail Pattern: HWM 297, 11/16-by-3-inch chair rail.

F. Moldings for Opaque Finish (Painted Finish): Made to patterns included in WMMPA WM 12.

1. Softwood Moldings: WMMPA WM 4, P grade.
   a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
   b. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
2. Hardwood Moldings: WMMPA HWM 2, P-grade.
   a. Species: Aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar.
   b. Maximum Moisture Content: 9 percent.
3. Optional Material: Primed MDF.
4. Finger Jointing: Not allowed.
5. Base Pattern: WM 623, 9/16-by-3-1/4-inch ogee base or as approved by MCA.
6. Shoe-Mold Pattern: WM 131, 1/2-by-3/4-inch ogee shoe mold or as approved by MCA.
7. Casing Pattern: WM 327, 11/16-by-2-1/4-inch clamshell casing or as approved by MCA.
8. Mull-Casing Pattern: WM 957, 3/8-by-1-3/4-inch beaded-edge casing or as approved by MCA.
9. Stop Pattern: WM 886, 3/8-by-1-3/8-inch bullnose stop or as approved by MCA.
10. Chair-Rail Pattern: WM 297, 11/16-by-3-inch chair rail or as approved by MCA.

G. PVC-Wrapped Moldings: WMMPA WM 2 and made to patterns included in WMMPA WM 12.

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. Louisiana-Pacific Corporation.
   b. Nickell Moulding Company, Inc.
   c. Spectrum Products, Inc.
   d. Zamma Corporation.

2. Base Pattern: Match existing.
3. Shoe-Mold Pattern: Match existing.

4. Casing Pattern: Match existing.
5. Mull-Casing Pattern: Match existing.
6. Stop Pattern: Match existing.
7. Chair-Rail Pattern: Match existing.
8. Colors, Textures, and Grain Patterns: Match existing.

H. Foam Plastic Moldings: Molded product of shapes indicated, with a tough outer skin on exposed surfaces; factory primed. Exposed surfaces shall not be shaped after molding.

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. Apex Urethane Millwork.
   b. Architectural Ornament, Inc.
   c. Artistic Architectural Ornaments, Inc.
   d. Carter Millwork, Inc.
   e. Century Architectural Specialties LLC.
   f. Chemcrest Architectural Products.
   g. Diamond Mfg., Inc.
   h. Focal Point Architectural Products; Focal Point, Inc.
   i. Fypon Ltd.
   j. Melton Classics Incorporated.
   k. Vintage Mouldings Manufacturing Ltd.
   l. Worthington Millwork.
2. Density: Not less than 20 lb/cu. ft..
3. Flame-Spread Index: Not more than 75 when tested according to ASTM E 84.
4. Thickness: Not more than 1/2 inch.
5. Width: Not more than 8 inches.
6. Patterns: Match MCA's samples.

2.5 FIRE-RATED INTERIOR DOOR FRAMES

A. Frames, complete with casings, fabricated from fire-retardant particleboard or fire-retardant MDF with veneered exposed surfaces, or from solid fire-retardant-treated wood. Frames shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, based on testing according to NFPA 252.
   1. Basis-of-Design Product: Subject to compliance with requirements, Species: Red oak.
   2. Fire Rating: 60 minutes.

2.6 PANELING

A. Hardwood Veneer Plywood Paneling: Manufacturer's stock hardwood plywood panels complying with HPVA HP-1, made without urea-formaldehyde adhesive.

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. Chesapeake Hardwood Products, Inc.
b. Georgia-Pacific Building Products.
c. Holland Southwest International.

2. Face Veneer Species and Cut: Plain-sliced red oak.
3. Veneer Matching: Selected for similar color and grain.
4. Backing Veneer Species: Any hardwood compatible with face species.
5. Construction: Veneer core.
6. Thickness: 1/4 inch.
7. Panel Size: 48 by 96 inches.
8. Glue Bond: Type II (interior).
9. Face Pattern: Manufacturer's standard V-grooved pattern, with grooves at edges, center, and third points of panels, and at other locations to provide pattern resembling random-width boards.
10. Finish: As selected by MCA from manufacturer's full range.

B. Board Paneling: Interior wood-board paneling complying with WMMPA WM 9.

1. Species: Southern pine.
2. Grade: Clear No. 2.
3. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
4. Pattern: V-joint, tongue and groove
5. Net Coverage Width: Not less than 6-3/4 inches.

C. Board Paneling:

1. Species and Grade: Southern pine, No. 2 Paneling; SPIB.
2. Maximum Moisture Content: 19 percent.
3. Pattern: V-joint, tongue and groove, NeLMA EWP 4.
4. Net Coverage Width: Not less than 6-3/4 inches.

2.7 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

C. Installation Adhesive for Foam Plastic Moldings: Product recommended for indicated use by foam plastic molding manufacturer.

D. Paneling Adhesive: Comply with paneling manufacturer's written recommendations for adhesives.

E. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

2.8 FABRICATION

A. Back out or kerf backs of the following members except those with ends exposed in finished work:

1. Interior standing and running trim except shoe and crown molds.
2. Wood-board paneling.

B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, too small to fabricate with proper jointing arrangements, or with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
4. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.

1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
2. Install trim after gypsum-board joint finishing operations are completed.
3. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 PANELING INSTALLATION

A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings. Install with uniform tight joints between panels.

1. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners and adhesive as recommended by panel manufacturer.
2. Conceal fasteners to greatest practical extent.
3. Arrange panels with grooves and joints over supports. Fasten to supports with nails of type and at spacing recommended by panel manufacturer. Use fasteners with prefinished heads matching groove color.

B. Hardboard Paneling: Install according to manufacturer's written recommendations. Leave 1/4-inch gap to be covered with trim at top, bottom, and openings. Butt adjacent panels with moderate contact. Use fasteners with prefinished heads matching paneling color.

1. Wood Stud or Furring Substrate: Install with 1-inch annular-ring shank hardboard nails.
2. Plaster or Gypsum-Board Substrate: Install with 1-5/8-inch annular-ring shank hardboard nails.

3. Nailing: Space nails 4 inches o.c. at panel perimeter and 8 inches o.c. at intermediate supports unless otherwise required by manufacturer.

C. Board Paneling: Install according to manufacturer's written instructions. Arrange in random-width pattern suggested by manufacturer unless boards or planks are of uniform width.

1. Install in full lengths without end joints.
2. Stagger end joints in random pattern to uniformly distribute joints on each wall.
3. Install with uniform end joints with only end-matched (tongue-and-groove) joints within each field of paneling.
4. Install with uniform end joints. Locate end joints only over furring or blocking.
5. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards. Install with uniform tight joints between boards.
6. Fasten paneling by face nailing, setting nails, and filling over nail heads.
7. Fasten paneling with trim screws, set below face and filled.
8. Fasten paneling by blind nailing through tongues.
9. Fasten paneling with paneling system manufacturer's concealed clips.
10. Fasten paneling to gypsum wallboard with panel adhesive.

3.6 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes, if any.

3.8 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 06 61 16

SOLID SURFACE FABRICATIONS

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. This Section includes the following horizontal and trim solid surface product types:
   1. Countertops with sinks
   2. Laboratory countertops
   3. Lavatory tops with undermount bowls

B. Related Sections include the following:
   1. Division 6 Section “Rough Carpentry” for Blocking.
   2. Division 22 Section “Plumbing Fixtures.”

1.3 DEFINITION

A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.4 SUBMITTALS

A. Product data:
   1. For each type of product indicated.
   2. Product data for the following:
      a. Chemical-resistant tops

B. Shop drawings:
   1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
      a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
      b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
      c. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in solid surface.

C. Product data:
   1. Indicate product description, fabrication information and compliance with specified performance requirements.

D. Product certificates:
   1. For each type of product, signed by product manufacturer.

E. Manufacturer certificates:
   1. Signed by manufacturers certifying that they comply with requirements.

F. NSF/ANSI standards:
   1. Refer to www.nsf.org for the latest compliance to NSF/ANSI Standard 51 for food zone — all food types.

G. Maintenance data:
   1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
      a. Maintenance kit for finishes shall be submitted.
   2. Include in project closeout documents.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. 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. Fabricator/installer qualifications:
   1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.

C. Applicable standards:
   1. Standards of the following, as referenced herein:
      a. American National Standards Institute (ANSI)
      b. American Society for Testing and Materials (ASTM)
      c. National Electrical Manufacturers Association (NEMA)
      d. NSF International
   2. Fire test response characteristics:
      a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
         1) Flame Spread Index: 25 or less.
         2) Smoke Developed Index: 450 or less.

D. Coordination drawings:
   1. Shall be prepared indicating:
      a. Plumbing work.
      b. Electrical work.
      c. Miscellaneous steel for the general work.

d. Indicate location of all walls (rated and non-rated), blocking locations and recessed wall items, etc.

2. Content:
   a. Project-specific information, drawn accurately to scale.
   b. Do not base coordination drawings on reproductions of the contract documents or standard printed data.
   c. Indicate dimensions shown on the contract drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.
   d. Provide alternate sketches to designer for resolution of such conflicts.
   e. 1) Minor dimension changes and difficult installations will not be considered changes to the contract.

E. Drawings shall:
   1. Be produced in 1/2-inch scale for all fabricated items.

F. Drawings must be complete and submitted to the architect within 60 days after award of contract for record only.
   1. No review or approval will be forthcoming.
   2. Coordination drawings are required for the benefit of contractor's fabricators/installers as an aid to coordination of their work so as to eliminate or reduce conflicts that may arise during the installation of their work.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver no components to project site until areas are ready for installation.

B. Store components indoors prior to installation.

C. Handle materials to prevent damage to finished surfaces.
   1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.7 WARRANTY

A. Provide manufacturer's warranty against defects in materials.
   1. Warranty shall provide material and labor to repair or replace defective materials.
   2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.
   3. Warranty shall be transferable to subsequent owner for remainder of warranty period.

B. Optional Installed Warranty:
   1. To qualify for the optional Installed Warranty, fabrication and installation must be performed by a DuPont Certified Fabrication/Installation source who will provide a brand plate for the application.
   2. This warranty covers all fabrication and installation performed by the certified/approved source subject to the specific wording contained in the Installed Warranty Card.

C. Manufacturer's warranty period:
   1. Ten years from date of substantial completion.

1.8 MAINTENANCE

A. Provide maintenance requirements as specified by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. Subject to compliance with requirements, provide products by one of the following:
      a. Corian® surfaces from the DuPont company (basis of design).
      b. Approved equal.

2.2 MATERIALS

A. Solid polymer components
   1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
   2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.

B. Thickness:
   1. 1/2 inch

C. Edge treatment:
   1. Eased unless otherwise noted.

D. Backsplash:
   1. Applied

E. Sidesplash:
   1. Applied.

F. Performance characteristics:
   1. Tensile Strength: 6,000 psi, ASTM D 638
   2. Tensile Modulus: 1.5 x 10^{-6} psi ASTM D 638
   3. Tensile Elongation: 0.4% min. ASTM D 638
   4. Flexural Strength: 10,000 psi ASTM D 790
   5. Flexural Modulus: 1.2 x 10^{-6} psi ASTM D 790
   6. Hardness:
      a. >85 Rockwell "M" Scale ASTM D 785

b. 56 Barcol Impressor ASTM D 2583

7. Thermal Expansion: 3.02 x 10^{-5} in./in./°C (1.80 x 10^{-5} in./in./°F) ASTM D 696
8. Gloss: (60° Gardner) 5–75 (matte—highly polished) ANSI Z124
9. Light Resistance(Xenon Arc): No effect NEMA LD 3-2000 Method 3.3
10. Wear and Cleanability: Passes ANSI Z124.3 & Z124.6
11. Stain Resistance: Sheets Passes ANSI Z124.3 & Z124.6
12. Fungus and Bacteria Resistance: Does not support microbial growth ASTM G21&G22
13. Boiling Water Resistance: No visible change NEMA LD 3-2000 Method 3.5
14. High Temperature Resistance: No change NEMA LD 3-2000 Method 3.6
15. Izod Impact: 0.28 ft.-lbs./in. of notch ASTM D 256 (Notched Specimen) (Method A)
16. Ball Impact: No fracture using 1⁄2 lb. ball: NEMA LD 3-2000 Method 3.8
    a. 1⁄4" slab—36" drop
    b. 1⁄2" slab—144" drop
17. Weatherability ΔE^*_{94}<5 in 1,000 hrs. ASTM G 155
18. Specific Gravity † 1.7
19. Water AbsorptionLong-term ASTM D 570
    a. 0.4% (3⁄4")
    b. 0.6% (1⁄2")
    c. 0.8% (1⁄4")
20. Toxicity Test ("LC50"Test)
    a. 99 (solid colors) Pittsburgh Protocol
    b. 66 (patterned colors)
21. Flammability All colors ASTM E 84,(Class I and Class A) NFPA 255 & UL 723
22. Flame Spread Index<25
23. Smoke Developed Index <25

2.3 ACCESSORIES

A. Joint adhesive:
   1. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.
B. Sealant:
   1. Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.
C. Sink/lavatory mounting hardware:
   1. Manufacturer's standard bowl clips, panel inserts and fasteners for attachment of undermount sinks/lavatories.
D. Conductive tape:
   1. Manufacturer's standard aluminum foil tape, with required thickness, for use with cutouts near heat sources.
E. Insulating felt tape:
   1. Manufacturer's standard for use with conductive tape in insulating solid surface material from adjacent heat source.

2.4 FACTORY FABRICATION

A. Shop assembly
   1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
   2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
      a. Reinforce with strip of solid polymer material, 2" wide.
   3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
   4. Rout and finish component edges with clean, sharp returns.
      a. Rout cutouts, radii and contours to template.
      b. Smooth edges.
      c. Repair or reject defective and inaccurate work.

B. Thermoforming:
   1. Comply with manufacturer's data.
   2. Heat entire component.
      a. Material shall be uniform, between 275 and 325 degrees Fahrenheit during forming.
   3. Form pieces to shape prior to seaming and joining.
   4. Cut pieces to finished dimensions.
   5. Sand edges and remove nicks and scratches.

2.5 FINISHES

A. Select from the manufacturer's standard color chart.
   1. Color:

B. Finish:
   1. Provide surfaces with a uniform finish.
      a. Matte; gloss range of 5–20.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with fabricator 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. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
   1. Provide product in the largest pieces available.
   2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
   3. Exposed joints/seams shall not be allowed.
   4. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
   5. Cut and finish component edges with clean, sharp returns.
   6. Rout radii and contours to template.
   7. Anchor securely to base cabinets or other supports.
   8. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
   9. Carefully dress joints smooth, remove surface scratches and clean entire surface.
   10. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.

B. Coved backsplashes and applied sidesplashes:
   1. Install applied sidesplashes using manufacturer's standard color-matched silicone sealant.
   2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.

C. Integral sinks/vanities:
   1. Provide solid surface materials bowls and/or lavatories sinks with overflows in locations shown on the drawings.
   2. Secure sinks and lavatory bowls to tops using manufacturer's recommended sealant, adhesive and mounting hardware to maintain warranty.

3.3 REPAIR

A. Repair or replace damaged work which cannot be repaired to architect's satisfaction.

3.4 CLEANING AND PROTECTION

A. Keep components clean during installation.

B. Remove adhesives, sealants and other stains.

3.5 SCHEDULE

A. Countertops:
   1. Surfaces of material adhesively joined with inconspicuous seams.
      a. Vertical Thickness: 1/2"
      b. Horizontal Thickness: See drawings for dimensions.

c. Edge Details: Eased
d. Finish: Matte
e. Backsplash: 4”

B. Countertops with stainless steel or porcelain sinks:
1. Surfaces of material adhesively joined using silicone sealant.
a. Vertical Thickness: 1/2"
b. Horizontal Thickness: See drawing dimensions or match vanity cabinet base
c. Edge Details: Eased
d. Finish: Matte
e. Backsplash: 4”
f. Sink

C. Countertops with traditional undermount lavatories:
1. Surfaces of material adhesively joined with silicone sealant.
a. Vertical Thickness: 1/2"
b. Horizontal Thickness: Match Vanity cabinet base.
c. Edge Details: Eased
d. Finish: Matte
e. Backsplash: 4”
f. Sink

SECTION 07 21 00

BUILDING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass-fiber blanket insulation.

B. Spray Foam insulation.

C. Vapor Retarders.

D. Related Accessories.

1.2 REFERENCES

A. American National Standards Institute (ANSI/ASSE).

B. ASTM International (ASTM).

C. North American Insulation Manufacturers Association (NAIMA).

D. Occupational Safety and Health Administration (OSHA).

E. Underwriters Laboratories (UL).

1.3 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Submit Material Safety Data Sheets (MSDS) prior to commencement of work for review and for filing at job site as required.

C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging with labeling intact including material name, production date and product code, until ready for installation.

B. Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow.

C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
   1. CertainTeed Corporation.
   2. Guardian Building Products, Inc.
   3. Johns Manville.
   4. Knauf Insulation.
   5. Owens Corning.
   6. Reef Industries, Inc.

B. Substitutions: or equal.

C. Requests for substitutions will be considered in accordance with Section 01 60 00.
   1. When submitting request for substitution, provide complete product data and MSDS sheet for each substitute product.

2.2 GLASS-FIBER BLANKET INSULATION

A. Unfaced and Kraft Faced Batt Insulation: ASTM C 665, Type I (Unfaced) or Type II (Faced), Class A (Unfaced) or Class C (Faced); non-combustible when tested in accordance with ASTM E 136; extra wide stapling flanges.
   1. Physical and Mechanical Properties
      a. R-value to match existing conditions or meet local building codes. The greater duty or obligation on the R-value shall govern.
      b. Size: Maximum sizes available, to avoid jointing to greatest extent possible.
      c. Width for Metal Framing Application: Same as framing center to center dimension.
      d. Width for Wood Framing Application: Maximum of 1 inch (25 mm) less than framing center to center dimension.
      e. Vapor Retarder Perm Rating (For Faced Batt Insulation): Maximum 1.0 perms (57 ng/Pa s sq m)) when tested in accordance with ASTM E 96.
      f. Surface Burning Characteristics (For Unfaced Batt Insulation): Maximum flame spread of 25, maximum smoke developed of 50, when tested in accordance with ASTM E 84.
      g. Properties:
         1) Free of Formaldehyde: Insulation is manufactured with bio-based binder and no formaldehyde.
         2) VOC Emission: Low VOC emission certified by GreenGuard Environmental Institute for Children and Schools.
         3) Recycled Content: Minimum of 40% "post-consumer" recycled material.

B. Accessory Materials and Fasteners: Provide all materials required for complete and proper installation of insulation, whether specified or not.

C. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.

D. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by manufacturer for sealing joints and penetrations in vapor retarder.

2.3 SPRAY FOAM INSULATION

A. Open-Cell and Closed-Cell Spray Foam Insulation: Low density, MDI-based semi-rigid polyurethane water-blown type Open Cell Foam: foam OR Medium-density, MDI-based polyurethane thermoset rigid HFC-blown type Closed Cell Foam:
   1. Physical and Mechanical Properties:
      a. Thermal Performance (Open-Cell AND Closed-Cell): Thicknesses and R-value to match existing conditions or meet local building codes. The greater duty or obligation on the R-value shall govern.
      b. Core Density: 0.45-0.55pcf (Open-Cell) OR 1.9-2.4pcf (Closed-Cell) when tested in accordance with ASTM D 1622.
      c. Thermal Resistance: 3.6 (Open-Cell) OR 6.4(Initial) and 5.8(Aged) less than or equal to 2-1/2 inches / 6.4 when greater than 2-1/2 inches (Closed-Cell) when tested in accordance with ASTM C 518.
      d. Open Cell Content: Greater than 95% when tested in accordance with ASTM D 2842.
      e. Closed Cell Content: 88-95% when tested in accordance with ASTM D 2842.
      f. Compressive Strength: Greater than 2.4psi (Open-Cell) OR Greater than 25psi (Closed-Cell) when tested in accordance with ASTM D 1621.
      g. Tensile Strength: 5.2psi (Open-Cell) OR 23psi (Closed-Cell) when tested in accordance with ASTM D 1623.
      h. Water Absorption: Less than 30% by volume (Open-Cell) OR Less than 2% by volume (Closed-Cell) when tested in accordance with ASTM D 2842.
      i. Dimensional Stability: Less than 12% by volume (Open-Cell) OR Less than 9% by volume (Closed-Cell) when tested in accordance with ASTM D 2126
      j. Water Vapor Transmission: 33 perm/inch (Open-Cell) OR 1.3 perm/inch (Closed-Cell) when tested in accordance with ASTM E 96.
      k. Air Permeability (Open-Cell AND Closed-Cell): 0.013 when tested in accordance with ASTM E 283.
      l. Fungi Resistance (Open-Cell AND Closed-Cell): Pass, with no growth when tested in accordance with ASTM C 1338.
   2. Fire performance
      a. Flame Spread (Open-Cell AND Closed-Cell): Less than 25 when tested in accordance with ASTM E 84.
      b. Smoke: Less than 350 (Open-Cell) OR Less than 450 (Closed-Cell) when tested in accordance with ASTM E 84.

B. Accessory Materials and Fasteners: Provide all materials required for complete and proper installation of spray foam insulation, whether specified or not.

2.4 VAPOR RETARDERS

A. Vapor Retarder (Fire Retardant Reinforced, Reinforced, and Standard):
   1. Physical and Mechanical Properties:

a. Material (Minimums): 3-ply fire retardant laminate (Fire Retardant Reinforced) OR 3-ply laminate (Reinforced) OR Extruded polyethylene Film
b. Weight (Minimums): 33lbs/1,000sq.ft. (Fire Retardant Reinforced), 40lbs/1,000sq.ft. (Reinforced), 49lbs/1,000sq.ft. (Standard), when tested in accordance with ASTM D 3776.
c. Puncture Propagation Tear (Minimums): 26lb (Fire Retardant Reinforced) OR 30lb (Reinforced) OR 34lb (Standard), when tested in accordance with ASTM D 2582.
d. Permeance (Perm) (Minimums): 0.062grains/hr-sq ft-in Hg (Fire Retardant Reinforced), 0.038grains/hr-sq ft-in Hg (Reinforced), 0.018grains/hr-sq ft-in Hg (Standard), when tested in accordance with ASTM E 96.
e. Drop Dart (Minimums): 450g (Fire Retardant Reinforced), 475g (Reinforced), 2270g (Standard), when tested in accordance with ASTM D 1709.
f. Tensile Strength (1" Tensile) (Minimums): 90lb/5050psi (Fire Retardant Reinforced), 35lb/4560 psi (Reinforced), 44lb/4400 psi (Standard), when tested in accordance with ASTM D 882.
g. Puncture Strength (Minimums): 30lb (Fire Retardant Reinforced), 35lb (Reinforced), 24lb (Standard), when tested in accordance with ASTM D 4833.
h. Usable Temperature Range: Minus 25 to 170 degrees F (minus 32 to 77 degrees C).
i. Application(s):
   1) Use on roof decks under insulation.
   2) Use on exterior walls on inside face of framing.
   3) Use under concrete slabs, over aggregate fill.
   4) Use under concrete slabs, under aggregate fill.

B. Accessory Materials and Fasteners: Provide all materials required for complete and proper installation of vapor retarders, whether specified or not.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that adjacent materials are dry and ready to receive insulation.

3.2 INSTALLATION , GENERAL

A. Install in accordance with NAIMA "Recommendations for Installation in Residential and Other Light-Frame Construction - Fiber Glass Building Insulation" and manufacturer's instructions.

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 envelope 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 thickness, 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 INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacture'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 Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill cavities formed by framing members. If more than one length is required to fill 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 wood-framed construction, install blankets according to ASTM C 1320 and as follows:
      a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members
      b. With faced blankets having stapling flanges, lap blanket over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.4 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders. 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 punctures or tears in vapor retarder facing by taping. Follow tape manufacturer's application recommendations.

E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

F. Protect insulation from damage and from becoming wet before, during and after installation.

END OF SECTION

SECTION 07 21 19

FOAMED IN PLACE 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. Section Includes:

1. Closed-cell spray polyurethane foam.
2. Open-cell spray polyurethane foam.

B. Related Requirements:

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 1.5 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F.
   1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.

   2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

   3. CFC/HCFC Emissions: No CFC or HCFC emissions and total formaldehyde emissions less than 1 percent, cured for 7 days and tested to ASTM D5116 for 24 hours.

2.2 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

C. Protect adjacent surfaces from accidental application.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids.

C. Apply to uniform density without voids.

D. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer, but never greater than in a layer exceeding 2 inches thickness.

E. Do not spray into rising foam.

F. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.

G. Cavity Walls: Install into cavities to a thickness of 6 inches.

H. Miscellaneous Voids: Apply according to manufacturer's written instructions.

I. Do not apply at temperatures less than 32 degrees F.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION

SECTION 07 25 00

WEATHER 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. Section Includes:

1. Building paper.
2. Building wrap.
3. Flexible flashing.
4. Drainage material.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

1. Manufacturers: Dupont Tyvek, Harvey Typar.
2. Water-Vapor Permeance: Not less than 75 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A).

3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg when tested according to ASTM E 2178.
4. Allowable UV Exposure Time: Not less than three months.
5. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 FLEXIBLE FLASHING

A. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.030 inch.
   1. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

B. Rubberized-Asphalt Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.030 inch.
   1. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

C. Primer for Flexible Flashing: Product recommended in writing by flexible flashing manufacturer for substrate.

D. Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.

2.3 DRAINAGE MATERIAL

A. Drainage Material: Product shall maintain a continuous open space between water-resistive barrier and exterior cladding to create a drainage plane and shall be used under siding.
   1. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.

B. Cover sheathing with water-resistive barrier as follows:

1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.

C. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.
3. Extend weather barrier completely over openings.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over water-resistive barrier at bottom and sides of openings.
4. Lap water-resistive barrier over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.3 DRAINAGE MATERIAL INSTALLATION

A. Install drainage material over building wrap and flashing to comply with manufacturer's written instructions.

END OF SECTION

SECTION 07 31 13

ASPHALT SHINGLES

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. Asphalt shingles.
2. Underlayment.
3. Ridge vents.
4. Metal flashing and trim.

B. Related Requirements:

1. Section 077200 "Roof Accessories" for ridge vents.

1.3 DEFINITION

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by a qualified testing agency.

C. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For asphalt shingles to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture according to manufacturer's written instructions.

B. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.

C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Manufacturing defects.

2. Material Warranty Period: 30 years from date of Substantial Completion.
3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 100 mph (45 m/s) for five years from date of Substantial Completion.
4. Workmanship Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Laminated-Strip Asphalt Shingles: ASTM D 3462/D 3462M, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.

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. Atlas Roofing Corporation.
b. GAF Materials Corporation.
c. Owens Corning.
d. PABCO Roofing Products.

2. Butt Edge: Match Existing.

3. Strip Size: Manufacturer's standard or match existing.
4. Impact Resistance: UL 2218, Class 4.
5. Color and Blends: Match Existing.

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, asphalt-saturated organic felts, nonperforated.

1. Type: Type I.

B. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970/D 1970M, minimum of 40-mil- (1.0-mm-) thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release backing; cold applied.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Atlas Roofing Corporation.
b. Carlisle Coatings & Waterproofing Inc.

c. CertainTeed Roofing Corporation.
d. GAF Materials Corporation.
e. Owens Corning.
f. Tamko Building Products, Inc.

C. Granular-Surfaced Valley Lining: Shall not be used.

2.4 RIDGE VENTS

A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent for use under ridge shingles.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cor-A-Vent, Inc.
b. GAF Materials Corporation.
c. Lomanco, Inc.
d. Obdyke, Benjamin Incorporated.
e. Owens Corning.

2. Minimum Net Free Area: Match Existing.

3. Width: Match Existing.
4. Thickness: Match Existing.
5. Features: Match Existing

B. Flexible Ridge Vent: Manufacturer's standard, compression-resisting, three-dimensional, open-nylon or polyester-mat filter bonded to a nonwoven, nonwicking, geotextile fabric cover.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. GAF Materials Corporation.
b. Obdyke, Benjamin Incorporated.
c. Tamko Building Products, Inc.

2. Minimum Net Free Area: Match Existing

3. Width: Match Existing
4. Thickness: Match Existing.

2.5 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, sharp-pointed, with a minimum 3/8-inch- (9.5-mm-) diameter flat head and of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through OSB or plywood sheathing.

1. Shank: Barbed.
2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

C. Felt-Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.

D. Synthetic-Underlayment Fasteners: As recommended in writing by synthetic-underlayment manufacturer for application indicated.

2.6 METAL FLASHING AND TRIM

A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

1. Sheet Metal: Aluminum, mill finished.

B. 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 the item.

1. Apron Flashings: Fabricate with lower flange a minimum of 5 inches (125 mm) over and 4 inches (100 mm) beyond each side of downslope asphalt shingles and 6 inches (150 mm) up the vertical surface.
2. Step Flashings: Fabricate with a headlap of 2 inches (50 mm) and a minimum extension of 5 inches (125 mm) over the underlying asphalt shingle and up the vertical surface.
3. Cricket or Backer Flashings: Fabricate with concealed flange extending a minimum of 24 inches (600 mm) beneath upslope asphalt shingles and 6 inches (150 mm) beyond each side of each chimney and skylight and 6 inches (150 mm) above the roof plane.
4. Open-Valley Flashings: Fabricate in lengths not exceeding 10 feet (3 m) with 1-inch- (25-mm-) high, inverted-V profile at center of valley and equal flange widths of 10 inches (250 mm) minimum or match existing..
5. Drip Edges: Fabricate in lengths not exceeding 10 feet (3 m) with 2-inch (50-mm) roof-deck flange and 1-1/2-inch (38-mm) fascia flange with 3/8-inch (9.5-mm) drip at lower edge.

C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch (1.6 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches (100 mm) from pipe onto roof.

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 the Work.

1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provisions have been made for flashings and penetrations through asphalt shingles.

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 UNDERLAYMENT INSTALLATION

A. Install using methods using underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply. When local codes and application instructions are in conflict, the more stringent requirements shall take precedence.

B. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches (50 mm) over underlying course. Lap ends a minimum of 4 inches (100 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with felt-underlayment nails.

1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches (75 mm) in direction that sheds water. Lap ends of felt not less than 6 inches (150 mm) over self-adhering sheet underlayment.
2. Install fasteners at no more than 36 inches (914 mm) o.c.

C. Double-Layer Felt Underlayment: For roofs with slopes of 2:12 and less than 4:12 Install on roof deck parallel with and starting at the eaves. Install a 19-inch- (485-mm-) wide starter course at eaves and completely cover with full-width second course. Install succeeding courses lapping previous courses 19 inches (485 mm) in shingle fashion. Lap ends a minimum of 6 inches (150 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with felt-underlayment nails.
1. Install felt underlayment on roof sheathing not covered by self-adhering sheet underlayment. Lap edges over self-adhering sheet underlayment not less than 6 inches (150 mm) in direction that sheds water.
2. Terminate felt underlayment extended up not less than 4 inches (100 mm) against sidewalls, curbs, chimneys, and other roof projections.

3. Install fasteners at no more than 36 inch (914 mm) o.c.

D. Self-Adhering Sheet Underlayment Leak Barrier: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.
   1. Eaves: Extend from edges of eaves up the slope 36 inches (914 mm) or at least 24 inches (600 mm) beyond interior face of exterior wall.
   2. Rakes: Extend from edges of rake 36 inches (914 mm) beyond interior face of exterior wall.
   3. Valleys: Extend from lowest to highest point 18 inches (450 mm) on each side.
   4. Hips: Extend 18 inches (450 mm) on each side along entire length.
   5. Ridges: Extend 36 inches (914 mm) on each side without obstructing continuous ridge vent slot.
   6. Sidewalls: Extend beyond sidewall 18 inches (450 mm), and return vertically against sidewall not less than 4 inches (100 mm).
   7. Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Extend beyond penetrating element 18 inches (450 mm), and return vertically against penetrating element not less than 4 inches (100 mm).
   8. Roof Slope Transitions: Extend 18 inches (450 mm) on each roof slope.

E. Concealed Valley Lining: For woven and closed-cut valleys. Comply with NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems." Install underlayment centered in valley and fastened to roof deck.

   1. Lap roof-deck underlayment over valley underlayment at least 6 inches (150 mm).
   2. Install a 36-inch- (914-mm-) wide strip of leak barrier, centered in valley. Lap ends of strips at least 12 inches (300 mm) in direction to shed water, and seal with asphalt roofing cement. Fasten to roof deck.

F. Metal-Flashed, Open-Valley Underlayment: Install two layers of minimum 36-inch- (914-mm-) wide underlayment centered in valley. Stagger end laps between layers at least 72 inches (1830 mm). Lap ends of each layer at least 12 inches (300 mm) in direction to shed water, and seal with asphalt roofing cement. Fasten each layer to roof deck.

   1. Lap roof-deck underlayment over first layer of valley underlayment at least 6 inches (150 mm).

G. Granular-Surfaced, Open-Valley Lining: Shall not be used.

3.3 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements:

   1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.

C. Step Flashings: Install with a headlap of 4 inches (100 mm) and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

D. Cricket or Backer Flashings: Install against the roof-penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.

E. Open-Valley Flashings: Install centered in valleys, lapping ends at least 8 inches (200 mm) in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.

1. Secure hemmed flange edges into metal cleats spaced 12 inches (300 mm) apart and fastened to roof deck.
2. Adhere 9-inch- (225-mm-) wide strip of self-adhering sheet to metal flanges and to self-adhering sheet underlayment.

F. Rake Drip Edges: Install rake drip-edge flashings over underlayment and fasten to roof deck seal with plastic cement.

G. Eave Drip Edges: Install eave drip-edge flashings below underlayment and fasten to roof sheathing seal with plastic cement.

H. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 ASPHALT-SHINGLE INSTALLATION

A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

B. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip at least 7 inches (175 mm) wide with self-sealing strip face up at roof edge.

1. Extend asphalt shingles 1/2 inch (13 mm) over fasciae at eaves and rakes.
2. Install starter strip along rake edge.

C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

E. Fasten asphalt-shingle strips with a minimum of four to six roofing nails located according to manufacturer's written instructions.

1. Where roof slope exceeds 21:12, seal asphalt shingles with asphalt roofing cement spots after fastening with additional roofing nails.
2. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
3. When ambient temperature during installation is below 50 deg F (10 deg C), seal asphalt shingles with asphalt roofing cement spots.

F. Closed-Cut Valleys: Extend asphalt-shingle strips from one side of valley 12 inches (300 mm) beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt-shingle courses from other side of valley and cut back to a straight line 2 inches (50 mm) short of valley centerline. Trim upper concealed corners of cut-back shingle strips.

1. Do not nail asphalt shingles within 6 inches (150 mm) of valley center.
2. Set trimmed, concealed-corner asphalt shingles in a 3-inch- (75-mm-) wide bed of asphalt roofing cement.

G. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

H. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION

SECTION 07 46 33

VINYL SIDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preformed Vinyl Siding, Trim, and Accessories for Facing Exterior Walls.

B. Preformed Vinyl Soffit Panels, Trim, and Accessories for Facing Exterior Roof Overhangs, Eaves and Fascia.

C. Air Moisture Barriers.

D. Related Accessories.

1.2 REFERENCES

A. American Architectural Manufacturers Association (AAMA).

B. Air Barrier Association of America (ABAA).

C. American National Standards Institute (ANSI/ASSE).

D. ASTM International (ASTM).

E. Occupational Safety and Health Administration (OSHA).

F. Underwriters Laboratories (UL).

G. Vinyl Siding Institute (VSI).

1.3 SUBMITTALS

A. Manufacturer's data sheets on each product to be used, including:
   1. Material descriptions, dimensions, and profiles.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

B. Submit Material Safety Data Sheets (MSDS) prior to commencement of work for review and for filing at job site as required.

C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors and sheens available.

D. Maintenance Data: Include recommended cleaning methods and cleaning materials.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver siding in manufacturer's protective cartons and clearly labeled as to specific products

contained.

B. During delivery and storage keep siding cartons flat and supported along entire length.

C. Store materials off ground, out of weather, in dry place. Provide ventilation. Protect from falling objects and construction activities.

1.5 WARRANTY

A. Provide Manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
   1. Associated Materials, Inc
   2. CertainTeed Corporation.
   3. Gentek Building Products, Inc.
   4. Ply Gem Siding Group.
   5. The Foundry.

B. Substitutions: Requests for substitutions will be considered in accordance with Section 01 60 00.
   1. When submitting request for substitution, provide complete product data and MSDS sheet for each substitute product.

2.2 VINYL SIDING

A. Style: Match existing.
   1. Dimensions: Double 4” Exposure.
   2. Thickness: .042” Nominal Thickness minimum.
   3. Surface finish: Woodgrain Texture.
   4. Color: Owner selected from manufacturer standard range.

2.3 SOFFITS, FASCIA, TRIM, AND ACCESSORIES

A. Standard Materials:
   1. Consistent with shape, size, and properties as existing and as required for complete installation.
   2. Produced from the same compound materials and with comparable properties as the siding.
   3. Color: Matching or color coordinated with siding.

2.4 AIR MOISTURE BARRIER

A. Spunbonded Polypropylene Weather Membrane with a microporous coating, Non-woven, and nonperforated. Materials to match existing installed product or be a manufacturer recommended product.

B. All sealing tape and fasteners per air moisture barrier manufacturer requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Confirm that all critical dimensions are as specified on the drawings

B. Beginning installation indicates Installer's acceptance of substrate as suitable to accept siding and soffits.

3.2 PREPARATION

A. Repair substrate flaws or defects before applying siding or soffits.

B. Where necessary, fur surfaces to an even plane and free from obstructions before application.`

C. Where necessary, patch or replace air moisture barrier before installing siding.

3.3 INSTALLATION

A. Install vinyl siding and vinyl soffits in accordance with the latest edition of "Vinyl Siding Installation Manual," published by the Vinyl Siding Institute (VSI) and special details from the drawings.

B. Install siding, soffits, and accessories in accordance with best practice, with all joint members plumb and true.

C. Install air moisture barrier in accordance with Manufacturer’s instruction over exterior sheathing or open studs. Seal joints and penetrations through weather resistive barrier with specified tape and fasteners prior to installation of finish material. Air infiltration barrier shall be air tight and free from holes, tears, and punctures. All window and door penetrations are to be flashed and sealed per ASTM 2112, AMMA guidelines and manufacturer instructions. Cover with exterior cladding within 6 months of installation.

END OF SECTION

SECTION 07 71 23

GUTTERS DOWNSPOUTS AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Gutter Downspout and Accessories

B. Related Accessories:

1. Splash Block.

1.2 REFERENCES

A. American Architectural Manufacturers Association (AAMA).

B. ASTM International (ASTM) B209 –Aluminum and Aluminum Alloy Sheet

C. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

1.3 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00 ‘Submittal Requirements’

B. Manufacturer's data sheets on each product to be used, including:
1. Material descriptions, dimensions, and profiles.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products to prevent twisting, bending, and abrasion, and to provide ventilation. Slope stored materials to drain.

C. During storage prevent contact with materials capable of causing discoloration, staining, or other damage.

1.5 WARRANTY

A. Provide Manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 DOWNSPOUTS

A. Downspouts: Aluminum sheet, ASTM B 209, Alloy 3105-H24. Minimum tensile

strength 26,000 psi, minimum yield strength 25,000 psi or equivalent; Thickness: 0.019 inches; Size 3 inches by 4 inches

B. Endcaps: Aluminum sheet, ASTM B 209, Alloy 3105-H24, thickness 0.027 inch.

C. Inside and Outside Mitres: Aluminum sheet, ASTM B 209, Alloy 3105-H24, thickness 0.027 inch.

D. Gutter Hangers and Anchors: Aluminum sheet, ASTM B 209, Alloy 3105-H24, thickness 0.063 inch. Provide types required to suit project requirements.

E. Downspout Anchors: Aluminum. Provide types required to suit project requirements.

F. Elbows: Aluminum sheet, ASTM B 209, Alloy 3105-H24. Minimum tensile strength 26,000 psi, minimum yield strength 25,000 psi or equivalent.
   1. Thickness: 0.019 inch.
   2. Size: To match downspouts.

G. Aluminum Finish: two-coat system applied in a continuous baked-on process in a single operation, comprising of an acid-based primer and baked-on high performance linear polyester topcoat on exposed surfaces.

   1. Color: As selected by MCA

H. Accessories:
   1. Miscellaneous components: Provide all necessary elbows, downspout offset sections, and pop rivets as required for a complete installation. All miscellaneous components shall match downspouts.

2.2 RELATED ACCESSORIES

A. Fasteners: Match existing materials.
   1. Finish: Match existing finish.
   2. Size: As recommended by manufacturer.

B. Flashings: Match existing or where installation is recommended by Manufacturer. Colors to match existing.

C. Sealants: Mildew-Resistant Joint Sealant as recommended by Manufacturer at gutter j joints. Color shall match existing.

D. Splash Blocks: Provide reinforced concrete splash blocks (minimum 4,000 psi concrete) at end of all downspouts discharging to the ground surface. Precast splash blocks shall be approximately 30 inches long by approximately 12 inches wide by approximately 3 inches high with a color of gray or white.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates are in place and ready for installation of gutters and downspouts.

3.2 INSTALLATION

A. General: Install downspouts per manufacturer's written installation instructions. Install Work securely in place and provide for expansion and contraction of components using lapped and sealed joints.

B. Downspouts:
1. Install downspouts, provide elbows and offsets, and secure downspouts to wall construction using downspout supports spaced as per Manufacturer's instructions.
2. Cut neat holes in decking without comprising structural integrity for passage of downspouts.
3. Provide 45 degree elbow at bottom of downspout to direct water away from wall surface or foundation.
4. Install a splash block under each downspout.

END OF SECTION

SECTION 07 84 13

PENETRATION FIRESTOPPING

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. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Not required.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction if required by authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."
3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.

2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.

D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.

F. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content:

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

G. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Permanent forming/damming/backing materials.
2. Substrate primers.
3. Collars.
4. 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 sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

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 of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming 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.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
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 the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

3.5 FIELD QUALITY CONTROL

A. Contractor will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping 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 that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Silicone Joint Sealants.

B. Urethane Joint Sealants.

C. Latex Joint Sealants.

D. Related Accessories.

1.2 REFERENCES

A. American National Standards Institute (ANSI/ASSE).

B. ASTM International (ASTM).

C. Occupational Safety and Health Administration (OSHA).

D. Underwriters Laboratories (UL).

1.3 SUBMITTALS

A. Manufacturer's data sheets on each product to be used, including:
   1. Material descriptions, dimensions, and profiles.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

B. Submit Material Safety Data Sheets (MSDS) prior to commencement of work for review and for filing at job site as required.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.5 WARRANTY

A. Provide Manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 SILICONE JOINT SEALANTS

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:

1. BASF Building Systems.
2. Dow Corning Corporation.
3. GE Advanced Materials - Silicones.
4. Sika Corporation; Construction Products Division.
5. Tremco Incorporated.

B. Type: Single component (S).

C. Grade: Pourable (P).

D. Class: 100/50.

E. Uses Related to Exposure: Traffic (T) and Nontraffic (NT).

2.2 URETHANE JOINT SEALANTS

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
1. BASF Building Systems.
2. Bostik, Inc.
3. Lymtal. International. Inc.
4. Polymeric Systems, Inc.
5. Sika Corporation; Construction Products Division.
6. Tremco Incorporated.

B. Type: Single component (S).

C. Grade: Pourable (P).

D. Class: 100/50.

E. Uses Related to Exposure: Traffic (T) and Nontraffic (NT).

2.3 LATEX JOINT SEALANTS

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
1. BASF Building Systems.
2. Bostik, Inc.
3. May National Associates, Inc.
4. Pecora Corporation.
5. Schnee-Morehead, Inc.
6. Tremco Incorporated.

B. Latex: Acrylic latex or siliconized acrylic latex.

2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
   1. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or 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 or primer 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.

3.2 INSTALLATION

A. Install sealant types compatible with adjacent surfaces, materials, and finishes to which sealant may come in contact with.

B. Install sealant backings of kind 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.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that 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 in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or

curing begins, tool sealants according to requirements specified in subparagraphs 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 sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Clean off excess sealant 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.

END OF SECTION

SECTION 08 10 00

DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior Door Units.

B. Interior Door Units.

C. Door Hardware and related accessories.

1.2 REFERENCES

A. American National Standards Institute (ANSI/ASSE).

B. ASTM International (ASTM).

C. Insulating Glass Certification Council (IGCC).

D. Occupational Safety and Health Administration (OSHA).

E. Underwriters Laboratories (UL).

F. Window and Door Manufacturers of America (WDMA).

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Manufacturer's data sheets on each product to be used, including:
   1. Material descriptions, dimensions, and profiles.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Hardware Selection: Submit complete descriptive literature, including finishes, for each type of new door hardware and accessory.

A. Operation and Maintenance Data: Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors, materials and components in Manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store door units as recommended by Manufacturer.

1.3 WARRANTY

A. Provide Manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
   1. Andersen Corporation.
   2. JELD-WEN, inc.
   3. Marvin Windows and Doors.
   4. Masonite International Corporation.
   5. Pella Corporation.

B. Substitutions: or equal.

C. Requests for substitutions will be considered in accordance with Section 01 60 00.
   1. When submitting request for substitution, provide complete product data and MSDS sheet for each substitute product.08 10

2.2 EXTERIOR DOOR UNITS

A. See drawings.

2.3 INTERIOR DOOR UNITS

A. See drawings.

PART 3 EXECUTION

3.1 PREPERATION

A. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.2 INSTALLATION

A. Install door unit assembly per Manufacturer’s instructions.
   1. Shim jambs straight. Inspect jamb for square, level and plumb.
   2. Fasten jamb to studs.
   3. Structurally secure sill.
   4. Apply sealant to interior side of jamb between outside of jamb and stud to seal gaps.
   5. Install hardware.
   6. Install interior and exterior trim.
   7. Set all nails below surface and fill holes with wood matched putty stick.
   8. Install weatherstrip wedges.

B. Weatherproofing: Apply in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 08 11 69

METAL STORM DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal Storm Door Assemblies.

B. Related Accessories.

1.2 REFERENCES

A. American Architectural Manufacturers Association (AAMA).

B. American National Standards Institute (ANSI/ASSE).

C. ASTM International (ASTM).

D. Insulating Glass Certification Council (IGCC).

E. Occupational Safety and Health Administration (OSHA).

F. Underwriters Laboratories (UL).

G. Window and Door Manufacturers of America (WDMA).

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Hardware Selection: Submit complete descriptive literature, including finishes, for each type of storm door and accessory.

A. Operation and Maintenance Data: Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Carefully pack products in poly bags or other protective containers. Deliver products to the project site in undamaged condition, store out of contact with the ground under weather tight covering, and protect against damage.

1.3 WARRANTY

A. Provide Manufacturer's standard warranty

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
   1. Andersen Corporation.
   2. Harvey Industries, Inc.
   3. Kaufmann Window & Door Corp.
   4. Larson Manufacturing Company.
   5. Pella Corporation.

B. Substitutions: or equal.

C. Requests for substitutions will be considered in accordance with Section 01 60 00.
   1. When submitting request for substitution, provide complete product data and MSDS sheet for each substitute product.

2.2 METAL STORM DOOR ASSEMBLIES

A. Materials to match existing door.

B. Doors shall be self-storing, equal light, combination storm doors, fully assembled and pre-hung complete with glazing, insect screens, hardware, and weather stripping ready for installation into prepared door openings. Field measure openings to obtain exact dimensions needed for fabrication.

C. Hardware: For each storm door, provide the same hardware as existing including, but not limited to, a spring-loaded latch bolt operated by a turn knob, thumb piece, or lever handle; a tubular, adjustable, pneumatic or hydraulic closer; a chain door stop; and an adjustable sweep mounted on a bottom expander or with a flat metal retainer. Storm doors shall be lockable from the inside. Latch hardware, latch pin, knob, and springs shall be made from corrosion resistant materials.

D. Frames: Expander type, regular Z-bar, or New England Z-bar, as required to suit actual conditions at the door openings.

2.3 ACCESSORIES

A. Connections: Rigidly connect frames at corners to prevent racking during normal handling and installation.

B. Glass Inserts: Provide glaze inserts matching existing materials.

C. Insert Locks: On inserts, locks shall engage round holes or deep notches in the main frame.

PART 3 EXECUTION

3.1 PREPERATION

A. Thoroughly clean and repair surfaces to which storm door frames will be applied.

3.2 INSTALLATION

A. Install square, in a true plane, level, plumb, in alignment with adjacent construction, and in accordance with manufacturer's printed directions.
   1. Sealants: Make the entire perimeter of the main frame weather tight. Provide gaskets to separate new metal from existing metal.
   2. Fasteners: Attach units with panhead screws of adequate dimensions for the particular installation.
   3. Cleaning: After installation, clean exposed surfaces to remove foreign matter and surface blemishes.

END OF SECTION

SECTION 08 51 69

METAL STORM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications, apply to this section

1.2 SUMMARY

A. Section Includes;
   1. Metal Storm Windows

B. Related Documents -
   1. AADAF45(2003; Reaffirmed 2009) Designation System for Aluminum Finishes
   2. AAMA 1002(2011) Voluntary Specification for Secondary Storm Products for Windows and Sliding Glass Doors
   3. AAMA 2603(2015) Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
   4. AAMA 611(2014) Voluntary Specification for Anodized Architectural Aluminum
   5. ASTM C920(2014a) Standard Specification for Elastomeric Joint Sealants

1.3 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 product.

B. Shop Drawings:
   1. Include plans, elevations, sections, and attachment details.
   2. Indicate method of glazing, method of attaching and operating both screen and glass insert panels, and method and materials for weatherstripping.
   3. Include details of installation, and connections with other work, including details of existing windows and adjacent construction. Storm window schedule shall show location of each unit.

1.4 INFORMATIONAL SUBMITTALS

A. Operations and Maintenance Data

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project site in undamaged condition. Store products out of contact with the ground under weathertight covering, and protect against damage.
B. Do not install damaged units.

1.6 FIELD MEASUREMENT

A. Dimensions shown are nominal. Field measure openings to obtain exact dimensions needed for fabrication. Meeting rails or stiles of storm windows shall align with the meeting rails or stiles of the prime windows.

PART 2 - PRODUCTS

2.1 MANUFACTURERES

A. Subject to Compliance with Requirements provide products by the following
   1. Harvey Building Products
   2. Approved Equal

2.2 MATERIALS

A. Aluminum AAMA 1002.
B. Storm Windows
   1. AAMA 1002, Specification VWE except as otherwise specified herein.
   2. Windows shall have a Performance Class of 40.
   3. Extrusions shall have a nominal wall thickness of not less than 1.14 mm 0.045 inch.
C. Sealant
   1. ASTM C920, Type S or M, Grade NS, Class 12.5, use NT, Color-Clear.
   2. Sealant shall have been tested for use with the materials on which it will be used in this project.

2.3 FABRICATION

A. Fabricate Accordiing to AAMA 1002.
B. Connections - Rigidly connect frames at corners so as to prevent racking during normal handling and installation.
C. Locks and Latches - On vertically operating inserts, locks shall engage round holes or deep notches in the main frame. On horizontally operating inserts, latches shall automatically engage a groove or ridge on the main frame or sash.
D. Access for Cleaning - Inserts, both operating and non-operating, shall be removable for cleaning. Where prime windows have only one operating sash, the operating sash of the storm window shall be in the same position as the prime window.

2.4 FINISHES

A. Exposed aluminum surfaces shall be factory finished with anodic coating or organic coating. New storm windows shall have the same finish.
   1. Exposed surfaces of aluminum extrusions and sheet shall be cleaned and given an anodized finish conforming to AA DAF45.
   2. Finish shall be integral color anodized, designation AA-M10-C22-A32, Architectural Class II, AAMA 611, or electrolytically deposited color anodized, designation AA-M10-C22-A34, Architectural Class II, AAMA 611.
   3. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions 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.
C. Clean glass, wood, and metal surfaces which will be between the storm and prime windows with appropriate detergents or cleaning agents. Leave free of dirt, streaks, fingerprints, and other soil.

3.2 INSTALLATION

A. Install square, in true plane, level, plumb, in alignment with adjacent construction, and in accordance with manufacturer's printed instructions to ensure proper fit, sealing, and operation.
B. Sealants - Make perimeter of storm windows weathertight, except at weep holes. Provide gaskets to separate new metal from existing metal.
C. Fastening Holes in the main frame shall be oversized to allow for expansion and contraction.
D. Attach units with panhead screws of adequate dimensions for the particular installation.
E. Drainage At the storm window sill, between main frame and sill, provide weep holes of ample size to drain rainwater collecting between a closed prime window and an open (summer position) storm window.

3.3 CLEANING

A. After installation, clean exposed surfaces to remove foreign matter and surface blemishes.
B. Remove units which cannot be cleaned satisfactorily, and units which are damaged, and provide new units

SECTION 08 52 00

VINYL CLAD WOOD WINDOWS

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 vinyl-clad wood windows.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for wood windows.

B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Product Schedule: For wood windows. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of wood window, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to wood window manufacturer for installation of units required for this Project.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure to meet performance requirements.
   b. Structural failures including excessive deflection, water leakage, and air infiltration.
   c. Faulty operation of movable sash and hardware.
   d. Deterioration of materials and finishes beyond normal weathering.
   e. Failure of insulating glass.

2. Warranty Period:
   a. Window: 10 years from date of Substantial Completion.
   b. Glazing Units: Ten years from date of Substantial Completion.
   c. Aluminum-Cladding Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Vinyl-Clad Wood Windows:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. Andersen Windows; Andersen Corporation.

B. Source Limitations: Obtain wood windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: WDMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: CW.
2. Minimum Performance Grade: 50.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.32 Btu/sq. ft. x h x deg F (1.83 W/sq. m x K).

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.30.

E. Windborne-Debris Resistance: Capable of resisting impact from windborne debris based on testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 and requirements of authorities having jurisdiction.

2.3 WOOD WINDOWS

A. Operating Types: Provide the following operating types in locations indicated on Drawings:
   1. Double hung.

B. Frames and Sashes: Fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch (0.8 mm) deep by 2 inches (51 mm) wide; water-repellent preservative treated.
   1. Exterior Finish: Vinyl-clad wood.
      a. Color: White.
   2. Interior Finish: Manufacturer's standard color-coated finish.
      a. Color: Owner selected from manufacturers full range of standard colors.

C. Insulating-Glass Units: ASTM E 2190
   1. Glass: ASTM C 1036, Type 1, Class 1, q3.
      a. Tint: Clear.
      b. Kind: Fully tempered with Stormwatch® by Anderson Windows or approved equal.
   2. Lites: Two.
   3. Filling: Fill space between glass lites with argon.
   4. Low-E Coating: Low E-4®, with Heatlock™ by Andersen Windows or approved equal.

D. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
   1. Dual Glazing:
      a. Interior Lite: Glass.
      b. Exterior Lite: Insulating-glass unit.

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: Manufacturer Standard, White Color

F. Hung Window Hardware:
   1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
   2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.

3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.

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.

2.4 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, outside for sliding 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.
   2. Finish for Exterior Screens: Matching color and finish of cladding.

C. Glass-Fiber Mesh Fabric: 18-by-14 (1.1-by-1.4-mm) or 18-by-16 (1.0-by-1.1-mm) mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D 3656.
   1. Mesh Color: Manufacturer's standard.

2.5 FABRICATION

A. Fabricate wood windows in sizes indicated. Include a complete system for installing and anchoring windows.

B. Glaze wood windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.

E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
   1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085200

SECTION 09 29 00

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Gypsum Board and Joint Treatments.

B. Mold and Mildew Resistant Gypsum Board.

C. Related Accessories.

1.2 REFERENCES

A. American National Standards Institute (ANSI/ASSE).

B. ASTM International (ASTM).

C. Gypsum Association (GA).

D. Occupational Safety and Health Administration (OSHA).

E. Underwriters Laboratories (UL).

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Submit Material Safety Data Sheets (MSDS) prior to commencement of work for review and for filing at job site as required.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold

damaged.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
   1. American Gypsum.
   2. CertainTeed Gypsum, Inc.
   3. Georgia-Pacific Gypsum
   4. National Gypsum Co.
   5. Pabco Gypsum, Inc.
   6. USG Corporation.

B. Substitutions: or equal.

C. Requests for substitutions will be considered in accordance with Section 01 60 00.
   1. When submitting request for substitution, provide complete product data and MSDS sheet for each substitute product.

2.2 GYPSUM PRODUCTS, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area that correspond with the support system indicated.

B. Recycled Content: Provide gypsum panel products with recycled content such that post consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum 50 percent by weight.

2.3 INTERIOR GYPSUM MATERIALS

A. Regular Gypsum Board: Gypsum core panel surfaced with paper on front and back edges and complying with ASTM C 1396 and ASTM C 36.
   1. Thickness: 1/2 inch (12.7 mm), unless otherwise indicated.
   2. Width: 48 inches (1219 mm).
   3. Length: Use longest length available, avoiding unnecessary joints.
   4. Edges: Use square, rounded tapered, or tapered per required application.

B. Regular Mold Resistant Gypsum Board: Gypsum core panel enhanced with moisture-resistant wax emulsion and chemically treated to resist mold and mildew in the core and surfaced with mold and mildew resistant paper on front, back and long edges and complying with ASTM C 1396 Section 7 and ASTM C 630.
   1. Thickness: 1/2 inch (129 002.7 mm), unless otherwise indicated.
   2. Width: 48 inches (1219 mm).
   3. Length: Use longest length available, avoiding unnecessary joints.
   4. Edges: Use square, rounded tapered, or tapered per required application.
   5. Mold and Mildew Resistance: Panel score of 10 when tested in accordance with ASTM D 3273.

2.4 GYPSUM JOINT TREATMENT AND FINISH PRODUCTS

A. Joint Treatment Tape: Complying with ASTM C 475 and GA-216.

B. Joint Compound: Vinyl type pre-mixed compound; complying with ASTM C 475.

C. Joint Compound: Level Five vinyl type pre-mixed compound; off-white color or tinted gray color; complying with ASTM C 475 and fulfilling ASTM C 840; designed for joint finishing of Level Five gypsum board.

2.5 ACCESSORY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Corner Bead: Formed galvanized steel angle, min. base steel 0.014 in. thick, and complying with ASTM C 1047.

C. Casing Bead: Formed galvanized steel or vinyl trim, matching existing application and complying with ASTM C 1047, type(s) as follows:
1. J-shaped U-bead, for face nailing and finishing with joint treatment.
2. J-shaped U-bead, requiring no finishing.
3. L-shaped, for application over edge and finishing with joint treatment.

D. Control Joint: Extruded vinyl formed with V-shaped slot covered with removable flexible vinyl strip; complying with ASTM C 1047.

E. Control Joint: Bent zinc sheet formed with V-shaped slot, covered with plastic tape, with perforated flanges; complying with ASTM C 1047.

F. Screws: ASTM C 954 or ASTM C 1002 or both with heads, threads, points, and finish as recommended by panel manufacturer.

G. Nails: ASTM C 514 with heads, lengths, configurations, and finish as recommended by panel manufacturer.

H. Acoustical Sealant: Nondrying, nonhardening, nonskinning, nonstaining, nonbleeding, gunnable type as recommended by panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.2 INSTALLATION

A. Application: Apply and maintain conditions during installation in accordance with GA-216 and GA-238 and as follows:
1. Keep gypsum board dry throughout application.

2. Do not use gypsum board that has visible mold growth.
3. Apply gypsum board on walls with a minimum 1/4 inch (6.4 mm) gap between the gypsum board and the floor.
4. Do not apply gypsum board over other building materials where conditions exist that are favorable to mold growth.
5. Maintain a sound weather-tight building envelope including, such elements as the roof, sealants, windows, etc..
6. Immediate and appropriate remediation measures must be taken as soon as water leaks or condensation sources are identified.
7. If gypsum board is damaged by water, assess the need for replacement in accordance with GA-231.

B. Install accordance with GA 216 and the following:
1. Gypsum Sheathing Board: ASTM C 1280 and GA-253.
2. Gypsum Board and Joint Treatment: ASTM C 840 and GA-214.
3. Gypsum panel manufacturer's published recommendations.

C. Finishing: Tape, fill, sand and finish joints in accordance with ASTM C 840 and GA-214.
1. Level 2: Water resistant gypsum backing board indicated to receive tile.
2. Level 4: Gypsum board indicated to receive light textured coatings and light-grade wall coverings.
3. Level 5: All other gypsum board.

END OF SECTION

SECTION 09 30 00

TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Floor and Wall Tile.

B. Trims.

C. Tile Setting Materials.

D. Related Accessories.

1.2 REFERENCES

A. American National Standards Institute (ANSI/ASSE).

B. ASTM International (ASTM).

C. Occupational Safety and Health Administration (OSHA).

D. Underwriters Laboratories (UL).

E. Tile Council of North America (TCNA).

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Submit Material Safety Data Sheets (MSDS) prior to commencement of work for review and for filing at job site as required.

D. Selection Samples: Submit a complete set of tile samples that represent the full range of manufacturer's products, colors and patterns available.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging until ready for installation.

B. Protect adhesives and liquid additives from freezing or overheating in accordance with manufacturer's instructions.

C. Store tile and setting materials on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
   1. American Olean Tile Co.
   2. Daltile Corporation.
   3. Interceramic Inc.
   4. Merola Tile.

B. Substitutions: or equal.

C. Requests for substitutions will be considered in accordance with Section 01 60 00.
   1. When submitting request for substitution, provide complete product data and MSDS sheet for each substitute product.

2.2 TILE, GENERAL

A. Tile shall also be provided in accordance with the following:
   1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
   2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.
   3. Factory Applied Temporary Protective Coatings: Where existing, to match, protect exposed surfaces of tile against adherence of mortar and grout by precoating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.

2.3 FLOOR AND WALL TILE

A. Product: Brixton Cermic Tile by Daltile or equal.

B. Size and Shape: 12" Square Floor Tile, 6" Square Wall Tile.

C. Surface Finish: Glazed.

D. Colors: Bone, Sand or Mushroom as selected by owner.

E. Pattern: Not Used.

F. Trim Units: Matching bullnose, bullnose corner, cove/inside finger cove, radius cap, sink rail, sink rail incorner/outcorner, cove base, outside cove corner, Cement Bullnose, Cove

Base, Cove Base Corner, Fabric Bullnose, Groover Bullnose shapes in sizes coordinated with field tile shapes.

2.4 TRIM AND ACCESSORIES

A. Ceramic Accessories: Match existing finish, same color and finish as adjacent field tile; same manufacturer as tile.
   1. Soap Dish: With wash cloth holder, clam shell design, surface mounted or recessed; cast strength sufficient to resist lateral pull force of 75 lbs (34 Kg).
   2. Toilet Tissue Holder: Surface mounted or recessed, for single roll, with spring loaded holder.
   3. Towel Bars: Standard design, surface mounted with extensions for casting into small wall openings; cast strength sufficient to resist lateral pull force of 30 lbs (14 Kg).
   4. Corner Shelf.

B. Non-Ceramic Trim: Match material, finish, style and dimensions as existing and to suit application, for setting using tile mortar or adhesive; use in the following locations:
   1. Open edges of floor tile.
   2. Transition between floor finishes of different heights.
   3. Thresholds at door openings.
   4. Expansion and control joints, floor and wall.

C. Stone Thresholds: Provide stone thresholds uniform in color and finish and fabricated to match existing material type, size and finish.
   1. Provide to provide transition between tile surface and adjoining finishes where required.

2.5 SETTING MATERIALS

A. Organic or Epoxy Adhesive: Thinset per Manufacturer requirements.

B. Mortar Bed Materials: Per Manufacturer requirements.

C. Mortar Bond Coat Materials: Per Manufacturer requirements.

D. Standard Grout: Cement grout, sanded or unsanded, as specified by Manufacturer; color selected by owner.

E. Polymer modified cement grout, sanded or unsanded, as specified by Manufacturer; color selected by owner.

F. Epoxy Grout: As specified by Manufacturer; color selected by owner.

G. Silicone Sealant: Silicone sealant, moisture and mildew resistant type, as specified by Manufacturer; color selected by owner.

H. Waterproofing membranes: Per Manufacturer requirements.

I. Cementitious Backer Board: Per Manufacturer requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall surfaces are free of substances which would impair bonding of setting materials, smooth and flat within tolerances specified by Manufacturer, and are ready to receive tile.

B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and flat within tolerances specified by Manufacturer.

3.2 INSTALLATION

A. Preparation: Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.
   1. Remove any curing compounds or other contaminates.
   2. Vacuum clean surfaces and damp clean.
   3. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
   4. Install cementitious backer board in accordance with Manufacturer requirements and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

B. Install tile, grout and setting materials in accordance with applicable requirements of manufacturer's instructions, and TCA Handbook recommendations.

C. Lay tile to pattern to match existing application. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.

D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Install thresholds where required.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

J. Allow tile to set for a minimum of 48 hours prior to grouting.

K. Grout tile joints. Use standard grout unless otherwise indicated.

L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

M. Comply with the manufacturer's instructions, specified industry standards and recommendations for cleaning, traffic, furnishings installation and equipment installation.

END OF SECTION

SECTION 09 62 19

LAMINATE 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. Section Includes:
   1. Laminate Flooring
   2. Underlayment and Vapor Barrier
   3. Trims and moldings

B. Related Sections:
   1. Wood substrates: Section 061000 – "Rough Carpentry"

1.3 SYSTEM DESCRIPTION

A. Laminate plank flooring with mechanical locking system and underlayment applied over a wood substrate.

B. Flooring system of "floating – floor" construction type allowing for expansion and contraction due to changes in humidity.

1.4 ACTION SUBMITTALS

A. Comply with Section 013300, unless otherwise indicated.

B. Product Data:
   1. Product data and detailed specification of construction.
   2. Manufacturer's installation instructions.
   3. Manufacturer's recommendations for product handling, storage, acclimation, installation, protection, and maintenance.

C. Samples: Submit selection and verification samples for design(s) and finish texture(s).

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installation shall be performed by a firm experienced in the application of systems similar in complexity to those required for this Project.

B. Manufacturer's Qualifications: Not less than 25-years experience in the laminate flooring industry and a record of successful commercial applications.

C. Source Limitations: Obtain all products and materials from one source.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Ordering: Order material in compliance with manufacturer's lead time requirements to avoid construction delays.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged cartons.

C. Storage and Protection: Store in a horizontal fashion, flat and off the floor (i.e. palletized).

1.7 PROJECT CONDITIONS

A. Maintain air temperature between 55º and 80º Fahrenheit and humidity levels between 25% and 60% for 48 hours before, during and after installation.

B. Install laminate flooring after other finishing operations have been completed.

1.8 WARRANTY

A. Manufacturer's warranty for joint integrity, wear resistance, stain resistance, and fade resistance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Provide products by the following:
   1. Shaw Flooring

B. Substitutions: Equal product.

C. Requests for substitutions will be considered in accordance with Section 01 60 00
   1. When submitting requests for substitution, provide complete product data and MSDS sheet for each substitute product.

2.2 LAMINATE FLOORING

A. Composite panel consisting of high-pressure laminate surfacing and high-pressure laminate balancing backer bonded to high density fiberboard (HFD) core with moisture resistant adhesive.

B. Performance Standard Compliance
   1. ASTM E662, Smoke Density, Flaming and non-flaming <450
   2. Meet NALFA LF-01.
   3. ASTM C1028, Slip Resistance: Wet and dry

C. Panel edges:
   1. Patented aluminum locking system for glue-free installation.
   2. Wax-impregnated edges.

D. Performance Standard Compliance:
   1. The products surface shall be capable of withstanding a minimum of 11,500 (Alloc Commercial) revolutions in accordance with NEMA LD 3.13.
   2. The floor as installed shall have a static coefficient of friction when dry greater than 0.80 and when wet greater than 0.72 as tested in accordance with ASTM C1028.
   3. The floor shall be resistant to stains and reagents and exceed all standards as set forth in and tested in accordance with ASTM D3023
   4. The floor shall have a horizontal joint strength of not less than 1,000 lbs./lineal ft. when tested in accordance with Lloyd-LR 10K (ISO/TC 219)
   5. Ball Impact Resistance (ANSI/NEMA LD3-2000, 3.8): No damage 1,675 mm (Alloc Commercial) and no damage 675 mm (Alloc Original).
   6. Critical Radiant Flux (ASTM E 648): NFPA 101 Class 1 Specific Optical Density of Smoke: Class 1 when tested in accordance with ASTM D 3023 and <350 when tested in accordance with ASTM E 662-03
   7. Impact Insulation Classification (IIC): 64 when tested in accordance with ASTM E 492 – 90 NVLAP
   8. Sound Transmission Classification (STC): 61 when tested in accordance with ASTM E 90-02 NVLAP
   9. Meets ASTM E1333 and California State Code for emissions.
   10. Mechanical locking system strength > 1000 lbs / lineal foot as per ISO/TC 219 / TG03

2.3 ACCESSORIES

A. Vapor barrier shall be polyethylene sheet(s) not less than 6.0 mils thick.

B. Underlayment for product in the form of a 2mm (0.08”) thick crosslinked HDPE sheet or manufacturer recommended product.

2.4 RELATED MATERIALS

A. Decorative Laminate Trim available in 94” lengths matching colors.
   1. Quarter Round
   2. Wall Base
   3. Reducer
   4. Square Nose Reducer or End Cap

5. T-Molding
6. Overlap and Flush Stair nose.

B. Flooring Spacers: Maintain spacing between flooring and walls or other perimeter vertical surfaces.

C. Silicone Sealant: Seal gaps around metal door frames and flooring edges and areas where moisture is present.

D. Molding Trim
1. Expansion: Used in doorways or thresholds to join two areas of laminate flooring.
2. Transition: Used to join laminate flooring to other flooring materials of varying heights.
3. End Cap: Used at exterior doorways to finish space at end of laminate flooring.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with current manufacturer's product installation manual.

3.2 EXAMINATION

A. Site Verification of Conditions: Examine substrate conditions, application areas, and jobsite conditions are acceptable for product installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Surface Preparation: Prepare sub floor to receive laminate flooring and verify that the sub floor is flat to within 3/16" over a 10' span. Ensure that the sub floor is structurally sound and stable. Clean sub floor to remove loose dirt particles and debris.

B. Acclimation: Condition flooring materials in unopened cartons in the room where the installation is to take place or room with exact similar conditions for at least 48 hours prior to installation.

C. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 INSTALLATION

A. Install flooring symmetrically about room centerline unless otherwise indicated.

B. Install polyethylene vapor barrier sheet on:
   1. Concrete Subfloors.
   2. Over existing floors installed on concrete.
   3. Over all subfloors that have open crawlspace underneath them.

C. Install laminate flooring as a floating floor.

D. Connect the planks via locking mechanism and stagger the plank's end joints a minimum of 12".

E. Provide a minimum of ¼" expansion space between flooring planks and perimeter walls, columns and other fixed objects.

F. Install transition pieces:
   1. When exceeding 50 lineal feet in a single room.
   2. At the centerline of doors.
   3. When transitioning to other flooring materials or unfinished areas.

G. Do not nail, screw, or fix laminate flooring to the sub floor(s).

H. Install wall base or trim at floor perimeter and at vertical obstructions.

I. Seal flooring penetrations and perimeters at wet areas with silicon sealant

J. Stairs and Steps
   1. Install stairs and steps in compliance with manufacturer's installation instructions.
   2. Use laminate flooring planks for risers and treads combined with stairnose moldings

3.5 PROTECTION

A. Cover installed flooring to protect it from damage during the remainder of construction. Use heavy Kraft-paper or other suitable material.

B. Cleaning: Maintain flooring in accordance with manufacturer's suggestions.

SECTION 09 90 00

PAINTS AND COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior Paint and Coatings Systems Including Surface Preparation.

B. Exterior Paint and Coatings Systems Including Surface Preparation.

1.2 REFERENCES

A. American National Standards Institute (ANSI/ASSE).

B. ASTM International (ASTM).

C. Master Painters Institute (MPI)

D. Occupational Safety and Health Administration (OSHA).

E. Painting and Decorating Contractors of America (PDCA).

F. The Society for Protective Coatings (SSPC).

G. Underwriters Laboratories (UL).

1.3 SUBMITTALS

A. Product Data: For each paint system indicated, including.
   1. Product characteristics.
   2. Surface preparation instructions and recommendations.
   3. Primer requirements and finish specification.
   4. Storage and handling requirements and recommendations.
   5. Application methods.
   6. Cautions for storage, handling and installation.

B. Submit Material Safety Data Sheets (MSDS) prior to commencement of work for review and for filing at job site as required.

C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors and sheens available.

D. Coating Maintenance Manual: upon conclusion of the project, the Contractor or paint manufacture/supplier shall furnish a coating maintenance manual. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

E. Field Coating of Vinyl Siding Methods and Procedures:
   1. Manufacturer Guarantee: Submit letter from Manufacturer with acceptable product and application methods for coatings used on vinyl siding systems.
   2. Quality Assurance Plan: Submit methods and procedure plan for protection of adjacent environmental items, equipment, vehicles, adjacent structures, etc.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.
   1. Product name, and type (description).
   2. Application and use instructions.
   3. Surface preparation.
   4. VOC content.
   5. Environmental handling.
   6. Batch date.
   7. Color number.

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

1.5 EXTRA MATERIALS

A. Furnish Owner with any unused materials. Properly seal canisters and label with finish and finish location for proper Owner storage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, available manufactures offering products that may incorporated into the Work include the following:
   1. BEHR Process Corporation.
   2. Benjamin Moore & Co.
   3. The Sherwin-Williams Company.

B. Substitutions: or equal.

C. Requests for substitutions will be considered in accordance with Section 01 60 00.
   1. When submitting request for substitution, provide complete product data and MSDS sheet for each substitute product.

2.2 PAINT MATERIALS - GENERAL

A. Paints and Coatings.
   1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before

application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

D. Application to Materials: Apply paints and coatings manufacturer's specifications for application to Wood, Drywall, Plaster, Metals, etc.

E. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

F. Color: Refer to existing finishes or as selected by Owner.

2.3 INTERIOR PAINT SYSTEMS

A. Interior Painting:
1. Finish: Gloss, Semi-Gloss, Satin or Flat to match existing. If matching is not required, finish per Manufacturer or industry requirements for interior applications.
2. Coats: Apply quantity of coats to match existing. If matching is not required, finish per Manufacturer or industry requirements for interior applications.

B. Interior Primers/Sealers:
1. Interior primers/sealers to be latex or as per Manufacturer/Industry requirements for interior applications.

C. Interior Wood Sealers:
1. Wood primers to be latex or as per Manufacturer/Industry requirements for interior applications.

2.4 EXTERIOR PAINT SYSTEMS

A. Exterior Painting:
1. Finish: Gloss, Semi-Gloss, Satin or flat to match existing. If matching is not required, finish per Manufacturer or industry requirements for exterior applications.
2. Coats: Apply quantity of coats to match existing. If matching is not required, finish per Manufacturer or industry requirements for exterior applications.

B. Exterior Primers/Sealers:
1. Water based primers/sealers to be alkali resistant and/or bonding or as per Manufacturer or industry requirements for exterior applications.

C. Exterior Wood Sealers:
1. Wood primers to be alkyd and/or latex or as per Manufacturer or industry

requirements for exterior applications.

D. Vinyl Siding:
   1. Primers and finishes as per manufacturer or industry requirements for vinyl application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared; notify MCA of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify MCA of unsatisfactory preparation before proceeding.

B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.
   1. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify MCA immediately if lead based paints are encountered.

3.2 SURFACE PREPARATION

A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.
   1. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry a minimum of 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
   2. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
   3. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.

B. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.

C. Plaster: Must be allowed to dry thoroughly for at least 30 days before painting, unless the products are designed to be used in high pH environments. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1

gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.

D. Vinyl Siding, Architectural Plastics, EIFS and Fiberglass: Clean vinyl siding thoroughly by scrubbing with a warm, soapy water solution. Rinse thoroughly. Do not paint vinyl siding with any color darker than the original color unless approved by Manufacturer.

E. Wood: Must be clean and dry. Prime and paint as soon as possible. Knots and pitch streaks must be scraped, sanded, and spot primed before a full priming coat is applied. Patch all nail holes and imperfections with a wood filler or putty and sand smooth.

3.3 INSTALLATION

A. Apply all coatings and materials with the manufacturer’s specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B. Apply primer to all materials receiving a finish coat of paint.

C. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

D. Apply coatings using methods recommended by manufacturer and uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

F. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

G. Comply with the manufacturer's instructions, specified industry standards and recommendations for cleaning, traffic, furnishings installation and equipment installation.

END OF SECTION

SECTION 13 34 00

FABRICATED ENGINEERED STRUCTURES

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. Section Includes:
   1. Engineered wood-framed factory built modular structure consisting of the following components:
      1. Engineered roof truss, wall, floor and bracing framing.
      2. Complete building system with all accessories required to obtain a certificate of occupancy from the building official having jurisdiction.

B. Contractor shall provide all services, material, equipment, and labor for fabricated engineered structure composed of modular components to meet requirements specified herein and on drawings.
   1. Contractor shall be responsible for obtaining a building permit in the City of Milford, Connecticut and shall ensure the manufacturer prepares requisite sealed drawings for permit approval.
   2. Drawings listed in Section 011500 “List of Drawings” will be provided sealed for the purposes of building permit application.

1.3 REFERENCES

A. Reference Standards:
   1. Lumber grading rules and wood species:
      1. National Design Specifications for Wood Construction, current edition.
      2. Northeastern Lumber Manufacturer’s Association, Inc. (NELMA).
      3. Southern Pine Inspection Bureau (SPIB): Southern Pine.
      4. West Coast Lumber Inspection Bureau (WCLIB): Douglas Fir.
      5. Western Wood Products Association (WWPA): Douglas Fir and Ponderosa Pine.
   2. MSR Lumber Producers Council (MSR) for machine stress rated lumber.
   3. National Design Specifications for Wood Construction.
   4. National Design Standard for Metal Plate Connected Wood Truss Construction (TPI).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-engineered product. Indicate component materials, dimensions, profiles, and construction and installation details.
   1. Include information for specialty accessory products specified for this Project.

B. Shop Drawings: Include plans, profiles, elevations, sections, details, attachments to other work, openings, fasteners, loads and reinforcements.
   1. Sizes, stress grades, and species of lumber.
   2. Structural Framing Drawings: Show complete fabrication of primary and secondary framing. Include provisions for openings and the following information:
      1. Slope or depth, span, and spacing of truss.
      2. Heel bearing height.
      3. Design loading to include:
         1) Top chord live load.
         2) Top chord dead load.
         3) Bottom chord dead load.
         4) Concentrated loads and their points.
      4. Adjustments to lumber and plate design values for conditions of use.
      5. Plate type, thickness of gauge, and size.
      6. Lumber size, species and grade for each member.
   3. Submit Shop Drawings that have been engineered and certified by professional engineer licensed in the State in which Project is located. Include seal and signature of professional engineer on Shop Drawings.

C. Design Data: Truss engineering calculations for loading and stresses, bearing seal and signature of professional engineer licensed the State of Connecticut. Include the following calculations:
   1. Minimum design shall meet design standards of latest edition of International Residential Code unless other, more stringent requirements are in force in Project location.
   2. Bending moments and axial forces for each member.
   3. Basic plate design values.
   4. Design analysis for each joint indicating that proper plates have been used.
   5. Provide design calculations for exterior walls, canopies, soffit systems, and lateral bracing walls.
   6. Submit design calculations that have been engineered and certified by professional engineer licensed in the State in which Project is located. Include seal and signature of professional engineer on calculations

1.5 INFORMATIONAL SUBMITTALS

A. Quality Control Submittals:
   1. Test Reports: Certified test reports showing compliance with specified performance characteristics.
   2. Certification: Manufacturer's certification that Products furnished meet specified design and performance criteria.

B. Certifications: Certify that specified roof and wind load requirements are met.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with minimum 5 years' documented experience.
   1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
   2. Manufacturer shall have engineering department.
   3. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by qualified professional engineer.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project.

C. Source Limitations: Obtain engineered structure from single source from single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and store materials per manufacturer's requirements. Deliver structure to site packaged to prevent damage and marked for ease of identification.

B. Handle and store trusses to comply with recommendations in TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
   1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
   2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
   3. Provide for air circulation around stacks and under coverings.
   4. Store trusses to avoid contact with other materials that could create staining or discoloration.

C. Inspect trusses upon deliver to Project site and notify manufacturer immediately if members have damage from handling or show discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

1.8 WARRANTY

A. Contractor shall warranty building and its associated components for a period of one year from the date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:
   1. Westchester Modular Homes, Inc. 30 Reagans Mill Road Wingdale, NY
   2. Huntington Homes, Inc. 344 Fasset Road, East Montpeilier VT

B. Substitutions: or equal.
   1. Requests for substitutions will be considered in accordance with Section 01 60 00.

2.2 PERFORMANCE CRITERIA

A. Design Requirements:
   1. Design wood members per formulas published in National Design Specifications (NDS) for Wood Construction.
   2. Design light meta-toothed connector plates and joint design in compliance with Truss Plate Institute's (TPI) National Design Standard for Metal Plate Connected Wood Truss Construction.
   3. Design compliant with 2009 International Residential Code and 2011 National Electrical Code.

2.3 GENERAL MATERIAL REQUIREMENTS

A. DRAWING SPECIFIED MATERIALS
   1. All specified materials on drawings and in other Divisions are basis of design and alternate products will be allowed subject to a product equivalency review.
      1. Refer to Section 01 25 00 "Substitution Procedures" and Section 01 60 00 "Product Requirements" for procedure of alternate product equivalency review.

B. MATERIALS – WOOD
   1. In addition to the requirements specified below see Division 6 Specifications and drawings.
   2. Wood Trusses: Factory-fabricated of surfaced lumber.
      1. Lumber:
         1) Top and Bottoms Chords: No. 1or better Spruce Pine Fir.
         2) Webs: No. 2 grade or better Spruce Pine Fir.
      2. Metal Connector Plates: Fabricated from ASTM A653; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A); G60 hot-dip galvanizing coating designation.
      3. Fabrication
         1) Shop-fabricate wood trusses.
         2) Cut truss members to accurate lengths, angles, and sizes to produce close-fittingjoints.
         3) Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
         4) Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
            a) Fabricate wood trusses within manufacturing tolerances in TPI 1.
         5) Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.
   3. Wall Fire Blocking: 2 inch by 6 inch girts, No. 3 or better Spruce pine fir.

4. Purlins and Truss Ties: 2 inch by 4 inch laid on edge, MSR SPF 1650.
    1. Purlins may be installed over top chord of truss, flat, or in purling hangers. Where purlins and truss ties are set in hangers, provide 2 inch by 6 inch laid on edge, MSR SPF 1650 or No. 1 or better Spruce pine fir.
5. Wind Bracing:
    1. 2 inch by 6 inch, No. 2 or better.
    2. 2 inch by 4 inch diagonal in roofline bracing as required by design.
6. Stud Wall Framing: No. 3 Spruce Pine fir or better.
7. Floor Framing: No. 2 Spruce Pine fir or better
8. Framing Around Openings:
    1. Provide 2 inch by 6 inch and 2 inch by 4 inch No. 2 around door and window openings.
9. Headers: Provide built-up No. 1 or as required to meet loading designs.
10. Incidental Framing: No.3 or better 2 inch by 4 inch.

C. MATERIALS – Thermal and Moisture Projection
    1. See Division 7 Specifications and drawings for requirements.

D. MATERIALS - Openings
    1. See Division 8 Specifications and drawings for requirements.

E. MATERIALS – FINISHES
    1. See Division 9 Specifications and drawings for requirements.

F. MATERIALS – PLUMBING AND HVAC
    1. See Division 22 and 23 and drawings for requirements.

G. MATERIALS – ELECTRICAL
    1. See Division 26 Specifications and drawings for requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Before erection proceeds, survey elevations and locations of foundation bearing surfaces and other embedments to receive structural framing for compliance with requirements.
    1. Engage land surveyor to perform surveying.

C. Verify that mechanical and electrical utilities are in correct position.

D. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent framing, connections, and bracing are in place unless indicated otherwise.

3.3 ERECTION OF FRAMING

A. General: Do not use materials that are unsound, warped, improperly finished, or with defective surfaces, sizes, or patterns.
   1. Comply with frame manufacturer's approved Shop Drawings for details and building erection.

B. Trusses:
   1. Set trusses in place in center of column using lifting methods as approved by manufacturer.
   2. Brace trusses per WTCA guidelines and BCSI Manual

C. Purlins: Install purlins with fasteners and at spacings per approved Shop Drawings.

D. Truss Ties: Install truss ties at locations recommended by structure manufacture and per approved Shop Drawings
   1. Run truss ties from end wall to end wall.

E. Incidental Framing: Install 2 inch by 4 inch or 2 inch by 6 inch blocking as required per structure manufacturers recommendations.

END OF SECTION

SECTION 14 41 19

STAIRWAY CHAIRLIFTS

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 private-residence, inclined stairway chairlifts.

B. Related Requirements:
   1. Section 017839 'Project Record Documents'
   2. Section 061063 'Exterior Rough Carpentry'

1.3 DEFINITIONS

A. Definitions in ASME A18.1 apply to Work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components, and finishes for lifts.
   2. Include rated capacities, operating characteristics, electrical characteristics, safety features, controls, finishes, and accessories.

B. Shop Drawings: For each lift.

   1. Include plans, elevations, sections, details, attachments to other work, and required clearances.
   2. Indicate dimensions, weights, loads, and points of load to building structure.
   3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of lift.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lift to include in operation and maintenance manuals.

1. In addition to items specified in Section 017839 "Project Record Documents," include the following:

a. Parts list with sources indicated.
b. Recommended parts inventory list.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted use of lifts.

C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard two year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of lifts that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A18.1, "Safety Standard for Platform Lifts and Stairway Chairlifts."

2.2 INCLINED STAIRWAY CHAIRLIFT

A. Private-Residence Inclined Stairway Chairlift, General: Preengineered lift system.

B. Rated Capacity: Minimum 250 lb (115 kg).

C. Rated Speed: Minimum 18 fpm (0.09 m/s), Maximum 25 fpm (0.13 m/s).

D. Power Supply: 120 V, 60 Hz, one phase.

E. Battery Operation: Provide battery-operated drive with automatic charging system.

F. Manual Lowering: Provide means to manually lower units in case of malfunction or power loss.

G. Folding Units: When not in use, units shall be capable of manually folding up against wall to minimize projection into stairway.

H. Support to Structure: Provide brackets to support vertical loads from floor or stair treads and to support lateral loads from walls. Fabricate brackets from steel plates, shapes, or bars.

I. Accessories: Provide units with the following accessories:

1. Tubular-steel, manually operated safety arms designed to restrain and provide grab bar for occupant.
2. Retractable seatbelt.
3. Seat with back and two handgrips or arms.

2.3 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

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 installation tolerances, critical dimensions, and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with ASME A18.1 and manufacturer's written instructions for installation of lifts unless otherwise indicated.

B. Wiring Method: Conceal conductors and cables within housings of units or building construction. Do not install conduit exposed to view in finished spaces. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

C. Adjust stops for accurate stopping at each landing.

D. Lubricate operating parts of lift, including drive mechanism, guide rails, hinges, safety devices, and hardware.

E. Test safety devices and verify smoothness of required protective enclosures and other surfaces.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of lift installation and before permitting use of lifts, perform acceptance tests as required and recommended by ASME A18.1 and authorities having jurisdiction.

B. Operating Test: In addition to acceptance testing, load lifts to rated capacity and operate continuously for 30 minutes between lowest and highest landings served. Readjust stops, signal equipment, and other devices for accurate stopping and operation of system.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on lifts.

3.4 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of lift Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper lift operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lifts. Include a review of emergency systems and emergency procedures to be followed at time of operational failure and other building emergencies.

B. Check operation of lifts with Owner's personnel present and before date of Substantial Completion. Determine that operating systems and devices are functioning properly.

C. Check operation of lifts with Owner's personnel present not more than one month before end of warranty period. Determine that operating systems and devices are functioning properly.

END OF SECTION 144119

SECTION 14 42 16

VERTICAL WHEELCHAIR LIFTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 01 Specifications Apply to this Section

1.2 SUMMARY

A. Section Includes Commercial vertical platform lifts.

B. Related sections
1. Section 03 30 00 – Cast-in-place Concrete.
2. Section 06 10 00 – Rough Carpentry.
3. Division 26 – Electrical – dedicated telephone service and wiring connections, lighting and wiring connections at top of hoistway, electrical power service and wiring connections.

1.3 REFERENCES

A. ASME A17.1 - Safety Code for Elevators and Escalators.

B. ASME A17.5 - Elevator and Escalator Equipment.

C. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.

D. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.

E. NFPA 70 - National Electric Code.

F. CSA - National Electric Code.

1.4 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Provide a complete layout of lift equipment detailing dimensions and clearances as required including;
1. Include plans, elevations, sections, details, attachments to other work, and required clearances.
2. Indicate dimensions, weights, loads, and points of load to building structure.
3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of lift.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted use of lifts.

C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard two year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

B. Installer Qualifications: Minimum 2 year experience installing similar products and approved by manufacturer.

1.8 REGULATORY REQUIREMENTS

A. Provide platform lifts in compliance with:
   1. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
   2. CSA B44.1/ASME A17.5 - Elevator and Escalator Equipment.
   3. CSA B355 - Lifts for Persons with Physical Disabilities.
   4. CSA - National Electric Code.
   5. NFPA 70 - National Electric Code.

B. Fabricate and install work in compliance with applicable jurisdictional authorities.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Handling: Handle materials to avoid damage.

1.10 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.11 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.12 WARRANTY

A. Manufacturer's Warranty: Standard limited warranty against defects in materials and manufacturing.
   1. Warranty Period: For major components including the drive system, 2 years.
   2. Warranty Period: For all other components, 1 year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Bruno Independent Living Aids, Inc.
   2. Savaria,
   3. Symmetry Elevating Solutions.
   4. Inclinator Company of America

2.2 VERTICAL PLATFORM LIFT - GENERAL

A. Performance Standards:
   1. ASME A18.1-2011 (Sec. 2) Safety Standards for Platform Lifts and Stairway Chairlifts.
   2. CSA B355-09 Lifts for Persons with Physical Disabilities.
   3. CSA B44.1-11/ASME A17.5-2011 Elevator and Escalator Electrical Equipment.

2.3 ENCLOSED VERTICAL WHEEL CHAIR LIFT

A. Capacity
   1. 750 lbs (340 kg) maximum

B. Mast Height – As shown on drawings from available manufacturer lifting heights.

C. Performance:
   1. Rated Load: 750 lb (340 kg) maximum.
   2. Number of Passengers: One passenger with mobility device.
   3. Speed: 10 feet/minute (0.05 meters/second) maximum.
   4. Number of Landings: 2-Stop.
   5. For pit applications, maximum floor-to-floor is measured from the bottom of the pit.
   6. Platform Configuration: From the following options as shown on drawings.
      a. Enter/Exit Straight Through (Front and Rear Openings).
      b. 90 Degree Enter/Exit (Front and Side Openings).
      c. Enter/Exit Same Side (Front Opening only).
   7. Platform Dimensions:
      a. 36 inches x 48 inches (914 mm x 1219 mm).

D. Leadscrew Drive:
   1. Drive Type: Self-lubricating ACME screw drive
   2. Emergency Operation: Manual hand wheel or crank operation.
   3. Safety Devices: Integral safety nut assembly.
   4. Drive:
      a. Primary Drive: Electric Motor, 1/2 to 2 hp, 20 full-load amps max, continuous

duty, AC or DC operation.
b. Intermediate Reduction: Dual 4L style poly-V belts and pulleys, 3.94:1 pulley reduction.
c. Final Drive: ACME lead screw with bronze nut and bronze safety back up nut.
5. Power Supply:
a. 120 Volt AC single phase; 60 Hertz on 20 Amp Dedicated Circuit.
b. 5 Amp, 24VDC internal battery charger with 120 VAC, 60 Hertz 3 Amp maximum input power

E. Hydraulic Drive:
1. Drive Type: Chain Hydraulic
2. Emergency Operation: Manual hand wheel or crank operation.
3. Safety Devices: Slack chain safety device.
4. Drive:
a. 3/4 to 3 HP gear type motor, 20 full-load amps max, continuous duty
5. Power Supply:
a. 120 VAC single phase; 60 Hertz on 20 amp Dedicated Circuit.
b. 12 VDC down operation only (optional)

F. Motor Controller: 24VDC relay control with 35A circuit breaker and disconnect.

G. Braking: Precision landing control.

H. Platform configuration:
1. Straight Through Entry/Exit: Front and Rear Openings
2. 90 Degree Entry/Exit: Front and Side Openings
3. On/Off Same Side Entry/Exit: One Front Opening Only

I. Landing Openings:
1. Lower Landing: Door
2. Upper Landing: Door

J. Platform Control: Up and down rocker switch or optional paddle controls, continuous pressure, key switch control (key removable in both on/off position).

K. Call Station Control: At each landing; Up and down rocker switch or optional paddle controls, continuous pressure, key switch control (key removable in both on/off position).

L. Emergency Stop Switch: Red, sealed, 1.55 inches (39 mm) diameter mushroom head, illuminated with audio alarm, push to stop, pull to reset.

M. Lift Construction:
1. Main Frame: Welded steel tubular guide construction with formed sheet steel guarding.
2. Carriage: Welded carriage with 2.25 inches (57 mm) diameter front and back sealed dual ball bearing wheels and adjustable low-friction plastic side stabilizer guide pads.
3. Platform: Totally enclosed side walls consisting of 1 inch (25.4 mm) tubular framing and sheet metal siding.
4. Under Carriage Safety: Totally enclosed bottom formed steel safety pan.
5. Finish: E-coated platform and landing gate parts; exterior grade powder coat paint.

N. Enclosure Construction:
   1. Main Frame: Welded steel tubular guide construction with formed sheet steel guarding.
   2. Enclosure Panels: 3/16 inch clear Plexiglass
   3. Height above Upper Landing: 83 inches Minimum.
   4. Enclosure Dome:
   5. Ventilation System: Thermostatically controlled fans.
   6. Outdoor Protection: Lift shall include modifications recommended by manufacturer for reliable performance in outdoor climate of project site.
   7. Finish: E-coated, exterior grade powder coat painted metal components.

O. Operation:
   1. Limit Switches: Adjustable upper and lower limit switches; upper and lower final limit switches.
   2. Manual Lower Device: Manual hand crank to lower device; access to adaptive shaft via safety interlocked top cap
   3. Doors: Mechanical interlock which releases door only when platform is at door landing location. Electronic sensors shall prevent lift from operation unless door is closed with call/send rocker and switch/paddle controls.
   4. Telephone kit: ADA compliant with battery backup.
   5. Battery package upgrade (optional): 34 AH battery package.
   6. Cold-weather package: For operating temperatures below 20 degree F (-7 degree C).
   7. Pit switch.

P. Safety Devices and Features
   1. Grounded Electrical System.
   2. At all landings: Solenoid activated interlock with electronic interlock which releases door only when platform is at door landing; electronic sensors stop platform from operating unless door is closed.
   3. Electrical disconnect shall shut off power to the lift.
   4. System shall be outfitted to automatically de-energize/disconnect electric power in the event of floor water intrusion to the shaft way.

PART 3 EXECUTION

3.1 EXAMINATION

A. For enclosed applications, do not begin installation until hoistway has been properly prepared. Verify that hoistway spaces are of correct size and within tolerances.

B. Verify required landings and openings are of correct size and within tolerances.

C. Verify site dimensions are of correct size and within tolerances and clearances have been maintained and meet local regulations.

D. Verify electrical rough-in is at correct location.

E. Do not begin installation until substrates have been properly prepared.

F. If substrate preparation is the responsibility of another installer, notify Architect of

unsatisfactory preparation before proceeding.

3.2 SITE PREPARATION

A. The following is a list of general operations designed to prepare the job site for installation of the vertical wheelchair lift in and enclosed shaft way. This list is provided as a guide to help the installer. For a complete list of requirements check the installation site's applicable local codes.

1. Electrical Requirements: DC battery-powered units: use a GFI 120V, 15A, 60Hz single phase circuit to operate the internal battery charger (charge draws 3A max.). National Electrical Code requires a GFI is used in all outdoor or wet environment applications.
2. Platform Pathway Requirements: Make sure the pathway that the platform runs in is clear of any electrical conduit and wire ways. Make sure no liquids, steam or gas piping discharge into the pathway, and make sure that there is sufficient headroom clearance (minimum of 80 inches [2032 mm]) throughout floor-to-floor travel.
3. Floor Recommendations: 4 inches (102 mm) thick, 3500 PSI minimum compressive strength, reinforced concrete slab. Refer to technical drawings for minimum slab dimensions. If the temperature can fall below freezing, an insulation sheet between the concrete slab and the compacted subgrade shall be used.
4. Pit requirements: 3 inches maximum (gate/door will not open if pit is over 3 inches).
5. Floor Attachment: Meet all manufacturer requirements; At a minimum the Vertical Wheelchair Lift shall be fastened to concrete slab using four 1/2 inch (3/8 inch bolt) x minimum 2-1/2 inches long concrete anchors suitable for the environment. Follow selected concrete anchor manufacturer's guidelines and applicable codes.
6. Housing Attachment in Hoistway: Meet all manufacturer requirements; at a minimum use 5/16-18 tapped holes on tower frame work to fasten the tower housing to a vertical wall near or above the upper landing (200 lb/91 kg wall loading). Mounting brackets are supplied with unit. Housing shall remain intact.
7. Top Gate Attachment: As required by manufacturer.
8. Lower Landing Gate Attachment (3-Gate): As required by manufacturer.
9. Platform-to-Top Landing Sill Clearance: Meet ASME 18.1 code requirements. The platform floor-to-sill clearance at the upper landing to not be less than 3/8 inch (9.5 mm) nor exceed 3/4 inch (19 mm). Follow applicable local codes.
10. Fascia Wall Requirements: Meet ASME 18.1 code requirements. Fascia shall be smooth and non-perforated that guards the full length and width of the platform. The fascia shall be securely fastened from the upper landing sill down to the lower landing sill. It shall be able to withstand a 125-pound side load over any 4-inch square area. Follow applicable local codes.

3.3 PREPARATION

A. Clean surfaces 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.

3.4 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

3.5 FIELD QUALITY CONTROL

A. Perform tests in compliance with ASME A18.1 and as required by authorities having jurisdiction.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 22 05 17

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

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. Sleeves.
2. Stack-sleeve fittings.
3. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Provide data on sleeves, fittings, and accessories. Provide manufacturer's catalog information.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

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. Smith, Jay R. Mfg. Co.
2. Zurn Industries, LLC.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Where required for project work Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

C. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.

2. Install sleeves that are large enough to provide adequate annular clear space between sleeve and pipe or pipe insulation for installation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

D. Fire-Barrier Penetrations: Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing.
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07 84 13 "Penetration Firestopping."

END OF SECTION

SECTION 22 05 18

ESCUTCHEONS FOR PLUMBING PIPING

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. Escutcheons.
2. Floor plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Provide data on escutcheons and floor plates. Provide manufacturer's catalog information.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
g. Bare Piping in Equipment Rooms: One-piece, stamped steel type.

2. Escutcheons for Existing Piping:

a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
e. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.
f. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 220523

VALVES FOR PLUMBING PIPING

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. Bronze angle valves.
   2. Bronze globe valves.
   3. Bronze ball valves.
   4. Bronze lift check valves.
   5. Bronze swing check valves.
   6. Bronze gate valves.
   7. Lubricated plug valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.
B. EPDM: Ethylene propylene-diene terpolymer rubber.
C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
D. NRS: Nonrising stem.
E. OS&Y: Outside screw and yoke.
F. RS: Rising stem

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.
   1. Certification that products comply with NSF 61 Annex G and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, and soldered ends.
   3. Set ball valves open to minimize exposure of functional surfaces.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Apollo Valves; Conbraco Industries, Inc.
   b. Crane; Crane Energy Flow Solutions.
   c. Homestead Valve, A Division of Olson Technologies Inc.
   d. Milwaukee Valve Company.
   e. NIBCO INC.
   f. Watts; a Watts Water Technologies company.
   g. Zurn Industries, LLC

C. ASME Compliance:
   1. ASME B1.20.1 for threads for threaded end valves.
   2. ASME B16.1 for flanges on iron valves.
   3. ASME B16.5 for flanges on steel valves.
   4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
   5. ASME B16.18 for solder-joint connections.
   6. ASME B31.9 for building services piping valves.

D. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.

E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Actuator Types:
   1. Handlever: For quarter-turn valves smaller than NPS 4 (DN 100).

I. Valves in Insulated Piping:
   1. Include 2-inch (50-mm) stem extensions.
   2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
   3. Memory stops that are fully adjustable after insulation is applied.

J. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE ANGLE VALVES

A. Class 125 Bronze Angle Valves:
   1. Description: Standard MSS SP-80 Type 1, CWP Rated 200 psig (1380 kPa).
      a. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
      b. Ends: Threaded.
      c. Stem and Disc: PTFE.
      d. Packing: Asbestos free.
      e. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 150 Bronze Angle Valves:
   1. Description: Standard MSS SP-80 Type 1, CWP Rated 300 psig (2070 kPa).
      a. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
      b. Ends: Threaded.
      c. Stem and Disc: PTFE.
      d. Packing: Asbestos free.
      e. Handwheel: Malleable iron, bronze, or aluminum.

2.3 BRONZE GLOBE VALVES

A. Class 125 Bronze Globe Valves:
   1. Description: Standard MSS SP-80 Type 1 with CWP Rating of 200 psig (1380 kPa). ASTM B62, bronze body with intergral seat and screw in bonnet.
      a. Ends: Threaded.
      b. Stem and Disc: Bronze.
      c. Packing: Asbestos free.
      d. Handwheel: Malleable iron, bronze, or aluminum.

2.4 BRONZE BALL VALVES

A. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim:
   1. Description: Standard MSS SP-110 with CWP Rating of 600 psig (4140 kPa). Two piece body of bronze material
      a. Ends: Threaded and soldered.
      b. Seats: PTFE.
      c. Stem: Bronze or brass.
      d. Ball: Chrome-plated brass.
      e. Port: Full.

2.5 BRONZE CHECK VALVES

A. Class 125, Lift Check Valves with Nonmetallic Disc:
   1. Description: Standard MSS SP-80, Type 2 with CWP Rating of 200 psig (1380 kPa).
      a. Body Design: Vertical flow.
      b. Body Material: ASTM B 61 or ASTM B 62, bronze.
      c. Ends: Threaded or soldered. See valve schedule articles.

d. Disc: NBR, PTFE.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:
1. Description: Standard MSS SP-80, Type 4 with CWP Rating of 200 psig (1380 kPa).
a. Body Design: Horizontal flow.
b. Body Material: ASTM B 62, bronze.
c. Ends: Threaded or soldered. See valve schedule articles.
d. Disc: PTFE.

2.6 BRONZE GATE VALVES

A. Class 125, NRS, Bronze Gate Valves:
1. Description: Standard MSS SP-80, Type 1 with CWP Rating of 200 psig (1380 kPa)
a. Body Material: Bronze with integral seat and screw-in bonnet.
b. Ends: Threaded or solder joint.
c. Stem: Bronze.
d. Disc: Solid wedge; bronze.
e. Packing: Asbestos free.
f. Handwheel: Malleable iron, bronze, or aluminum.

2.7 LUBRICATED PLUG VALVES

A. Class 125, Lubricated Plug Valves with Threaded or Flanged Ends:
1. Description: Standard MSS SP-78, Type I single gland
a. NPS 2-1/2 to NPS 4 (DN 65 to DN 100), CWP Rating: 200 psig (1380 kPa).
b. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
c. Pattern: Regular or short venturi.
d. Plug: Cast iron or bronze with sealant groove.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.
   2. Lift Check Valves: With stem upright and plumb.

F. Install valve tags.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. Use gate valves for shutoff service only.

B. If valve applications are not indicated, use the following:
   1. Throttling Service except Steam: Globe valves.

C. Pump-Discharge Check Valves: If valve applications are not indicated, use the following;
   1. NPS 2 (DN 50) and Smaller: Bronze swing check valves with nonmetallic disc.

D. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

E. Select valves with the following end connections:
   1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
   2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   3. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:
   1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.

2. Two-piece, bronze ball valves with full port and bronze or brass trim.

B. Pipe NPS 2 (DN 50) and Smaller: Bronze gate valves, Class 125, NRS with soldered or threaded ends.

3.5 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller: Bronze globe valves, Class 125, bronze disc, with threaded ends.

END OF SECTION 220523

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND 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. Section Includes:

1. Metal pipe hangers and supports.
2. Fiberglass pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for the following; include Product Data for the components:

1. Hangers.
2. Equipment supports.
3. Guides

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 1, steel pipe hanger except hanger is made of fiberglass or fiberglass-reinforced resin.
2. Hanger Rods: Continuous-thread rod, washer, and nuts made of stainless steel.

B. Strap-Type, Fiberglass Pipe Hangers:

1. Shall not be used.

2.3 THERMAL-HANGER SHIELD INSERTS

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. National Pipe Hanger Corporation.
2. Pipe Shields Inc.
3. Piping Technology & Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:
1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1 inch.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.5 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
15. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
16. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
17. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

18. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
10. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

11. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
12. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

13. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

P. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

Q. Maximum hanger spacing as indicated:

Piping Material	**Maximum Horizontal Spacing (ft)**	**Maximum Vertical Spacing (ft)**
Cast iron	5	15
Copper or copper alloy	12	10
PEX	2.5	10
CPVC (1 inch and smaller)	3	10
PVC	4	10

END OF SECTION

SECTION 22 05 33

HEAT TRACING FOR PLUMBING PIPING

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 plumbing piping heat tracing for freeze prevention on the house's water service riser and the house's sanitary service riser. The plumbing piping heat tracing system shall be a self-regulating parallel resistance type

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
2. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

B. Shop Drawings: For electric heating cable.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

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. Chromalox, Inc.
2. Delta-Therm Corporation.
3. Nelson Heat Trace.
4. Raychem; Tyco Thermal Controls.
5. Thermon Americas Inc.
6. Trasor Corp.

B. Comply with IEEE 515.1.

C. Heating Element: Pair of parallel No. 16 AWG, tinned or nickel-coated, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating. Self-regulating heating cable shall be designed for a useful life of 20 years or more with “power on” continuously

D. Electrical Insulating Jacket: Flame-retardant polyolefin.

E. Cable Cover: Tinned-copper braid and polyolefin outer jacket with ultraviolet inhibitor.

F. Maximum Operating Temperature (Power On): 150 deg F.

G. Maximum Exposure Temperature (Power Off): 185 deg F.

H. 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.

I. Capacities and Characteristics for Water Service:

1. Maximum Heat Output: 10 W/ft.
2. Piping Diameter: Copper Water Service Piping
3. Number of Parallel Cables: 2.
4. Spiral Wrap Pitch: Pitch sufficient to encase one revolution of pipe per one vertical/linear foot rise/run.

5. Electrical Characteristics for Single-Circuit Connection:

    a. Volts: 120.
    b. Phase: Single.
    c. Hertz: 60.

J. Capacities and Characteristics for Sanitary Service:

1. Maximum Heat Output: 10 W/ft.
2. Piping Diameter: Sanitary Service Piping
3. Number of Parallel Cables: 2.
4. Spiral Wrap Pitch: Pitch sufficient to encase one revolution of pipe per one vertical/linear foot rise/run.
5. Electrical Characteristics for Single-Circuit Connection:

    a. Volts: 120.
    b. Phase: Single.
    c. Hertz: 60.

2.2 CONTROLS

A. Pipe-Mounted Thermostats for Freeze Protection:

1. Remote bulb unit with adjustable temperature range from 30 to 50 deg F.
2. Snap action; open-on-rise, single-pole switch with minimum current rating adequate for connected cable.
3. Remote bulb on capillary, resistance temperature device, or thermistor for directly sensing pipe-wall temperature.
4. Corrosion-resistant, waterproof control enclosure.

B. Programmable Timer for Domestic Hot-Water-Temperature Maintenance:

1. Microprocessor based.
2. Minimum of four separate schedules.
3. Minimum 24-hour battery carryover.
4. On-off-auto switch.
5. 365-day calendar with 20 programmable holidays.
6. Relays with contacts to indicate operational status, on or off, and for interface with central HVAC control-system workstation.

2.3 ACCESSORIES

A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.

B. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.

1. Width for Markers on Pipes with OD, including insulation, less than 6 inches: 3/4 inch minimum.
2. Width for Markers on Pipes with OD, including insulation, 6 inches or larger: 1-1/2 inches minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Install the following types of electric heating cable for the applications described:
1. Freeze Protection for Piping: Self-regulating, parallel-resistance heating cable.
2. Temperature Maintenance for Domestic Hot Water: Self-regulating, parallel-resistance heating cable.

3.3 INSTALLATION

A. Install electric heating cable across expansion, construction, and control joints according to manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.

B. Electric Heating-Cable Installation for Freeze Protection for Piping:

1. Install electric heating cables after piping has been tested and before insulation is installed.
2. Install electric heating cables according to IEEE 515.1.
3. Install insulation over piping with electric cables according to Section 22 07 19 "Plumbing Piping Insulation."
4. Install warning tape on piping insulation where piping is equipped with electric heating cables.

C. Electric Heating-Cable Installation for Temperature Maintenance for Domestic Hot Water:

1. Install electric heating cables after piping has been tested and before insulation is installed.
2. Install insulation over piping with electric heating cables according to Section 22 07 19 "Plumbing Piping Insulation."
3. Install warning tape on piping insulation where piping is equipped with electric heating cables.

D. Set field-adjustable switches and circuit-breaker trip ranges.

3.4 CONNECTIONS

A. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections:

1. Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.
2. Test cables for electrical continuity and insulation integrity before energizing.
3. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.

D. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounted cables.

E. Cables will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed heating cables, including nonheating leads, from damage during construction.

B. Remove and replace damaged heat-tracing cables.

END OF SECTION

SECTION 22 07 19

PLUMBING PIPING INSULATION

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 insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Sanitary waste piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail application of field-applied jackets.

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   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. Pittsburgh Corning Corporation.
   2. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
   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. Aeroflex USA, Inc.
      b. Armacell LLC.
      c. K-Flex USA.

H. Mineral-Fiber, Preformed Pipe Insulation:
   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. Knauf Insulation.
      b. Manson Insulation Inc.
      c. Owens Corning.
   2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

   1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

E. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

F. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

G. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

   1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
   1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F.
   3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
   4. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
   1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F.
   3. Solids Content: 60 percent by volume and 66 percent by weight.
   4. Color: White.

2.5 SEALANTS

A. Sealant Manufacturers

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. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.
    c. Foster Brand; H. B. Fuller Construction Products.
    d. Mon-Eco Industries, Inc.
    e. Pittsburgh Corning Corporation.

B. Joint Sealants:
    1. Materials shall be compatible with insulation materials, jackets, and substrates.
    2. Permanently flexible, elastomeric sealant.
    3. Service Temperature Range: Minus 100 to plus 300 deg F.
    4. Color: White or gray.
    5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. FSK and Metal Jacket Flashing Sealants:
    1. Materials shall be compatible with insulation materials, jackets, and substrates.
    2. Fire- and water-resistant, flexible, elastomeric sealant.
    3. Service Temperature Range: Minus 40 to plus 250 deg F.
    4. Color: Aluminum.
    5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
    1. Materials shall be compatible with insulation materials, jackets, and substrates.
    2. Fire- and water-resistant, flexible, elastomeric sealant.
    3. Service Temperature Range: Minus 40 to plus 250 deg F.
    4. Color: White.
    5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

    1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
    2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
    3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Johns Manville; a Berkshire Hathaway company.
      b. P.I.C. Plastics, Inc.
      c. Proto Corporation.
      d. Speedline Corporation.
   2. Adhesive: As recommended by jacket material manufacturer.
   3. Color: White.
   4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
      a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
C. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Pittsburgh Corning Corporation.
      b. Polyguard Products, Inc.

2.9 TAPES

A. Manufacturers of tapes may include the following

   1. Subject to compliance with requirements, provide products by one of the following:
      a. Avery Dennison Corporation, Specialty Tapes Division.
      b. Compac Corporation.
      c. Ideal Tape Co., Inc,; an American Biltrite company.
      d. Knauf Insulation.
      e. Venture Tape.

B. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Width: 3 inches.
   2. Thickness: 11.5 mils.
   3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

C. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

D. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

E. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

2.10 SECUREMENTS

A. Bands:
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. ITW Insulation Systems; Illinois Tool Works, Inc.
   b. RPR Products, Inc.
2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, galvanized steel.
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. C & F Wire.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

   a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges, Fittings, Elbows, Valves and Pipe Specialties:

1. Install preformed pipe insulation to outer diameter of pipe flange, as straight segments of pipe insulation when available over pipe fittings and elbows, and preformed sections to valve bodies. Use mitered sections of insulation if preformed sections are not available. Secure according to manufacturer's written instructions.
2. Make width of insulation section same as overall width of flange and bolts, fittings, elbows, valves and pipe specialties, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
5. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges, Pipe Fittings, Elbows, Valves, and Pipe Specialties:

1. Install pipe insulation to outer diameter of piping component where appropriate.
2. Install mitered sections of pipe insulation where preformed sections are not available.
3. Where preformed sections are not available for valves; Install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Make width of insulation section same as overall width of flange and bolts, fittings, elbows, valves and pipe specialties, plus twice the thickness of pipe insulation.
5. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
6. Secure insulation to flanges, fittings, elbows, valves, and pipe specialties. Seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges, Pipe Fittings, Elbows, Valves, and Pipe Specialties:

1. Install preformed pipe insulation to outer diameter of pipe flange, as straight segments of pipe insulation when available over pipe fittings and elbows, and preformed sections to valve bodies.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
5. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
6. When preformed insulation for elbows, fittings, valves, and pipe specialities are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.10 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by MCA. Vary first and second coats to allow visual inspection of the completed Work.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by MCA, by removing field-applied jacket and insulation in layers in reverse order of their installation.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Flexible Elastomeric: 1 inch thick.

c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Flexible Elastomeric: 1 inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Sanitary Waste Piping Where Heat Tracing Is Not Installed:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 2 inches thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3.14 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Domestic Water Piping Where Heat Tracing Is or Is not Installed:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 2 inches thick.
b. Flexible Elastomeric: 2 inches thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

B. Sanitary Waste Piping Where Heat Tracing Is or Is not Installed:

1. All Pipe Sizes: Insulation shall be one of the following:

a. Cellular Glass: 2 inches thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3.15 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Sanitary Waste Piping, All Sizes, Where Heat Tracing Is Installed:
1. All Pipe Sizes:
a. Cellular glass, 2 inches thick.
b. Flexible Elastomeric: 2 inches thick.

3.16 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:
   1. No Jacket Required.

D. Piping, Exposed:
   1. PVC: 20 mils thick.

3.17 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:
   1. PVC: 30 mils thick.
   2. Other Jacket Type acceptable to MCA.

D. Piping, Exposed:
   1. PVC: 30 mils thick.
   2. Other Jacket Type acceptable to MCA.

3.18 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION

SECTION 22 11 13

FACILITY WATER DISTRIBUTION PIPING

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. Regional Water Authority 'Rules and Regulations for Water Service' latest edition.

1.2 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for water service, fire service mains, and combined water service/fire service mains. The Regional Water Authority (hereinafter referred to as "Water Company") has authority for the water service for this site and will provide water meters if needed. The Water Company will issue final approval on any water main design prior to construction.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation. Contractor is required to coordinate installation by utility company.

C. If the size of the existing service pipe or its location or characteristics going to be changed, then the Contractor needs to a apply for a new or modified service must be filed with the Water Company. The Contractor is responsible for obtaining a new or modified service with the Water Company. All costs for the service change are the responsibility of the Contractor including the Water Company's portion of the service and disconnection of the old service.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Shop Drawings shall be submitted for the following:
   1. Pipe and Fittings
   2. Valves
   3. Vaults
   4. Pits
   5. Enclosures

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

B. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Water valves and specialties to include in an emergency, operation, and maintenance manuals.

B. As Built Drawings: Upon completion and acceptance of work,

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

F. NSF Compliance:
1. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.

2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use hand wheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify MCA no fewer than 3 days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without MCA's written permission.

1.9 COORDINATION

A. Coordinate connection to water main with utility company.

B. The size shall be approved by the Water Company.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Service pipes need to be minimum of 1 inch in diameter and must be of Type L hard drawn copper tubing. The material must conform to the latest revision standard specification for seamless copper water tube, ASTM B88.

B. Fittings for underground copper service pipe should be flared or Iron Pipe Size (I.P.S.) thread connections only, and conform to the latest revision of AWWA Standard C800.

C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

D. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.2 JOINING MATERIALS

A. Brazing Filler Metals: AWS A5.8, BCuP Series copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.3 PIPING SPECIALTIES

A. Nonfreeze Wall Hydrants
   1. Standard: ASME A112.21.3M for exposed outlet, self-draining wall hydrants.
   2. Pressure Rating: 125 psig (860 kPa).
   3. Operation: Loose key.
   4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
   5. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25) or match existing.
   6. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
   7. Nozzle and Wall-Plate Finish: Match Existing

B. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

C. Tubular-Sleeve Pipe Couplings:
   1. Manufacturers: Subject to compliance with requirements, provide products approved by the Authorizing water utility company.
   2. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined approved by the Authorizing water utility company.

D. Split-Sleeve Pipe Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products approved by the Authorizing water utility company.
2. Description: Metal, bolted, split-sleeve-type, reducing or transition coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners approved by the Authorizing water utility company.

E. Flexible Connectors:
1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.
2. Ferrous-Metal Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.

F. Dielectric Fittings: Combination of copper alloy and ferrous; threaded, solder, or plain end types; and matching piping system materials.
1. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material that isolates dissimilar metals and ends with inside threads according to ASME B1.20.1.
2. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure to suit system pressures.
3. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
   a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.
4. Dielectric Couplings: Galvanized-steel couplings with inert and noncorrosive thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F.
5. Dielectric Nipples: Electroplated steel nipples with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types, and 300-psig minimum working pressure at 225 deg F.

2.4 CORROSION-PROTECTION PIPING ENCASEMENT

A. Encasement for Underground Metal Piping:

1. Standards: ASTM A 674 or AWWA C105.
2. Form: Tube.
3. Material shall be one of the following:
   a. LLDPE film of 0.008-inch (0.20-mm) minimum thickness.
   b. LLDPE film of 0.008-inch (0.20-mm) minimum thickness, or high-density, crosslaminated PE film of 0.004-inch (0.10-mm) minimum thickness.
   c. High-density, crosslaminated PE film of 0.004-inch (0.10-mm) minimum thickness.
4. Color: Natural.

2.5 VALVES

A. Curb Valves
1. Curb valves 2 inches and smaller should be Teflon (PTFE) coated ball type without drain and 90° stops. Brass components should conform to the latest revision of AWWA Standard C800/ASTM B-62 (85-5-5-5).
2. Curb valves 4 inches and larger should be resilient seated, fusion bond-ed, epoxy coated M.J. gate valves and should open right (clockwise). Valves should conform to the latest revision of AWWA Standard C-509. Interior and exterior fusion bonded epoxy coating should conform to the latest revision of AWWA Standard C-550.
3. Buried valves must have a 2 inch square operating nut.

B. Service Valves
1. Service valves 2 inches and smaller should be PTFE coated ball type, without drain, furnished with locking provision and integral meter saddles as approved by the Authorizing water utility company. Brass components should conform to the latest revision of AWWA Standard C800/ASTM B62 (85-5-5-5). The use of gate valves is prohibited.
2. Service valves 4 inches and larger should be resilient seated, fusion bonded, epoxy coated flanged gate valves and should open right (clockwise). Valves should conform to the latest revision of AWWA Standard C-509. Interior and exterior fusion bonded epoxy coating should conform to the latest revision of AWWA Standard C-550. Non-buried service valves will have an operating wheel.
3. Outside stem and yoke (OS & Y) valves are required on fire services 4 inches and larger.

C. Curb Boxes
1. Curb boxes for 1 inch and 1-1/4 inch curb valves must be of the Buffalo Screw Type with 3 inch diameter shaft. Whenever a curb box is exposed to vehicular traffic, it must be of the Roadway Type.
2. Curb boxes for 1-1/2 inch through 2-1/2 inch curb valves should be of the Roadway Screw Type with 4-1/4 inch diameter shaft.
3. Curb boxes for larger than 2-1/2 inch curb valves should be of the Buffalo Type with 5-1/4 inch diameter shaft.
4. All curb boxes should be of cast iron and fitted with a cast iron cover marked with the word “WATER” and installed with the cover flush with the finished grade.
5. Plastic curb boxes and curb box covers are prohibited.

2.6 GATE VALVES

A. Bronze Gate Valves:
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. Crane; Crane Energy Flow Solutions.
   b. Zurn Industries, LLC.
2. OS&Y, Rising-Stem Gate Valves:
   a. Description: Bronze body and bonnet and bronze stem.

1) Standards: UL 262 and FMG approved.
2) Minimum Pressure Rating: 175 psig (1207 kPa).
3) End Connections: Threaded.

3. Nonrising-Stem Gate Valves:
   a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.
      1) Standard: MSS SP-80.

2.7 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Description: Sleeve and valve compatible with drilling machine.
   a. Standard: MSS SP-60.
   b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
   c. Valve: AWWA, cast-iron, nonrising-stem, metal-seated gate valve with one raised face flange mating tapping-sleeve flange.
2. Manufacturers: Subject to compliance with requirements approved by the authorizing local water utility company.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches (125 mm) in diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.8 CHECK VALVES

A. AWWA Check Valves:
1. Description: Swing-check type with resilient seat. Include interior coating according to AWWA C550 and ends to match piping.
   a. Standard: AWWA C508.
   b. Pressure Rating: 175 psig (1207 kPa).

B. UL/FMG, Check Valves:
1. Manufacturers: Subject to compliance with requirements approved by the Authorizing water utility company.
2. Description: Swing-check type with pressure rating; rubber-face checks, unless otherwise indicated; and ends matching piping.
   a. Standards: UL 312 and FMG approved.

3. Pressure Rating: 175 psig.

2.9 DETECTOR CHECK VALVES

A. Detector Check Valves:

1. Description: Galvanized cast-iron body, bolted cover with air-bleed device for access to internal parts, and flanged ends. Include one-piece bronze disc with bronze bushings, pivot, and replaceable seat. Include threaded bypass taps in inlet and outlet for bypass meter connection. Set valve to allow minimal water flow through bypass meter when major water flow is required.

   a. Standards: UL 312 and FMG approved.
   b. Pressure Rating: 175 psig (1207 kPa).
   c. Water Meter: AWWA C700, disc type, at least one-fourth size of detector check valve. Include meter, bypass piping, gate valves, check valve, and connections to detector check valve.

2. Description: Iron body, corrosion-resistant clapper ring and seat ring material, flanged ends, with connections for bypass and installation of water meter.

   a. Standards: UL 312 and FMG approved.
   b. Pressure Rating: 175 psig (1207 kPa).

2.10 BUTTERFLY VALVES

A. AWWA Butterfly Valves:
   1. Description: Rubber seated.

      a. Standard: AWWA C504.
      b. Body: Ductile iron.
      c. Body Type: Flanged.
      d. Pressure Rating: 150 psig (1035 kPa).

B. UL Butterfly Valves:
   1. Description: Metal on resilient material seating.

      a. Standards: UL 1091 and FMG approved.
      b. Body: Ductile iron.
      c. Body Type: Flanged.
      d. Pressure Rating: 175 psig (1207 kPa).

2.11 PLUG VALVES

A. Plug Valves:
   1. Description: Resilient-seated eccentric.

a. Standard: MSS SP-108.
b. Body: Cast iron.
c. Pressure Rating: 175-psig (1207-kPa) minimum CWP.
d. Seat Material: Suitable for potable-water service.

2.12 WATER METERS

A. Coordinate with the Water Company on the water meter requirements. Meters one and one-half inch and larger shall be provided with a valve bypass to allow for repair or removal of the meter without interruption of service.

B. Valves shall be installed on both sides of every water meter. The valves shall be ball valves with iron pipe threaded connections or the meter system shall be installed in a department approved meter setter.

2.13 PRESSURE-REDUCING VALVES

A. Water Regulators:
1. Standard: ASSE 1003.
2. Pressure Rating: Initial pressure of 150 psig (1035 kPa).
3. Body: Bronze with chrome-plated finish for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).
4. Valves for Booster Heater Water Supply: Include integral bypass.
5. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).

B. Water Control Valves:
1. Description: Pilot-operation, diaphragm-type, single-seated main water control valve with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot control valve, restrictor device, specialty fittings, and sensor piping.
   a. Pressure Rating: Initial pressure of 150 psig (1035 kPa) minimum.
   b. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless-steel body.
      1) Pattern: Globe-valve design.
      2) Trim: Stainless steel.
   c. Design Flow Rate: As appropriate for the application
   d. Design Inlet Pressure: As appropriate for the application
   e. Design Outlet Pressure Setting: As appropriate for the application
   f. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.

2.14 RELIEF VALVES & VACUUM BREAKERS

A. Coordinate with local utility company and authorities having jurisdiction for installation and/or modification of any relief valves

2.15 BACKFLOW PREVENTERS

A. Backflow preventers shall be used on all potable and fire services.

B. Coordinate with Water Company and authorities having jurisdiction for installation and/or modification of any backflow preventers

C. Backflow prevention device (BFP) shall be type approved by the State Health Department.

2.16 WATER METER PIT

A. Description: Polymer-concrete body with lettering “WATER” in cover; and with slotted, open-bottom base section of length to fit over service piping. Meet loading requirement of water company or H-20 rating.

2.17 ALARM DEVICES

A. Alarm Devices, General: UL 753 and FMG approved, of types and sizes to mate and match piping and equipment.

B. Water-Flow Indicators: Vane-type water-flow detector, rated for 250-psig (1725-kPa) working pressure; designed for horizontal or vertical installation; with 2 single-pole, double-throw circuit switches to provide isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal when cover is removed.

C. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.

D. Pressure Switches: Single pole, double throw; designed to signal increase in pressure.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping shall be Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

F. Water Meter Box Water-Service Piping NPS 3/4 to NPS 2 (DN 20 to DN 50) shall be same as underground water-service piping.

G. Aboveground and Vault Water-Service Piping shall be Hard copper tube, ASTM B 88, Type L; wrought copper, solder-joint fittings: and brazed joints.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 (DN 50) and smaller installation.

B. Additional requirements:

1. Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast-iron, nonrising-stem, metal-seated gate valves with valve box.
2. Underground Valves, NPS 4 (DN 100) and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
3. Use the following for valves in vaults and aboveground:
   a. Gate Valves, NPS 2 (DN 50) and Smaller: PTFE coated ball type, without drain, furnished with locking provision and integral meter saddles as approved by the Authorizing water utility company.
   b. Gate Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, OS&Y rising stem, metal seated AWWA, cast iron, OS&Y rising stem, resilient seated UL/FMG, cast iron, OS&Y rising stem.
   c. Check Valves: AWWA C508 or UL/FMG, swing type.
4. Pressure-Reducing Valves: Use for water-service piping in vaults and aboveground to control water pressure.
5. Relief Valves: Use for water-service piping in vaults and aboveground.
   a. Air-Release Valves: To release accumulated air.
   b. Air/Vacuum Valves: To release or admit large volume of air during filling of piping.
   c. Combination Air Valves: To release or admit air.
6. Detector Check Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

3.4 PIPING INSTALLATION

A. Bury piping with depth of cover over top at least 48 inches (1220 mm), with top at least 12 inches (300 mm) below level of maximum frost penetration, and according to the following:

1. Under Driveways: With at least 48 inches (1220 mm) cover over top.
2. Under Railroad Tracks: With at least 48 inches (1220 mm) cover over top.
3. In Loose Gravelly Soil and Rock: With at least 12 inches (300 mm) additional cover.

B. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

C. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations to match existing service entrances.

D. Sleeves are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

E. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

F. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.5 JOINT CONSTRUCTION

A. Install copper piping with wrought-copper, solder-joint fittings; and brazed joints.

B. Make pipe joints according to the following:
1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
   a. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric unions.

3.6 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.

B. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.

E. MSS Valves: Install as component of connected piping system.

F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

G. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves. Install full-size valved bypass.

H. Relief Valves: Comply with AWWA C512. Install aboveground with shutoff valve on inlet.

3.8 DETECTOR-CHECK VALVE INSTALLATION

A. Install in vault or aboveground.

B. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.

C. Support detector check valves, meters, shutoff valves, and piping on brick or concrete piers.

3.9 WATER METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written instructions.

B. Meet AWWA requirements.

3.10 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

3.11 VACUUM BREAKER ASSEMBLY INSTALLATION

A. Install pressure vacuum breaker assemblies of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install pressure vacuum breaker assemblies in vault or other space subject to flooding.

3.12 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

D. Support NPS 2-1/2 (DN 65) and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.13 WATER METER BOX INSTALLATION

A. Install water meter boxes in paved areas flush with surface.

B. Install water meter boxes in grass or earth areas with top 2 inches (50 mm) above surface.

3.14 ALARM DEVICE INSTALLATION

A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.

B. Supervisory Switches: Supervise valves in open position.

1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.

C. Locking and Sealing: Secure unsupervised valves as follows:

1. Valves: Install chain and padlock on open OS&Y gate valve.
2. Post Indicators: Install padlock on wrench on indicator post.

D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.

E. Water-Flow Indicators: Install in water-service piping in vault. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.

3.15 CONNECTIONS

A. Make connections for copper water service piping with wrought-copper, solder-joint fittings; and brazed joints

B. Connect water-distribution piping to existing water service lateral. Use service clamp and corporation valve.

C. Connect water-distribution piping to interior domestic water piping.

D. Ground equipment in accordance with local utility company requirements and as required by authorities having jurisdiction.

3.16 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig (0 kPa). Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.17 IDENTIFICATION

A. Warning tape will be metalized plastic, blue in color, a minimum of 4 inches in width and have the words “CAUTION - WATER LINE BURIED BELOW” imprinted on it in black letters.

B. Trace wire will be made of Copper 18 gauge.

3.18 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION

SECTION 22 11 16

DOMESTIC WATER PIPING

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. Aboveground domestic water pipes, tubes, and fittings inside buildings.
2. Encasement for piping.

B. Related Requirements:

1. Section 22 11 13 "Facility Water Distribution Piping" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Shop Drawings shall be submitted for the following:
1. Pipe and Fittings
2. Valves
3. Piping Layouts

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

1.5 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify MCA no fewer than 3 days in advance of proposed interruption of service.

1.6 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

D. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

E. Copper Pressure-Seal-Joint Fittings:
1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

F. Copper Push-on-Joint Fittings:
1. Description:

a. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
b. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
1. Standard: ASSE 1079.
2. Pressure Rating: 125 psig minimum at 180 deg F .
3. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Standard: ASSE 1079.
2. Factory-fabricated, bolted, companion-flange assembly.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
1. Nonconducting materials for field assembly of companion flanges.
2. Pressure Rating: 150 psig.
3. Gasket: Neoprene or phenolic.
4. Bolt Sleeves: Phenolic or polyethylene.
5. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:
1. Standard: IAPMO PS 66.
2. Electroplated steel nipple complying with ASTM F 1545.
3. Pressure Rating and Temperature: 300 psig at 225 deg F.
4. End Connections: Male threaded or grooved.
5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Prior to installation the contractor shall supply drawing plans, schematics, and diagrams to indicate the general location and arrangement of domestic water piping. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install underground copper tube and ductile-iron pipe in PE encasement according to ASTM A 674 or AWWA C105/A21.5.

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."

D. Install shutoff valve immediately upstream of each dielectric fitting.

E. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 "Domestic Water Piping Specialties."

F. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

H. Install seismic restraints on piping if required.

I. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

J. 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.

K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

L. Install piping to permit valve servicing.

M. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

N. Install piping free of sags and bends.

O. Install fittings for changes in direction and branch connections.

P. Install PEX piping with loop at each change of direction of more than 90 degrees.

Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

R. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump.

S. Install sleeves for piping penetrations of walls, ceilings, floors, concrete walls, and slabs. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Push-on Joints for Copper Tubing: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.

H. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

I. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

J. Joints for PEX Piping: Join according to ASTM F 1807.

K. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Install supports for vertical stainless-steel piping every 15 feet.

G. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.

H. Install hangers for vertical PEX piping every 48 inches.

I. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. Complete testing with diagram of portion of piping tested.

c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

   a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
   b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Under-building-slab, domestic water, building-service piping, Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

B. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; copper, solder-joint fittings; and soldered joints.

3.13 VALVE SCHEDULE

A. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION

SECTION 221119

DOMESTIC WATER PIPING SPECIALTIES

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. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers.
7. Outlet boxes.
8. Hose bibbs.
9. Wall hydrants.
10. Drain valves.
11. Water-hammer arresters.
12. Air vents.
13. Flexible connectors.
14. Water meters.

B. Related Requirements:
1. Section 221116 "Domestic Water Piping".

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

B. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa unless otherwise indicated.

2.2 BACKFLOW PREVENTERS

A. General: ASSE standard backflow preventer and vacuum breaker of size, design flow rate, pressure loss at design flow rate and maximum pressure appropriate for installed application.
   1. Size NPS 2 (DN50) and smaller: Bronze Body with threaded ends
   2. Size NPS 2-1/2 (DN65) and larger: Bronze, cast iron, steel, or stainless steel body with flanged ends.
   3. Interior Components: Corrosion resistant materials
      a. Interior lining: AWWA C550 or FDA approved coating.
   4. Exterior finish: Rough Bronze

B. Pipe Applied, Atmospheric-Type Vacuum Breaker: ASSE 1001, with floating disc and atmospheric vent.

C. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7 garden-hose threads on outlet.

D. Pressure Vacuum Breakers: ASSE 1020 suitable for continuous pressure applications with ball valve on inlet and outlet.

E. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and 2 independent check valves.

F. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application.
   1. Pressure Loss: 12 psig (83 kPa) maximum, through middle third of flow range.
   2. Configuration: Designed for horizontal, straight-through, vertical-inlet, horizontal-center-section, and vertical-outlet, or vertical flow.
   3. Accessories:
      a. Valves Ball type with threaded ends on inlet and outlet.
      b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

G. Double-Check, Backflow-Prevention Assemblies: ASSE 1015, suitable for continuous pressure application with ball valve and inlet and outlet.
   1. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.
   2. Configuration: Designed for horizontal, straight-through flow.

H. Dual-Check-Valve Backflow Preventers: ASSE 1024, suitable for continuous pressure application with ball valve and inlet and outlet..

I. Double-Check, Detector-Assembly Backflow Preventers: ASSE 1048 and FM Global approved or UL Listed, suitable for continuous pressure application with outside-screw and yoke-gate type valves with flanged ends on inlet and outlet.
   1. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.
   2. Configuration: Designed for horizontal, straight-through flow.
   3. Accessories:
      a. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

J. Hose-Connection Backflow Preventers ASSE 1052, suitable for operation up to 10-foot head of water (30-kPa) back pressure and at least 3-gpm (0.19-L/s) flow.
   1. Inlet Size: NPS 1/2 or NPS 3/4 (DN 15 or DN 20).
   2. Outlet Size: Garden-hose thread complying with ASME B1.20.7.

K. Backflow-Preventer Test Kits:
   1. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.3 DISHWASHER AIR GAP FITTINGS

A. ASSE 1021, fitting for use with domestic dishwashers with capacity of at least 5 gpm (0.32-L/s); inlet pressure of at least 5 psi g (35-kPa); temperature rating of at least 140 deg F (60 deg C)

2.4 WATER PRESSURE-REDUCING VALVES

A. Water Regulators : ASSE 1003 with initial working pressure of 150 psig (1035 kPa)
   1. Body: Bronze
   2. Valves for Booster Heater Water Supply: Include integral bypass.
   3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).

2.5 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves <Insert drawing designation if any>:
   1. Type: Ball valve with two readout ports and memory-setting indicator.
   2. Body: Brass or bronze.
   3. Size: Same as connected piping, but not larger than NPS 2 (DN 50).

4. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Memory-Stop Balancing Valves NPS 2 (DN 50) and smallerMSS SP110 two piece copper-allow ball valves rated for 400-psig (2760-kpa) minium cold water pressure.
1. Body: Copper alloy.
2. Port: Standard or full port.
3. Ball: Chrome-plated brass.
4. Seats and Seals: Replaceable.
5. End Connections: Solder joint or threaded.
6. Handle: Vinyl-covered steel with memory-setting device.

2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. General: ASSE 1017, manually adjustable, thermostatic water mixing valve with bronze body with pressure rating of 125 psig (860 kPa).

B. Water-Temperature Limiting Devices:
1. Type: Thermostatically controlled, water mixing valve.
2. Material: Bronze body with corrosion-resistant interior components.
3. Connections: Threaded[**union**] inlets and outlet.
4. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
5. Valve Finish: Rough bronze.

C. Individual-Fixture, Water Tempering Valves: ASSE 1016, thermostatically controlled, water tempering valve with bronze body and corrosion-resistant interior components.
1. Temperature Control: Adjustable.
2. Inlets and Outlet: Threaded.
3. Finish: Rough or chrome-plated bronze.

D. Primary Water Tempering Valves :ASSE 1017, thermostatically controlled, water tempering valve, listed as tempering valve with bronze body.
1. Temperature Control: Manual.
2. Inlets and Outlet: Threaded.
3. Valve Finish: Rough bronze.

2.7 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers :
1. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.
2. Body: Bronze.
3. End Connections: Threaded.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size: .02 inch (0.51 mm)

2.8 OUTLET BOXES

A. Clothes Washer Outlet Boxes: Recessed enameled-steel or epoxy-painted-steel box and faceplate
   1. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.
   2. Supply Shutoff Fittings: NPS 1/2 (DN 15) gate, globe, or ball valves and NPS 1/2 (DN 15) copper, water tubing.
   3. Drain: NPS 1-1/2 (DN 40) standpipe and P-trap for direct waste connection to drainage piping.
   4. Inlet Hoses: Two 60-inch- (1500-mm-) long, rubber household clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.
   5. Drain Hose: One 48-inch- (1200-mm-) long, rubber household clothes washer drain hose with hooked end.

2.9 HOSE BIBBS

A. Hose Bibbs: ASME 112.18.1 for sediment faucets, bronze body with rough bronze finish, with pressure rating of 125 psig (860 kpa)
   1. Seat: Bronze, replaceable.
   2. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.
   3. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
   4. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
   5. Operation: Wheel handle or operating key.

2.10 WALL HYDRANTS

A. Nonfreeze Wall Hydrants: ASME 112.21.3M for exposed-outlet, self-draining wall hydrants.
   1. Pressure Rating: 125 psig (860 kPa).
   2. Operation: Loose key.
   3. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
   4. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).
   5. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
   6. Nozzle and Wall-Plate Finish: Rough bronze.

2.11 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves: MSS SP-110 for standard-port, two-piece ball valves
   1. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
   2. Size: NPS 3/4 (DN 20).
   3. Body: Copper alloy.

4. Ball: Chrome-plated brass.
5. Seats and Seals: Replaceable.
6. Handle: Vinyl-covered steel.
7. Inlet: Threaded or solder joint.
8. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves: MSS SP-80 for gate valves
1. Pressure Rating: Class 125.
2. Size: NPS 3/4 (DN 20).
3. Body: ASTM B 62 bronze.
4. Inlet: NPS 3/4 (DN 20) threaded or solder joint.
5. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves: MSS SP-110 for ball valves or MSS SP-80 for gate valves
1. Pressure Rating: 200-psig (1380-kPa) minimum CWP or Class 125.
2. Size: NPS 3/4 (DN 20).
3. Body: Copper alloy or ASTM B 62 bronze.
4. Drain: NPS 1/8 (DN 6) side outlet with cap.

2.12 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:
1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Metal bellows or Copper tube with piston.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.13 AIR VENTS

A. Bolted-Construction Automatic Air Vents:
1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig (860-kPa) minimum pressure rating at 140 deg F (60 deg C).
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 1/2 (DN 15) minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.14 FLEXIBLE CONNECTORS

A. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
1. Working-Pressure Rating: Minimum 200 psig (1380 kPa).
2. End Connections NPS 2 (DN 50) and Smaller: Threaded copper pipe or plain-end copper tube.

B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
   1. Working-Pressure Rating: Minimum 200 psig (1380 kPa).
   2. End Connections NPS 2 (DN 50) and Smaller: Threaded steel-pipe nipple.

2.15 WATER METERS

A. Comply with Utility provider requirements.

B. Remote Registration System: Comply with Utility provider requirements

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

   1. Locate backflow preventers in same room as connected equipment or system.
   2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
   3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

C. Install water-control valves with inlet and outlet shutoff valves and bypass with globe valve. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

   1. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, and pump.

G. Install outlet boxes recessed in wall or surface mounted on wall. Install 2-by-4-inch (38-by-89-mm) fire-retardant-treated-wood blocking, wall reinforcement between studs. Comply with requirements for fire-retardant-treated-wood blocking in Section 061000 "Rough Carpentry."

H. Install water-hammer arresters in water piping according to PDI-WH 201.

I. Install air vents at high points of water piping.[**Install drain piping and discharge onto floor drain.**]

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Pressure vacuum breakers.
2. Intermediate atmospheric-vent backflow preventers.
3. Reduced-pressure-principle backflow preventers.
4. Double-check, backflow-prevention assemblies.
5. Carbonated-beverage-machine backflow preventers.
6. Dual-check-valve backflow preventers.
7. Reduced-pressure-detector, fire-protection, backflow-preventer assemblies.
8. Double-check, detector-assembly backflow preventers.
9. Water pressure-reducing valves.
10. Calibrated balancing valves.
11. Primary, thermostatic, water mixing valves.
12. Manifold, thermostatic, water mixing-valve assemblies.
13. Photographic-process, thermostatic, water mixing-valve assemblies.
14. Primary water tempering valves.
15. Outlet boxes.
16. Hose stations.
17. Supply-type, trap-seal primer valves.
18. Trap-seal primer systems.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each [**pressure vacuum breaker**] [**reduced-pressure-principle backflow preventer**] [**double-check, backflow-prevention assembly**] [**and**] [**double-check, detector-assembly backflow preventer**] <**Insert type**> according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 22 13 13

FACILITY SANITARY SEWERS

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. Pipe and fittings.
   2. Nonpressure couplings.
   3. Expansion joints and deflection fittings.
   4. Backwater valves.
   5. Cleanouts.
   6. Encasement for piping.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

   1. Expansion joints and deflection fittings.
   2. Backwater valves.

B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Product Certificates: For each type of sanitary pipe and fitting, from manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify MCA no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without MCA's written permission.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

A. Pipe: ASTM A 746, for push-on joints.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, ductile iron, for push-on joints.

D. Gaskets: AWWA C111, rubber.

2.2 PVC PIPE AND FITTINGS

A. PVC Piping:

1. Pipe: AWWA C900, Class 150 PVC pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: AWWA C900, Class 150 PVC pipe with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

2.3 NONPRESSURE-TYPE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground non-pressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Shall not be used.

D. Shielded, Flexible Couplings:
   1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:
   1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

F. Nonpressure-Type, Rigid Couplings:
   1. Description: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling, molded from ASTM C 1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.4 EXPANSION JOINTS AND DEFLECTION FITTING

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. EBAA Iron, Inc.
   2. Romac Industries, Inc.
   3. Start Pipe Products

B. Ductile-Iron, Flexible Expansion Joints:

   1. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.

C. Ductile-Iron Expansion Joints:
   1. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated.

D. Ductile-Iron Deflection Fittings:
   1. Description: Compound coupling fitting with ball joint, flexing section, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for up to 15 degrees of deflection.

2.5 BACKWATER VALVES

A. PVC Backwater Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. IPS Corporation.
b. NDS Inc.
c. Zurn Industries, LLC.

2. Description: Horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

2.6 CLEANOUTS

A. PVC Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Canplas LLC.
b. IPS Corporation.
c. NDS Inc.
d. Sioux Chief Manufacturing Company, Inc.
e. Zurn Industries, LLC.

2. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.7 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density polyethylene film of 0.008-inch or high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.

C. Form: Sheet or tube.

D. Color: Black or natural.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 31 20 00 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Vertical soil piping shall be Ductile Iron and adequately secured to building structural elements with hangers indicated in Section 22 05 29 Hangers and Supports for Plumbing Piping. Horizontal gravity sewer piping shall be AWWA C900. Install piping to connect to existing building sanitary sewer lateral, 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 using 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. Install gravity-flow, non-pressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 2 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 48-inch minimum cover.
4. Install ductile-iron, gravity sewer piping according to ASTM A 746.
5. Install AWWA C900 according to AWWA M23 or ASTM D 2772 and ASTM F 1668.

F. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
1. Ductile-iron pipe and fittings.
2. Expansion joints and deflection fittings.

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 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, non-pressure, drainage piping according to the following:
1. Join ductile-iron, gravity sewer piping according to AWWA C600 for push-on joints.
2. Join AWWA C900 sewer piping according to AWWA M23 for gasketed joints.
3. Join dissimilar pipe materials with non-pressure-type, flexible or rigid couplings.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
1. Use non-pressure flexible couplings where required to join gravity-flow, non-pressure sewer piping unless otherwise indicated.
   a. Shielded flexible or rigid couplings for pipes of same or slightly different OD.
   b. Unshielded, increaser/reducer-pattern, flexible or rigid couplings for pipes with different OD.
   c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.4 BACKWATER VALVE INSTALLATION

A. Install combination horizontal and manual gate valves at the existing sanitary service lateral if required by the City or the reviewing sanitary utility or where indicated on drawings.

3.5 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.

1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 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.

3.6 CONNECTIONS

A. Connect non-pressure, gravity-flow drainage piping to building's sanitary building drains at the existing soil stack building underside envelope.

B. Make connections to existing piping.

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 minimum.
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 minimum.
3. 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.

3.7 CLOSING ABANDONED SANITARY SEWER SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes: Excavate around manhole as required and use either procedure below:

1. Remove manhole and close open ends of remaining piping.
2. Remove top of manhole down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Section 31 20 00 "Earth Moving."

3.8 IDENTIFICATION

A. Comply with requirements in Section 31 20 00 "Earth Moving" for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.9 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. Re-inspect 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. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

    a. Fill sewer piping with water. Test with pressure of at least 20-foot head of water, and maintain such pressure without leakage for at least 15 minutes.
    b. Close openings in system and fill with water.
    c. Purge air and refill with water.
    d. Disconnect water supply.
    e. Test and inspect joints for leaks.

6. 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.

G. Leaks and loss in test pressure constitute defects that must be repaired.

H. Replace leaking piping using new materials, and repeat testing until leakage is within the allowances specified.

3.10 CLEANING

A. Clean dirt and superfluous material from interior of piping. Flush with potable water.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

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. Pipe, tube, and fittings.
2. Specialty pipe fittings.

B. Related Sections:

1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify MCA no fewer than two days in advance of proposed interruption of sanitary waste service.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F 656.
1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Solvent Cement: ASTM D 2564.
1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:
1. Description: Manufactured assembly made of 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch-(2.4-mm-)] thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
a. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting. Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
3. Unshielded, Nonpressure Transition Couplings:
   a. Standard: ASTM C 1173.
   b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
   c. Sleeve Materials:
      1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
      2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
      3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
4. Shielded, Nonpressure Transition Couplings:
   a. Standard: ASTM C 1460.
   b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. 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.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
   1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
   2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
   3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

M. Install aboveground PVC piping according to ASTM D 2665.

N. Install underground PVC piping according to ASTM D 2321.

O. Install engineered soil and waste drainage and vent piping systems as follows:

   1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
   2. Sovent Drainage System: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
   3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

P. Plumbing Specialties:

1. Install backwater valves in sanitary waster gravity-flow piping. Comply with requirements for backwater valves specified in Section 221313 "Facility Sanitary Sewers."
2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Section 221313 "Facility Sanitary Sewers."

Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

R. Install sleeves for piping penetrations of walls, ceilings, floors, concrete walls, and slabs. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.5 VALVE INSTALLATION

A. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves.
2. Install backwater valves in accessible locations.
3. Comply with requirements for backwater valve specified in Section 221313 "Facility Sanitary Sewers."

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting, valve, and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 and NPS 8 (DN 150 and DN 200): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.

E. Install supports for vertical PVC piping every 48 inches (1200 mm).

F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Install horizontal backwater valves with cleanout cover flush with grade/surface in location specified.
6. Comply with requirements for backwater valves and cleanouts specified in Section 221313 "Facility Sanitary Sewers."

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping shall be the following:
   1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, vent piping shall be the following:
   1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Underground, soil and waste piping shall be:
   1. AWWA C900 PVC pipe; socket fittings; and solvent-cemented joints.
   2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 224100

RESIDENTIAL PLUMBING FIXTURES

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. Bathtubs.
2. Faucets.
3. Lavatories.
4. Showers.
5. Kitchen sinks.
6. Dishwasher air-gap fittings.
7. Disposers.
8. Water closets.
9. Toilet seats.
10. Supply fittings.
11. Waste fittings.

B. Related Requirements:
1. Section 221116 “Domestic Water Piping”
2. Section 221119 “Domestic Water Piping Specialities

1.3 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 lavatories.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For plumbing fixtures and faucets to include in emergency, operation, and operation and maintenance manuals.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of baths that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 BATHTUBS

A. Bathtub Front Bath:

1. Aquatic Bath 2603SMTE
2. Fixture:
   a. Standard: ANSI Z124.1.2 for plastic bathtubs and ANSI 117.1 for ADA bathtubs.
   b. Bathing Surface: Slip resistant according to ASTM F 462.
   c. Size: 60 by 33 inches (1525 by 838 mm).
   d. Color: Owner selected from manufacturers range.
   e. Drain Location: Right end.
   f. Drain: NPS 1-1/2 (DN 40); chrome-plated brass, pop-up waste and overflow.
3. Faucet: Delta Model 51400 with wall elbow Supply
4. Supply Fittings: Included in faucet.
5. Tub Filler: Chrome-plated-brass diverter spout.
6. Waste Fittings:
   a. Standard: ASME A112.18.2/CSA B45.125.2.
   b. Drain: Stainless steel or chrome-plated brass, removable strainer.
   c. Overflow: Chrome-plated-brass escutcheon with toggle drain-plug device.
   d. Drain Piping: NPS 1-1/2 (DN 40) cast-brass overflow, P-trap, and waste.

B. Rear Bath with shower.
1. American Standard Americast Princeton Recess Bath with Integral Overflow
2. Fixture:
   a. Standard: ANSI Z124.1.2 for plastic bathtubs.
   b. Bathing Surface: Slip resistant according to ASTM F 462.
   c. Size: 60 by 30 inches (1525 by 762 mm).
   d. Color: Owner selected from manufacturer range.
   e. Drain Location: Left end.
   f. Drain: NPS 1-1/2 (DN 40); chrome-plated brass, pop-up waste and overflow.
3. Faucet: Delta Tub and Shower Faucet Trim T13420 Series

4. Supply Fittings: Included in faucet.
5. Tub Filler: Chrome-plated-brass diverter spout.
6. Waste Fittings:
   a. Standard: ASME A112.18.2/CSA B45.125.2.
   b. Drain: Stainless steel or chrome-plated brass, removable strainer.
   c. Overflow: Chrome-plated-brass escutcheon with toggle drain-plug device.
   d. Drain Piping: NPS 1-1/2 (DN 40) cast-brass overflow, P-trap, and waste.

2.2 BATHTUB FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Bathtub Faucets Rear Bath: Single handle thermostatic.
   1. Model: Delta Tub and Shower Faucet Trim T13420 Series
   2. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
   3. Faucet:
      a. Body Material: Solid brass.
      b. Finish: Polished chrome plate.
      c. Maximum Flow Rate: 2.0 gpm unless otherwise indicated.
      d. Mounting: Exposed.
      e. Operation: Single handle, twist or rotate control, with hot- and cold-water indicators.
      f. Antiscald Device: Integral with mixing valve.
      g. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
      h. Diverter: In-tub filler spout.
      i. Supply Connections: NPS 1/2 (DN 15).
   4. Shower Head:
      a. Standard: ASME A112.18.1/CSA B125.1.
      b. Type: Ball joint and head integral with mounting flange.
      c. Backflow-Prevention Device: ASSE 1014.
      d. Shower Head Material: Metallic with chrome-plated finish.
      e. Spray Pattern: Adjustable.
   5. Bathtub Filler Spout: Chrome-plated brass.

C. Bathtub Faucets Front Bath: Single handle thermostatic.

   1. Thermostatic Faucets:Delta Linden Tub/Shower Faucet Set
   2. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.
   3. Faucet: Delta Linden T11894
      a. Body Material: Solid brass.
      b. Finish: Polished chrome plate.
      c. Maximum Flow Rate: 2.5 gpm (9.5 L/min.) unless otherwise indicated.
      d. Mounting: Exposed.
      e. Operation: Single handle, twist or rotate control, with hot- and cold-water indicators.
      f. Antiscald Device: Integral with mixing valve.

g. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
h. Diverter: In-tub filler spout.
i. Supply Connections: NPS 1/2 (DN 15).

4. Shower Head: Delta Model 51400 with wall elbow.
   a. Standard: ASME A112.18.1/CSA B125.1.
   b. Type: Hand shower. Include wall-mounting device.
   c. Backflow-Prevention Device: ASSE 1014.
   d. Shower Head Material: Metallic with chrome-plated finish.
   e. Spray Pattern: Adjustable.
5. Bathtub Filler Spout: Chrome-plated brass – Delta U1011-PK or equal.

2.3 LAVATORIES

A. Lavatories: Oval, solid surface, counter mounted.
   1. Solid-Surface Lavatories:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) American Standard America.
         2) Bradley Corporation.
         3) DuPont.
         4) Formica Corporation.
         5) Franke Consumer Products, Inc.
         6) InPro Corporation (IPC).
         7) Meganite Inc.
         8) Rynone Manufacturing Corp.
         9) Sloan Valve Company.
         10) Swan Corporation (The).
   2. Fixture:
      a. Standard: ANSI Z124.3 and ANSI/ICPA SS-1 for solid-surface lavatories.
      b. Type: Flat rim with ledge.
      c. Oval Nominal Size: 19 by 16 inches (483 by 406 mm).
      d. Faucet-Hole Punching: Three holes, 4-inch (102-mm) centers.
      e. Faucet-Hole Location: Rim.
      f. Color: White.
   3. Faucet: Delta Larhara Collection 2538-TP-DST .
   4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
   5. Waste Fittings: Comply with requirements in "Waste Fittings" Article.

2.4 LAVATORY FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Delta Larhara Collection 2538-TP-DST, Two Handle Thermostatic.
   1. General-Duty, Copper- or Brass-Underbody Faucets:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1) American Standard America.
   2) Delta Faucet Company.
   3) Moen Incorporated.

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
4. Body Material: General-duty, copper or brass underbody with brass cover plate.
5. Finish: Polished chrome plate.
6. Maximum Flow Rate: 1.2 gpm at 60 psi..
7. Centers: 4 inches (102 mm).
8. Mounting: Deck, exposed.
9. Valve Handle(s): Lever.
10. Inlet(s): NPS 3/8 (DN 10) tubing, with NPS 1/2 (DN 15) male adaptor.
11. Spout: Rigid.
12. Spout Outlet: Aerator.
13. Operation: Compression, manual or Noncompression, manual.
14. Drain: Pop up.

2.5 KITCHEN SINKS

A. Kitchen Sinks: One bowl stainless steel.
1. Stainless-Steel Kitchen Sinks:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Houzer, Inc.
      2) Kohler Co.
2. Fixture:
   a. Standard: ASME A112.19.3/CSA B45.4 for stainless-steel kitchen sinks.
   b. Overall Dimensions: 25” by 22”
   c. Metal Thickness: 0.038 inch (1.0 mm).
   d. Bowl:
      1) Dimensions: 21” x 15-3/4”
      2) Drain: 3-1/2-inch (89-mm) outlet for disposer.
         a) Location: Centered in bowl.
3. Faucet: Delta Linden 4453-DST
4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
5. Waste Fittings: Comply with requirements in "Waste Fittings" Article, except include continuous waste for multibowl sinks.
   a. Disposer: Coordinate with owner.
   b. Dishwasher Air-Gap Fitting: Comply with requirements in "Dishwasher Air-Gap Fittings" Article.

2.6 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Sink Faucets: Kitchen sink – Delta Linden 4453-DST or approved equal.
   1. General-Duty, Copper-Underbody Faucets:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) American Standard America.
         2) Delta Faucet Company.
         3) Moen Incorporated.
   2. Standard: ASME A112.18.1/CSA B125.1.
   3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
   4. Kitchen Sink Option: Separate hand spray complying with ASSE 1025.
   5. Finish: Polished chrome plate.
   6. Maximum Flow Rate: 1.8 gpm unless otherwise indicated.
   7. Mixing Valve: Single control.
   8. Backflow-Prevention Device for Hand Spray: Required.
   9. Centers: 8 inches (203 mm).
   10. Mounting: Deck, exposed.
   11. Handle(s): Lever.
   12. Spout Type: Swing, shaped tube.
   13. Spout Outlet: Aerator.
   14. Drain: Grid.

2.7 WATER CLOSETS

A. Water Closets: Floor mounted, floor outlet, vitreous china.
   1. Model: American Standard Optum Vormax 707AA.101
   2. Bowl:
      a. Standards: ASME A112.19.2/CSA B45.1, ASME A112.19.5, and ASSE 1037.
      b. Bowl Type: Siphon jet VorMax Flushing System.
      c. Height: Standard.
      d. Rim Contour: Elongated.
      e. Water Consumption: High Efficiency 1.28 gpf.
      f. Color: White.
   3. Toilet Seat: Slow Close EverClean telescoping cover
   4. Supply Fittings:
      a. Standard: ASME A112.18.1/CSA B125.1.
      b. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
      c. Stop: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
         1) Operation: Wheel handle.
      d. Riser:
         1) Size: NPS 1/2 (DN 15).

2) Material: ASME A112.18.6, braided- or corrugated-stainless-steel flexible hose riser.

2.8 TOILET SEATS

A. Toilet Seats :
1. Standard: IAPMO/ANSI Z124.5.
2. Material: Plastic.
3. Type: Residential.
4. Shape: Elongated rim (Closed front).
5. Configuration: Closed front with cover.
6. Size: Elongated.
7. Hinge Type: Self-sustaining.
8. Hinge Material: Plastic.
9. Seat Cover: Required.
10. Color: White.

2.9 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Lavatory and Kitchen Sink Supply Fittings:
1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
   a. Operation: Wheel handle.
3. Risers:
   a. Size: NPS 3/8 (DN 10) for lavatories.
   b. Size: NPS 3/8 (DN 10) for kitchen sinks.
   c. Material: Chrome-plated, soft-copper flexible tube or ASME A112.18.6, braided- or corrugated-stainless-steel flexible hose riser.

2.10 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Pop-up type with NPS 1-1/4 (DN 32) straight tailpiece as part of faucet for standard lavatories.

C. Drain: Grid type with NPS 1-1/2 (DN 40) straight tailpiece for standard bar sinks and.

D. Trap:

1. Size: NPS 1-1/2 (DN 40) for lavatories.
2. Size: NPS 1-1/2 (DN 40) for kitchen sinks.
3. Material: ASTM F 409 PVC two-piece trap and waste to wall and wall flange for kitchen sinks and lavatories.

2.11 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing-fixture installation.

B. Examine walls, floors, cabinets, and counters for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install plumbing fixtures level and plumb according to roughing-in drawings.

B. Install floor-mounted water closets on closet flange attachments to drainage piping.

C. Install counter-mounting fixtures in and attached to casework.

D. Install pedestal lavatories on pedestals and secured to wood blocking in wall.

E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball or gate valves if supply stops are not specified with fixture.

F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

G. Install toilet seats on water closets.

H. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

I. Install shower flow-control fittings with specified maximum flow rates in shower arms.

J. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes unless otherwise indicated.

K. Install disposer in outlet of each sink indicated to have a disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

L. Install dishwasher air-gap fitting at kitchen sink indicated to have air-gap fitting. Connect inlet hose to dishwasher and outlet hose to disposer.

M. Set bathtubs and baths in leveling bed of cement grout.

N. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

O. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.

B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed plumbing fixtures and fittings.

D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224100

SECTION 23 11 23

FACILITY NATURAL GAS PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sleeve, Pipe and fittings for site utility natural gas distribution.

1.2 REFERENCES

A. AASHTO T180 – Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18- in. Drop.
B. ANSI B16.3 – Malleable Iron Threaded Fittings.
C. ANSI B16.11 – Forged Steel Fittings, Socket Welding and Threaded.
D. ANSI B31.2 – Fuel Gas Piping.
E. ANSI B31.8 – Gas Transmission and Distribution Piping Systems.
F. ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings.
G. ASME B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
H. ASME B16.26 – Cast Copper Alloy Fittings for Flared Copper Tubes.
I. ASME BPVC SEC. VIII – Pressure Vessels.
J. ASME BPVC SEC. IX – Welding and Brazing Qualifications.
K. ASTM A 53 – Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
L. ASTM A 234 – Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
M. ASTM B 32 – Solder Metal.
N. ASTM B 75 – Seamless Copper Tube.
O. ASTM B 88 – Seamless Copper Water Tube.
P. ASTM D 698 – Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 pound Rammer and 12 inch Drop.
Q. ASTM D 1557 – Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 pound Rammer and 18 inch Drop.
R. ASTM D 2513 – Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.
S. ASTM D 2517 – Reinforced Epoxy Resin Gas Pressure Pipe Fittings.
T. ASTM D 2683 – Socket Type Polyethylene Fittings For Outside Diameter Controlled Polyethylene Pipe and Tubing.
U. ASTM D 2922 – Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
V. ASTM D 3017 – Moisture Content of Soil and Soil-Aggregate Mixtures.
W. AWS A5.8 – Brazing Filler Metal.

X. AWWA C105 – Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
Y. NFPA 54 – National Fuel Gas Code.
Z. NFPA 58 – National Fuel Propane Code.

1.3 SUBMITTALS

A. Product Data: Submit data on pipe materials, pipe fittings, valves and accessories.
B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
C. Project Record Documents: Record actual locations of pipe mains, sleeves, valves, connections, and invert elevations.
D. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.4 PROJECT CONDITIONS

A. Call "CALL BEFORE YOU DIG" (1-800-922-4455) At least 72 hours prior to any excavation.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the Southern Connecticut Gas Company requirements.
B. Welding Materials and Procedures: Conform to ASME Boiler and Pressure Vessel Code and applicable state regulations.
C. Welders Certification: In accordance with ASME SEC IX.
D. Conform to NFPA 54.
E. Maintain one copy of each document on site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 PIPE

A. Pipes are subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations.

B. Steel Pipe Above Ground: ASTM A 53, Schedule 40 black:
   1. Fittings: ANSI B16.3, malleable iron, ANSI B16.11, forged steel, or ASTM A 234, forged steel welding type.
   2. Joints: Threaded.

C. Polyvinyl chloride plastic: ASTM D 1785, 2 inch and 4 inch. PVC Schedule 40 PVC, approved by the Southern Connecticut Gas Company.
   1. Fittings: ASTM D 2466, Schedule 40 PVC, approved by the Southern Connecticut Gas Company.
   2. Joints: Fusion Welded, approved by the Southern Connecticut Gas Company.
   3. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Natural Gas Service" in large letters.

2.2 GAS COCKS

A. Gas cocks are subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations.
B. Up to 2 Inches: 150 pounds per square inch-gage WOG, bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends with cast iron curb box, cover, and key.
C. Over 2 Inches: 125 pounds per square inch-gage WOG, steel body and tapered plug, non-lubricated, Teflon packing, threaded ends, with cast iron curb box, cover, and key.
D. Gas Cock and Pressure Regulating Valves: Manufacturer's name and pressure rating marked on valve body.

2.3 PRESSURE REGULATING VALVES

A. Gas Pressure Regulating Valves are subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations.
B. Valves: Single stage, malleable iron body, corrosion-resistant, pressure regulator with atmospheric vent, elevation compensator; with threaded ends for 2 inch and smaller, flanged ends larger than 2 inch.
C. Capacity: For inlet and outlet gas pressures, specify gravity, and flow rate indicated.

2.4 PIPING SPECIALITIES

A. Appliance Flexible Connectors:
   1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
   2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
   3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
   4. Corrugated stainless-steel tubing with polymer coating.
   5. Operating-Pressure Rating: 0.5 psig.
   6. End Fittings: Zinc-coated steel.
   7. Threaded Ends: Comply with ASME B1.20.1.
   8. Maximum Length: 72 inches
B. Quick-Disconnect Devices: Comply with ANSI Z21.41.
   1. Copper-alloy convenience outlet and matching plug connector.
   2. Nitrile seals.
   3. Hand operated with automatic shutoff when disconnected.
   4. For indoor or outdoor applications.
   5. Adjustable, retractable restraining cable.

2.5 BEDDING AND COVER MATERIALS

A. Bedding: Fill is subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations.
B. Cover: Minimum cover 2 feet over the top of the pipe. Fill is subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations. Call the Southern Connecticut Gas Company for inspection before filling the pipe.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that building service connection and utility gas main size, location and invert are as indicated.

3.2 PREPARATION
Preparation for Gas service installation is subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations.

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Thread ferrous pipe 2 inches diameter and under.
B. Remove scale and dirt on inside and outside before assembly.
C. Prepare piping connections with threading and unions.

3.3 BEDDING
Bedding installation for Gas service is subject to the Southern Connecticut Gas Company requirements and current State and Federal regulations.

A. Excavate pipe trench in accordance with Section 02260 and Plans and Details for Work in this Section. Hand trim excavation for accurate placement of pipe to elevations indicate.
B. Place bedding material at trench bottom, level fill materials in on continuous layer not exceeding 6 inches compacted depth, compact to 95 percent.
C. Backfill around sides and to top of pipe with minimum 2 feet cover fill, tamped in place and compacted to 95 percent.
D. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION – PIPING

A. Gas pipe installation is subject to the Southern Connecticut Gas Company requirements.
B. Maintain separation of gas line from sewer and water piping in accordance with the Southern Connecticut Gas Company code.
C. Route piping in straight line as practically possible.
D. Install piping to conserve space and not interfere with use of site space.

E. Install piping to allow for expansion and contraction without stressing pipe or joints.
F. Install cocks and other fittings.
G. Establish elevations of buried piping to ensure not less than 24 inches of cover in driveways and parking areas.
H. Lay pipe on bedding.
I. Wrap couplings and fittings of steel pipe with polyethylene tape and heat shrink over pipe.
J. Install trace wire continuous over top of pipe above pipe line if required by utility company;
K. Backfill trench in accordance with appropriate backfill specification.
L. Center and plumb valve box over valve. Set box cover flush with finished ground surface. Prevent shock or stress from being transmitted through valve box to valve.
M. Wrap valve and valve box with polyethylene tape and heat shrink.

3.5 SERVICE CONNECTIONS

A. A gas service connection is subject to the Southern Connecticut Gas Company requirements.
B. Provide sleeve in foundation wall for gas service main. Seal enlarged sleeve watertight.
C. Anchor service main to exterior surface of foundation wall.
D. Install service regulator adjacent to building wall in specified location.
E. Install pressure regulating valve and riser pipe to prevent undue stress upon service pipe. For plastic service pipe, use steel pipe riser from below ground to regulator.
F. Provide regulator vent with rain and insect proof opening, terminating away from building openings.
G. A gas service connection is subject to the Southern Connecticut Gas Company requirements.
H. Provide sleeve in foundation wall for gas service main. Seal enlarged sleeve watertight.
I. Anchor service main to exterior surface of foundation wall.
J. Install service regulator adjacent to building wall in specified location.
K. Install pressure regulating valve and riser pipe to prevent undue stress upon service pipe. For plastic service pipe, use steel pipe riser from below ground to regulator.
L. Provide regulator vent with rain and insect proof opening, terminating away from building openings.

3.6 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
B. Install underground valves with valve boxes
C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.7 CONNECTIONS

A. Install natural gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

B. Install piping adjacent to appliances to allow service and maintenance of appliances.
C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within of 72 inches of each gas fired appliance and equipment. Install union between valve and appliances or equipment.
D. Install tee fitting with capped nipple in bottom to form drip as close as practical to inlet of each appliance for sediment trap.

3.8 FIELD QUALITY CONTROL

A. Field quality control is subject to the Southern Connecticut Gas Company requirements. Contractor shall engage the Southern Connecticut Gas Company to inspect trench, bedding, pipe, and fill at no cost to the owner.
B. Compaction testing will be performed in accordance with ASTM D 698.
C. Gas lines will be pressure tested to 150 pounds per square inch.
D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF SECTION

SECTION 23 21 13

HYDRONIC PIPING

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 pipe and fitting materials and joining methods for the following:
   1. Hot-water heating piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each product:

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
   1. Hot-Water Heating Piping: 150 psig (kPa) at 200 deg F (93 deg C).

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B).

B. Copper, Mechanically Formed Tee Option: For forming T-branch on copper water tube.
   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. T-DRILL Industries Inc.

C. Wrought-Copper Unions: ASME B16.22.

2.3 JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Manufacturers: Subject to Compliance with requirements available manufacturers offering products that may be incorporated in the work include, but are not limited to;
   1. A.Y. McDonald Mfg. Co.
   2. Calpico, Inc.
   3. Capitol Manufacturing Company
   4. Central Plastics Company
   5. Grinnel Mechanical Products
   6. Hart Industries International, Inc.
   7. Jomar International, Ltd.
   8. Matco-Norca
   9. Pipeline Seal and Insulator, Inc.
   10. Precision Plumbing Products, Inc.
   11. Victaulic Company
   12. Watts Regulator Co.
   13. Zurn Industries, LLC

C. Dielectric Unions:
   1. Description: ASSE 1079 Standard with pressure rating of 150 psig (1035 kPa)
      a. End Connections: Solder-joint copper alloy and threaded ferrous.

D. Dielectric Flanges:
   1. Description:ASSE 1079 Standard, Factory fabricated, bolted, companion-flange assembly with pressure rating of 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
      a. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

E. Dielectric-Flange Insulating Kits:
   1. Description: Nonconducting materials for field assembly of companion flanges with pressure rating of 150 psig (1035 kPa)
      a. Gasket: Neoprene or phenolic.
      b. Bolt Sleeves: Phenolic or polyethylene.
      c. Washers: Phenolic with steel backing washers.

F. Dielectric Nipples:
   1. Description: IAPMO PS 66 Standard, electroplated steel nipple complying with ASTM F 1545 and pressure rating of 300 psig (2070 kPa) at 225 deg F (107 deg C).
      a. End Connections: Male threaded or grooved.

b. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, shall be the following:
   1. Type L (Type B), drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

B. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.2 PIPING INSTALLATIONS

A. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

B. 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.

C. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

K. Install drains, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

L. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

M. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

N. Install branch connections to mains using mechanically formed tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

O. Install unions in piping, NPS 2 (DN 50) and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

P. Install flanges in piping, NPS 2-1/2 (DN 65) and larger, at final connections of equipment and elsewhere as indicated.

Q. Install shutoff valve immediately upstream of each dielectric fitting.

R. Install expansion loops, expansion joints, anchors, and pipe alignment guides.

S. Install sleeves for piping penetrations of walls, ceilings, and floors.

T. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric nipples.

3.4 HANGERS AND SUPPORTS

A. Comply with the following requirements for maximum spacing of supports.

B. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet (6 m) long.
   2. Spring hangers to support vertical runs.
   3. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
   1. NPS 3/4 (DN 20): Maximum span, 5 feet (1.5 m); minimum rod size, 1/4 inch (6.4 mm).
   2. NPS 1 (DN 25): Maximum span, 6 feet (1.8 m); minimum rod size, 1/4 inch (6.4 mm).
   3. NPS 1-1/4 ((DN 32):)Maximum span, 7 feet (2.1 m); minimum rod size, 3/8 inch (10 mm).

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

3.7 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."

5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 233113

METAL DUCTS

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. Single-wall rectangular ducts and fittings.
   2. Single-wall round ducts and fittings.
   3. Sheet metal materials.
   4. Sealants and gaskets.
   5. Hangers and supports.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:
   1. Liners and adhesives.
   2. Sealants and gaskets.

B. Delegated-Design Submittal:
   1. Sheet metal thicknesses.
   2. Joint and seam construction and sealing.
   3. Reinforcement details and spacing.
   4. Materials, fabrication, assembly, and spacing of hangers and supports.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
B. Welding certificates.
C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
   2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
   3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Galvanized Coating Designation: G60 (Z180).
C. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
   1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
B. Water-Based Joint and Seam Sealant:
   1. Application Method: Brush on.
   2. Solids Content: Minimum 65 percent.

3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for10-inch wg (2500-Pa) static-pressure class, positive or negative.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations.

Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
C. Install round ducts in maximum practical lengths.
D. Install ducts with fewest possible joints.
E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
I. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
B. Building Attachments: Use appropriate fasteners for construction materials to which hangers are being attached.
C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
D. Hangers Exposed to View: Threaded rod and angle or channel supports.
E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).
F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.
B. Leakage Tests:
   1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
   2. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
   3. Test for leaks before applying external insulation.
   4. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
C. Duct System Cleanliness Tests:
   1. Visually inspect duct system to ensure that no visible contaminants are present.
D. Duct system will be considered defective if it does not pass tests and inspections.
E. Prepare test and inspection reports.

3.6 DUCT CLEANING

A. Clean new and existing duct system(s) before testing, adjusting, and balancing.
B. Use service openings for entry and inspection.
   1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
   2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
   3. Remove and reinstall ceiling to gain access during the cleaning process.
C. Clean the following components by removing surface contaminants and deposits:
   1. Air outlets and inlets (registers, grilles, and diffusers).
   2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
   3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
   4. Coils and related components.
   5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
   6. Supply-air ducts, dampers, actuators, and turning vanes.
D. Mechanical Cleaning Methodology:
   1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
   2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.

3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
5. Provide drainage and cleanup for wash-down procedures.

3.7 START UP

A. Air Balance: Comply with manufacturer requirements and industry standards.

3.8 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
B. Supply Ducts and Return Ducts:
   1. Minimum sizes are indicated on drawings.
C. Intermediate Reinforcement:
   1. Galvanized-Steel Ducts: Galvanized steel.
D. Elbow Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
      a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
      b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
      c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
   2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
      a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
         1) Radius-to Diameter Ratio: 1.5.
      b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
      c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam.
E. Branch Configuration:
   1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
      a. Rectangular Main to Rectangular Branch: 45-degree entry.
      b. Rectangular Main to Round Branch: Spin in.
   2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
      a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
      b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
      c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300

AIR DUCT 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. Section Includes:
   1. Manual volume dampers.
   2. Flange connectors.
   3. Turning vanes.
   4. Flexible connectors.
   5. Flexible ducts.
   6. Duct accessory hardware.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
   1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
      a. Special fittings.
      b. Manual volume damper installations.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Galvanized Coating Designation: G60 (Z180).
B. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
C. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.
D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 MANUAL VOLUME DAMPERS

A. Low-Leakage, Steel, Manual Volume Dampers:
   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. McGill AirFlow LLC.
      b. Trox USA Inc.
      c. Vent Products Co., Inc.
   2. Comply with AMCA 500-D testing for damper rating.
   3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
   4. Suitable for horizontal or vertical applications.
   5. Frames:
      a. 0.094-inch- (2.4-mm-) thick, galvanized sheet steel.
      b. Mitered and welded corners.
      c. Flanges for attaching to walls and flangeless frames for installing in ducts.
   6. Blades:
      a. Multiple or single blade.
      b. Parallel- or opposed-blade design.
      c. Stiffen damper blades for stability.
      d. Galvanized, roll-formed steel, 0.064 inch (1.62 mm) thick.
   7. Blade Axles: Galvanized steel.

8. Bearings:
   a. Oil-impregnated stainless-steel sleeve or Stainless-steel sleeve.
   b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
9. Blade Seals: Vinyl or Neoprene.
10. Jamb Seals: Cambered stainless steel.
11. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:
1. Size: 0.5-inch (13-mm) diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

C. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 FLANGE CONNECTORS, TURNING VANES, AND FLEXIBLE CONNECTORS 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. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Hardcast, Inc.
4. Nexus PDQ.
5. Ward Industries; a brand of Hart & Cooley, Inc.
6. Aero-Dyne Sound Control Co.
7. Duro Dyne Inc.
8. Elgen Manufacturing.
9. METALAIRE, Inc.
10. SEMCO LLC.
11. JP Lamborn Co.
12. Ventfabrics, Inc.

2.5 FLANGE CONNECTORS

A. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
B. Material: Galvanized steel.
C. Gage and Shape: Match connecting ductwork.

2.6 TURNING VANES

A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
C. Vane Construction: Single wall.

2.7 FLEXIBLE CONNECTORS

A. Materials: Flame-retardant or noncombustible fabrics.
B. Coatings and Adhesives: Comply with UL 181, Class 1.
C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.
D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
   1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
   2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
   3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

2.8 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Flexmaster U.S.A., Inc.
   2. JP Lamborn Co.
B. Insulated, Flexible Duct: UL 181, Class 1, multiple layers of aluminum laminate or aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
   1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
   2. Maximum Air Velocity: 4000 fpm (20 m/s).
   3. Temperature Range: Minus 20 to plus 210 deg F (Minus 29 to plus 99 deg C).
   4. Insulation R-value: 6.
C. Flexible Duct Connectors:
   1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches (75 through 460 mm), to suit duct size.
   2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.9 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
C. Install control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
   1. Install steel volume dampers in steel ducts.
E. Set dampers to fully open position before testing, adjusting, and balancing.
F. Install test holes at fan inlets and outlets and elsewhere as indicated.
G. Install fire and smoke dampers according to UL listing.
H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
   1. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
   2. Control devices requiring inspection.
   3. Elsewhere as indicated.
I. Install access doors with swing against duct static pressure.
J. Access Door Sizes:
   1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
K. Install flexible connectors to connect ducts to equipment.
L. For fans developing static pressures of 5-inch wg (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
M. Connect terminal units to supply ducts directly or with maximum 12-inch (300-mm) lengths of flexible duct. Do not use flexible ducts to change directions.
N. Connect diffusers or light troffer boots to ducts directly or with maximum 24-inch (600-mm) lengths of flexible duct clamped or strapped in place.
O. Connect flexible ducts to metal ducts with liquid adhesive plus sheet metal screws.
P. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Operate dampers to verify full range of movement.
   2. Inspect locations of access doors and verify that purpose of access door can be performed.
   3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
   4. Inspect turning vanes for proper and secure installation.

5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

SECTION 233713

DIFFUSERS, REGISTERS, AND GRILLES

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. Louver face diffusers.
   2. Fixed face registers.

B. Related Sections:
   1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:
   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Louver Face Diffuser: See drawing designation.
   1. Devices shall be specifically designed for variable-air-volume flows.
   2. Material: Aluminum.
   3. Finish: Baked enamel, white.
   4. Face Size: See Drawings.
   5. Mounting: Surface with beveled frame.
   6. Pattern: As indicated on drawings core style.
   7. Accessories:
      a. Square to round neck adaptor.
      b. Adjustable pattern vanes.
      c. Throw reducing vanes.
      d. Equalizing grid.

e. Plaster ring.
f. Wire guard.
g. Sectorizing baffles.

2.2 REGISTERS AND GRILLES

A. Fixed Face Register:
1. Material: Aluminum.
2. Finish: Baked enamel, white.
3. Face Arrangement: 1/2-by-1/2-by-1/2-inch (13-by-13-by-13-mm) grid core.
4. Core Construction: Integral.
5. Frame: 1 inch (25 mm) wide.
6. Mounting Frame: Filter.
7. Mounting: Countersunk screw.
8. Damper Type: Adjustable opposed blade.
9. Accessory: Filter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.
B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify MCA for a determination of final location.
C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 23 54 16.13

GAS-FIRED FURNACES

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. Gas-fired, noncondensing and condensing furnaces and accessories complete with controls.
   2. Air cleaner
   3. Air filters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
   1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: To include in emergency, operation, and maintenance manuals.

   a. Furnace and accessories complete with controls.
   b. Air filter and Air Cleaner.

1.6 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

B. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 GAS-FIRED FURNACES, CONDENSING

A. Furnace Model and Manufacturer are indicated on drawings
   1. Approved equal products acceptable.
B. Cabinet: Steel.
   1. Cabinet interior around heat exchanger shall be factory-installed insulation.
   2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
   3. Factory paint external cabinets in manufacturer's standard color.
   4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
C. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.
   1. Special Motor Features: Electronically controlled motor (ECM) controlled by integrated furnace/blower control.
D. Type of Gas: Natural.
E. Heat Exchanger:
   1. Primary: Aluminized steel.
   2. Secondary: Stainless steel.
F. Burner:
   1. Gas Valve: 100 percent safety modulating main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
   2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.
G. Gas-Burner Safety Controls:
   1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
   2. Flame Rollout Switch: Installed on burner box; prevents burner operation.
   3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.
H. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.
I. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories; diagnostic light with viewport.
J. Accessories:

1. Combination Combustion-Air Intake and Vent: PVC plastic fitting to combine combustion-air inlet and vent through outside wall or roof as indicated on drawings.
2. PVC Plastic Vent Materials:
   a. PVC Plastic Pipe: Schedule 40, complying with ASTM D 1785.
   b. PVC Plastic Fittings: Schedule 40, complying with ASTM D 2466, socket type.
   c. PVC Solvent Cement: ASTM D 2564.
      1) PVC solvent cement shall have a VOC content of 510 g/L or less.
      2) Adhesive primer shall have a VOC content of 550 g/L or less.

2.2 ASSEMBLY DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a qualified testing agency, and marked for intended location and application.
B. General Requirements for Gas-Fired Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3 and NFPA 54.THERMOSTATS
C. Controls shall comply with requirements in ASHRAE/IES 90.1, "Controls."
D. Two-Stage, Heating-Only Thermostat: Wall-mounted unit with fan on-automatic selector.
E. Control Wiring: Unshielded twisted-pair cabling.
   1. No. 24 AWG, 100 ohm, four pair.

2.3 AIR FILTERS

A. Disposable Filters: 1-inch- thick fiberglass media with ASHRAE 52.2 MERV rating of 6 or higher, in sheet metal frame.

2.4 AIR CLEANERS

A. Electronic Air Cleaners: Packaged system, including sheet metal housing, prefilter, power supply, and automatic control device, arranged for mounting in return-air duct at furnace; equip with on-off and test switches and pilot light.
   1. Standard: UL 586.
   2. Rating: ASHRAE 52.2, particle size to 0.01 micrometer.
   3. Static Pressure Drop: Maximum 0.14-inch wg at 300-fpm air velocity.

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 the Work.

B. Examine factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for gas piping systems to verify actual locations of piping connections before equipment installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.

B. Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
   1. Install seismic restraints to limit movement of furnace by resisting code-required seismic acceleration.

C. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.
   1. Anchor furnace to substrate to resist code-required seismic acceleration.

D. Controls: Install thermostats and humidistats at mounting height of 60 inches above floor.

E. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.

3.3 CONNECTIONS

A. Gas piping installation requirements are specified in Section 231123 "Facility Natural-Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Vent Connection, Noncondensing, Gas-Fired Furnaces: Connect Type B vents to furnace vent connection and extend outdoors.

D. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.
   1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
   2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
   3. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

      a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

b. PVC Pressure Piping: Join schedule number ASTM D 1785 PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.

4. Slope pipe vent back to furnace or to outside terminal.

E. Connect ducts to furnace with flexible connector. Comply with requirements in Section 233300 "Air Duct Accessories."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Perform electrical test and visual and mechanical inspection.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
3. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

3.5 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for physical damage to unit casings.
2. Verify that access doors move freely and are weathertight.
3. Clean units and inspect for construction debris.
4. Verify that all bolts and screws are tight.
5. Adjust vibration isolation and flexible connections.
6. Verify that controls are connected and operational.

B. Adjust fan belts to proper alignment and tension.

C. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.

D. Measure and record airflows.

E. Verify proper operation of capacity control device.

F. After startup and performance test, lubricate bearings and adjust belt tension.

3.6 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.7 CLEANING

A. After completing installation, clean furnaces internally according to manufacturer's written instructions.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain furnace

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.
B. Related Requirements:
   1. 2013 Connecticut State Building Code
   2. 2011 NFPA 70 National Electrical Code
   3. 2009 International Residential Code

1.3 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00
B. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

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. Alpha Wire Company.
2. Belden Inc.
3. Cerro Wire LLC.
4. Encore Wire Corporation.
5. General Cable Technologies Corporation.
6. General Cable; General Cable Corporation.
7. Senator Wire & Cable Company.
8. Service Wire Co.
9. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2. Wire of higher temperature ratings shall be used where required by NFPA 70 National Electric Code, 2011.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for nonmetallic-sheathed cable, Type NM with ground wire.

2.2 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. 3M.
2. Gardner Bender.
3. Hubbell Power Systems, Inc.
4. Ideal Industries, Inc.
5. ILSCO.
6. NSi Industries LLC.
7. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

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.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type SE with individual conductors rated Type XHHW-2, single conductors in raceway.
B. Exposed Branch Circuits, Including in Crawlspaces: Nonmetallic-sheathed cable, Type NM.
C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Nonmetallic-sheathed cable, Type NM.
D. Branch Circuits in Cable Tray: Nonmetallic-sheathed cable, Type NM.
E. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables.
D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
E. Adequately support cables under provisions of the National Electric Code, NFPA 70, 2011 edition.

3.4 CONNECTIONS

A. 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.
B. Make splices, terminations, and taps that are compatible with conductor material
C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according NFPA 70.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
B. Perform the following tests and inspections:
   1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
C. Test and Inspection Reports: Prepare a written report to record the following:
   1. Procedures used.

2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL 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. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:
   1. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Ground rods.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

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. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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 UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
   1. Bury at least 24 inches (600 mm) below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical panel board

E. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors except as otherwise indicated.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from

panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
   2. For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

G. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet (6.0 m) long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.
   a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
   b. Perform tests by fall-of-potential method according to IEEE 81.

D. Grounding system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: [**10**] <**Insert value**> ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: [**5**] <**Insert value**> ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: [**3**] <**Insert value**> ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: [**1**] [**3**] <**Insert value**> ohm(s).

G. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL 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. Section Includes:
   1. Metal conduits, tubing, and fittings.
   2. Boxes and enclosures.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.
B. FMC: Flexible metal conduit.
C. GRC: Galvanized rigid steel conduit.
D. IMC: Intermediate metal conduit.
E. LFMC: Liquidtight flexible metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems; a part of Atkore International.
   2. Allied Tube & Conduit; a part of Atkore International.
   3. Anamet Electrical, Inc.
   4. Calconduit.
   5. Electri-Flex Company.
   6. FSR Inc.

7. Korkap.
8. Opti-Com Manufacturing Network, Inc (OMNI).
9. O-Z/Gedney; a brand of Emerson Industrial Automation.
10. Perma-Cote.
11. Picoma Industries, Inc.
12. Plasti-Bond.
13. Republic Conduit.
14. Southwire Company.
15. Thomas & Betts Corporation; A Member of the ABB Group.
16. Western Tube and Conduit Corporation.
17. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT: Steel compression type fitting.
3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

J. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 BOXES AND ENCLOSURES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Crouse-Hinds, an Eaton business.
2. Hubbell Incorporated.
3. Hubbell Incorporated; Wiring Device-Kellems.
4. MonoSystems, Inc.
5. RACO; Hubbell.

6. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet, Device, Pull, and Junction Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

G. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb (32 kg).
   1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

J. Gangable boxes are allowed.

K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 4X with continuous-hinge cover with flush latch unless otherwise indicated.
   1. Metal Enclosures: Galvanized Steel, finished inside and out with manufacturer's standard enamel.
   2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC.
   2. Concealed Conduit, Aboveground: GRC, IMC, or EMT.
   3. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X.

B. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
   3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

E. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support conduit and boxes adequately and per NFPA 70 and NECA-1.

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

F. Install conduits parallel or perpendicular to building lines.

G. Support conduit within 12 inches (300 mm) of enclosures to which attached.

H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

J. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

K. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

1. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path

L. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

N. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

O. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

P. Flexible Conduit Connections: Comply with NEMA RV 3.

Q. Mount boxes at heights indicated on Drawings, where not specified in drawings follow NECA-1. Install boxes with height measured to center of box unless otherwise indicated.

R. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

S. Locate boxes so that cover or plate will not span different building finishes.

T. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

U. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 260533

SECTION 26 08 00

ELECTRICAL SYSTEMS COMMISSIONING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.2 SUMMARY

A. The purpose of this Section is to define Contractor responsibilities in the commissioning process, which are being directed by the Contractor. Other electrical system testing is required under other Division 26 Specification Sections. National Electrical Installation Standards (NEIS) NECA 90-2004, "Recommended Practice for Commissioning Building Electrical Systems", 27th Volume of the NEIS Series, provides additional guidance for the commissioning of electrical systems.

B. Commissioning requires the participation of the Contractor to ensure that all systems are operating in a manner consistent with the Contract Documents. General Commissioning requirements and coordination are detailed in Division 01. Division 26 shall be familiar with all parts of Division 01 and the Commissioning Plan issued by the Contractor and shall execute all Commissioning responsibilities assigned to them in the Contract Documents and include the cost of Commissioning in the Contract price.

C. Electrical systems to be commissioned include the following:

1. Distribution and Branch Circuit Panelboards.

2. Lighting Fixtures and Controls.

3. Emergency Generators and Distribution System.

4. Uninterruptible Power Systems.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards.

1.4 SUBMITTALS

A. Contractor shall prepare Prefunctional Checklists and Functional Performance Test (FPT) procedures and execute and document results. All Prefunctional Checklists and tests must be documented using specific, procedural forms in Microsoft Word or Excel software developed for that purpose. Prior to testing, Contractor shall submit those forms to the MCA for review and approval.

B. Contractor shall provide MCA with documentation required for Commissioning work. At minimum, documentation shall include: Detailed Start-up procedures, Full sequences of operation, Operating and Maintenance data, Performance data, Functional Performance Test Procedures, Control Drawings, and details of MCA-Contracted tests.

C. Contractor shall submit to MCA installation and checkout materials actually shipped inside equipment and actual field checkout sheet forms used by factory or field technicians.

D. Contractor shall review and approve other relative documentation for impact on FPT's of the systems:

1. Shop Drawings and product submittal data related to systems or equipment to be commissioned. The Subcontractor responsible for the FPT shall review and incorporate comments from the MCA and MCA via the Contractor.

2. Incorporate manufacturer's Start-up procedures with Prefunctional checklists.

3. Draft Electrical Testing Agency (ETA) Reports: Review and provide comments to MCA.

4. Completed equipment Start-up certification forms along with the manufacturer's field or factory performance and Start-up test documentation: Subcontractor performing the test will review the documentation prior to commencing with the scheduled FPT's.

5. Final ETA Reports: Subcontractor performing the test will review the documentation prior to commencing with the scheduled FPT's.

6. Operating and Maintenance (O&M) information per requirements of the Technical Specifications and Division 01 requirements: To validate adequacy and completeness of the FPT, the Contractor shall ensure that the O&M manual content, marked-up record Drawings and Specifications, component submittal drawings, and other pertinent documents are available at the Project Site for review.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Infrared Thermographic Scanner:

1. Infrared scanning equipment shall be an AGA (or approved equal) thermovision set capable of viewing an entire bus or equipment assembly at one time and have a sensitivity of 0.2 degrees C with a liquid nitrogen reference.

2. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified.

PART 3 - EXECUTION

3.1 PREPARATION

A. Construction Phase:

1. Provide manufacturer's data sheets and shop drawing submittals of equipment.

2. Prepare the specific Functional Performance Test procedures specified in Section 26 08 16. Ensure that Functional Performance Test procedures address feasibility, safety, and equipment protection and provide necessary written alarm limits to be used during the tests.

3. Perform and clearly document all completed Prefunctional Checklists and Start-up procedures. Provide a copy to the MCA prior to the Functional Performance Test.

4. Compile all Commissioning records and documentation to be included in a Commissioning and Closeout Manual.

5. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

6. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

B. Electrical Testing Agency (ETA):

1. When requested by MCA, the Contractor shall retain an independent Electrical Testing Agency (ETA). This generally requires checking and testing of the electrical power distribution equipment per National Electrical Testing Association (NETA).

2. Attend Pre-Commissioning Meeting(s), Pre-Installation Meeting(s), and other Project meetings scheduled by the Contractor to facilitate the Commissioning process.

3. Obtain all required manufacturer's data to facilitate tests.

4. Generally ETA shall provide their standard forms to document the NETA tests to be incorporated into the Prefunctional Checklist and Functional Performance Tests record.

5. During related tests, execute and document the tests in the approved forms and/or test record.

6. Perform and clearly document all completed Start-up and system operational checkout procedures, providing a copy to the Contractor.

7. Clearly indicate any deficiencies identified during testing and add to an action list for resolution and tracking. The field technicians shall keep a running log of events and issues. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, Contract interpretation requests and lists of completed tests to the Contractor at least twice a week and provide technical assistance in the resolution of deficiencies.

3.2 TESTING

A. Prefunctional Checklists and Start-up:

1. Start-up and complete systems and sub-systems so they are fully functional, meeting the requirements of the Contract Documents.

2. Prefunctional Checklists shall be complete prior to commencement of a Functional Performance test.

B. Functional Performance Tests:

1. Functional Performance Tests are conducted after system Start-up and checkout is satisfactorily completed.

END OF SECTION

SECTION 26 08 16

ELECTRICAL SYSTEMS FUNCTIONAL PERFORMANCE TESTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.2 SUMMARY

A. This Section expands on and defines responsibilities of the Contractor in regards to Functional Performance Tests (FPT's) of the Commissioning process.

B. Contractor shall oversee the Commissioning activities with the Contractor's Subcontractors and MCA.

C. Prefunctional Checklists, tests and Start-ups are to be completed and documented for the record prior to commencing with FPT's. Refer to Section 26 08 00 for additional requirements.

D. Completed FPT Forms for all pieces of equipment and systems shall be submitted to the Owner prior to Substantial Completion.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with all applicable requirements and standards.

1.4 SUBMITTALS

A. Maintain and use an action item tracking system, "Action Item List," that indicates as a minimum, required information, identified deficiencies, work required, etc.). Each item shall be tracked with the initiator, the parties responsible, due date, the date of closure, and a description of the resolution. Each item shall be categorized for sorting and tracking and for documentation on applicable forms. Action Item List shall be distributed and documented using Microsoft Excel or a database format approved by Owner.

B. Disseminate this list as appropriate to keep all parties involved with the FPT informed.

C. Functional Performance Test procedure forms must include the following:

1. System and equipment or component name(s).

2. Equipment location and identification number as identified in the Equipment Matrix described in Division 01.

3. Unique test identification number and reference to unique Prefunctional Checklist and Start-up Documentation Identification Numbers for the equipment.

4. Date and time of test.

5. Project name.

6. Participating parties.

7. Specific sequence of operation or other specified parameters, including performance data being verified.

8. Instructions for setting up a Functional Performance Test.

9. Specific script-type, step-by-step procedures to perform a Functional Performance Test, in a clear, sequential and repeatable format that is customized for the system being tested.

10. A Yes/No checkbox (or data entry box as appropriate) for clearly indicating whether or not proper performance of each part of a Functional Performance Test was achieved with space for actual readings.

11. Section for comments.

12. Signatures and date block for participants and Owner approvals.

D. Refer to Division 01 and 26 08 00 for additional documentation requirements.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.2 TEST EQUIPMENT

A. Refer to Section 26 08 00 – Electrical Systems Commissioning.

PART 3 - EXECUTION

3.1 PREPARATION

A. The objective of FPT's is to demonstrate that each system operates according to the Contract Documents through all specified modes of operation.

B. Contractor shall operate each system through all modes of operation (occupied, unoccupied, warm-up, cool-down, etc.) where there is a specified system response. Verification of each sequence in the sequences of operation is required.

C. All equipment, components and devices applicable to the FPT must be started and this Start-up must be documented.

3.2 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

3.3 FUNCTIONAL PERFORMANCE TEST PROCEDURES

A. The purpose of a Functional Performance Test is to verify and document compliance with the stated criteria of acceptance. Contractor shall develop specific script-type test procedures and associated test forms to verify and document proper operation of each piece of equipment and system.

B. Contractor shall operate, or cause to be operated, each system, device, or equipment item, both intermittently and continuously, for duration a period as indicated in the Specification Section(s) for such item and/or in accordance with the manufacturer's written recommendations, the Contract Documents, and the Commissioning Plan.

C. Contractor shall operate each component device and each building system to the full extent of its capability, from minimum to maximum, and under automatic control and manual control.

D. Sampling: Some types of identical equipment (such as circuit breakers, receptacles etc.) will be tested using a sampling strategy.

E. Failure Limit on Sample Tests: With the sampling percentages is listed a failure limit. This limit indicates the maximum percentage of the tested devices that may have any test that fails before an entirely new sample must be tested. When the maximum number of failures is reached, testing on that sample will be terminated and re-testing will be scheduled.

1. Where sample tests involve multiple systems (ie: checking receptacles on different floors) the maximum failure limit will apply per system.

F. Capacities and adjusted and balanced conditions as applicable will generally be checked.

3.4 SPECIFIC SYSTEM FUNCTIONAL TEST PROCEDURES

A. Panelboards and Associated Loads:

1. Participants shall include Contractor, Electrical Subcontractor,

2. Sample: 100 percent (of panel boards and loads/receptacles); Failure Limit 10 percent.

3. Review Start-up documentation.

4. Inspect the Panelboard for conformance to Contract Documents in concert with reviewing the ETA reports.

5. Contractor shall incorporate the ETA reports into the Microsoft Excel software.

6. Receptacle Polarity Test: Check all receptacles installed or reconnected under this Contract with a receptacle circuit tester. Tester shall test for open ground, reverse polarity, open hot, open neutral, hot and ground reversed, hot or neutral and hot open.

7. Check circuit labeling by de-energizing circuits while circuit tester is in the receptacle. Labeling shall be checked on the load/receptacle and at the breaker.

B. Ground-Fault Receptacle Circuit Interrupter Tests:

1. Participants shall include Contractor, Electrical Subcontractor, and Commissioning Team. (First ten (10) receptacles)

2. Sample: 100 percent; Failure Limit 10 percent.

3. Test each receptacle or branch circuit breaker having ground-fault circuit protection to assure that the ground-fault circuit interrupter will not operate when subjected to a ground-fault current of less than 4 milliamperes and will operate when subjected to a ground-fault current exceeding 6 milliamperes. Perform testing using an instrument specifically designed and manufactured for testing ground-fault circuit interrupters. "TEST" button operation will not be acceptable as a substitute for this test. Replace receptacles that do not shutoff power with 5/1000 of an ampere within 1/40th of a second and retest. Submit test report signed by Test Engineer who performed this test.

C. Lighting and Lighting Control System:

1. Participants shall include Contractor and Electrical Subcontractor.

2. Sample 100 percent, Failure Limit 10 percent.

3. Spot check the lighting systems Start-up and ensure that the all lamps are operational and fixtures are clean.

4. Check all occupancy sensor placement and test reliability of activation/deactivation.

5. Check all switches to ensure proper operation and circuiting.

6. Test operation of circuits by changing system Date and Time to cause various circuits to switch modes. For rooms with occupancy sensors, validate the circuit energizes with occupancy in the space after the lights have been swept off. Test warning flicker prior to off sweep. Test cleaning and shed features.

7. For exterior fixtures, simulate night mode to validate function.

3.5 PARTICIPATION

A. Required participating parties are indicated with the individual tests. Typically, multiple parties are required for any given test, yet participation for any given party is only required for the respective portion of the test for which the party is responsible. In many cases, the maximum required time in hours is indicated in parenthesis for any given test. The time is typically per unit system unless indicated otherwise. If no time is indicated, participation is required throughout the entire test.

B. Frequently, on multiple samples where a given party does not directly conduct the test, the participation of that party will only be required for an initial quantity of systems/equipment. It is required that the parties be available on-site throughout the testing of any given system for which they are required participants. Therefore time for which they are not directly involved can be spent performing other work (typically addressing identified punch list items or failed test).

C. No party involved with the Project is prohibited from participation in or witnessing of any tests. Any Subcontractor may elect to witness all tests on their systems even if their involvement is not directly required.

D. Coordinate effectively with the individual Subcontractors throughout the development and execution of FPT's and maximize Subcontractors' involvement.

3.6 ACCEPTANCE CRITERIA

A. Acceptance criteria for tests are indicated in the Specification Sections applicable to the systems being tested. Generally, unless indicated otherwise, the criteria for acceptance will be that specified with the individual system, equipment, component, or device.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

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. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. ATS: Acceptance testing specification.

B. GFCI: Ground-fault circuit interrupter.

C. GFEP: Ground-fault equipment protection.

D. HID: High-intensity discharge.

E. MCCB: Molded-case circuit breaker.

F. SPD: Surge protective device.

G. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Include evidence of NRTL listing for SPD as installed in panelboard.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include wiring diagrams for power, signal, and control wiring.
10. Key interlock scheme drawing and sequence of operations.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Panelboard Schedules: For installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. Include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Relocate existing panelboard to new location in house.

B. Handle and prepare panelboards for installation according to NECA 407.

1.9 FIELD CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards 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.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify MCA no fewer than 3 days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Construction Manager's written permission.
3. Comply with NFPA 70E.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace SPD that fails in materials or workmanship within specified warranty period.

1. SPD Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

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. Comply with NEMA PB 1.

D. Comply with NFPA 70.

E. Enclosures: Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.
   a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
   b. Outdoor Locations: NEMA 250, Type 3R.
   c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
   d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 5.
2. Height: 84 inches maximum.
3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
7. Finishes:
   a. Panels, Trim and Back Boxes: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   b. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

F. Incoming Mains:
1. Location: Top.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

G. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
   a. Plating shall run entire length of bus.
   b. Bus shall be fully rated the entire length.
2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

6. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and listed and labeled by an NRTL acceptable to authority having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on Drawings. Connectors shall be sized for double-sized or parallel conductors as indicated on Drawings. Do not mount neutral bus in gutter.
7. Split Bus: Vertical buses divided into individual vertical sections.

H. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.

I. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

J. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: Five percent.

K. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.

1. Panelboards rated 240 V or less shall have short-circuit ratings but not less than 10,000 A rms symmetrical.

2.2 PERFORMANCE REQUIREMENTS

A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD

2.3 POWER PANELBOARDS

A. Panelboards: NEMA PB 1, distribution type.

B. Doors: Secured with vault-type latch.

C. Mains: Circuit breaker.

D. Branch Overcurrent Protective Devices: Plug in circuit breakers where individual positive-locking device requires mechanical release for removal.

E. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:
   a. Inverse time-current element for low-level overloads.
   b. Instantaneous magnetic trip element for short circuits.
2. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
3. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
4. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
5. Subfeed Circuit Breakers: Vertically mounted.
6. MCCB Features and Accessories:
   a. Standard frame sizes, trip ratings, and number of poles.
   b. Breaker handle indicates tripped status.
   c. UL listed for reverse connection without restrictive line or load ratings.
   d. Lugs: Compression or Mechanical style, suitable for number, size, trip ratings, and conductor materials.
   e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
   f. Ground-Fault Protection: Integrally mounted and/or remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
   g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
   h. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
   i. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.
   j. Auxiliary Contacts: One, SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
   k. Multipole units enclosed in a factory assembled to operate as a single unit.

2.5 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
   1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store panelboards according to NECA 407.

C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Comply with NECA 1.

C. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.

D. Equipment Mounting:
   1. Attach panelboard to the vertical finished or structural surface behind the panelboard.

E. Mount top of trim 90 inches above finished floor unless otherwise indicated.

F. Mount panelboard cabinet plumb and rigid without distortion of box.

G. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

H. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.

I. Install overcurrent protective devices and controllers not already factory installed.
   1. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

J. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

K. Install filler plates in unused spaces.

L. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

M. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs.

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:
   1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers and low-voltage surge arrestors stated in NETA ATS, Paragraph 7.6 Circuit Breakers and Paragraph 7.19.1 Surge Arrestors, Low-Voltage. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

3.6 PROTECTION

A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

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. Receptacles, receptacles with integral GFCI, and associated device plates.
   2. Tamper-resistant receptacles.
   3. Weather-resistant receptacles.
   4. Wall-switch and exterior occupancy sensors.
   5. Residential Devices
   6. Wall box dimmers
   7. Wall Plates
   8. SPD receptacles

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.
B. GFCI: Ground-fault circuit interrupter.
C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
D. UTP: Unshielded twisted pair.
E. SPD: Surge protective device.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.5 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00
B. Product Data: For each type of product.
C. Shop Drawings: List of legends and description of materials.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
B. Manufactures: Subject to compliance with requirements, provide products by one of the following:
    a. Cooper Wiring Devices, Inc.; Division of Cooper Industries, Inc.
    b. Hubbell Incorporated; Wiring Device-Kellems.
    c. Pass & Seymour/Legrand (Pass & Seymour).

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Wiring Devices, Components, and Accessories: Compliant with all provisions of 2005 Connecticut State Building code and latest amendment.
C. Comply with NFPA 70.
D. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
    1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
    2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
    1. Manufacturers: Comply with Section 2.1.B of this division.
B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
    1. Manufacturers: Comply with Section 2.1.B of this division.
    2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from

mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.4 GFCI RECEPTACLES

A. General Description:,
   1. Duplex GFCI Convenience Receptacles; 125 V, 20 A, straight blade, feed-through type.
   2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
   3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

2.5 SPD RECEPTACLES

A. General Description: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 1449, and FS W-C-596, with integral SPD in line to ground, line to neutral, and neutral to ground.
   1. 125 V, 20 A, straight blade, type.
   2. SPD Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
   3. Active SPD Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

2.6 HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES

A. Wiring Devices for Hazardous (Classified) Locations: Comply with NEMA FB 11 and UL 1010.

2.7 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
B. Switches, 120/277 V, 20 A:
   1. Single Pole
   2. Two Pole
   3. Three Way
   4. Four Way

2.8 RESIDENTIAL DEVICES

A. Residential-Grade, Tamper-Resistant Convenience Receptacles, 125 V, 15 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.

1. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.

B. Weather-Resistant and Tamper-Resistant Convenience Receptacles, 125 V, 15 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.
   1. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.

C. Fan Speed Controls:
   1. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters.
   2. Comply with UL 1917.
   3. Continuously adjustable rotary knob, 1.5 A.
   4. Three-speed adjustable rotary knob, 1.5 A.

D. Telephone Outlet:
   1. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

E. Combination TV and Telephone Outlet:
   1. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

2.9 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.
   2. Material for Finished Spaces: Smooth, high-impact thermoplastic.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable cover.

2.10 FINISHES

A. Device Color:
   1. Wiring Devices Connected to Normal Power System: Almond unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

2.8 METAL BOXES

A. Interior Outlet Boxes: Provide galvanized flat rolled sheet steel interior outlet wiring boxes of types, shapes, and sizes, including box depths to suit each respective location and installation. Construction with stamped knockouts on back and sides, and with threaded screw holes for securing box covers and wiring devices

B. Box Accessories: Provide outlet box accessories as required for each installation.

C. Manufacturer: Subject to compliance with requirements, provide products by one of the following
   1. Raco
   2. Hubbell Incorporated; Wiring Devices Kellems
   3. Thomas and Betts Corp.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1 and NFPA 70, including mounting heights listed in that standard, unless otherwise indicated.
B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.
C. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
D. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
   3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
   4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
   5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
   6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
   7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
   8. Tighten unused terminal screws on the device.
   9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
   10. Fasten boxes rigidly to substrate or structural surfaces.
E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Test Instruments: Use instruments that comply with UL 1436.
   2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:
   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.
   6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 26 51 19

INTERIOR LIGHTING

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. Interior solid-state luminaires that use LED technology.
   2. Interior fluorescent luminaires, lamps, and ballasts.
   3. Lighting fixture supports.

1.3 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.

1.4 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00
B. Product Data: For each type of product.
   1. Arrange in order of luminaire designation.
   2. Include data on features, accessories, and finishes.
   3. Include physical description and dimensions of luminaires.
   4. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
   5. Ballast, including BF.
C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 QUALITY ASSURANCE

A. Provide luminaires from a single manufacturer for each luminaire type.
B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.8 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: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 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. Bulb shape complying with ANSI C79.1.
F. Lamp base complying with ANSI C81.61.
G. CRI of minimum 70. CCT of 3000 K.
H. Rated lamp life of 50,000 hours.
I. Lamps dimmable from 100 percent to 0 percent of maximum light output.
J. Internal driver.
K. Nominal Operating Voltage: 120 V ac.
   1. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.
L. Housings:
   1. Extruded-aluminum housing and heat sink.
   2. White painted finish.

2.2 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:
   1. Lamp end-of-life detection and shutdown circuit.
   2. Automatic lamp starting after lamp replacement.
   3. Sound Rating: Class A.
   4. THD Rating: Less than 20 percent.
   5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   6. Operating Frequency: 20 kHz or higher.
   7. Lamp Current Crest Factor: 1.7 or less.
   8. BF: 0.95 or higher unless otherwise indicated.
   9. Power Factor: 0.95, except luminaires designated as "residential" may use low-power-factor electronic ballasts or higher.
   10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on EMI and RFI for nonconsumer equipment.

2.3 FLUORESCENT LAMPS

A. Compact Fluorescent Lamps: Four-pin or medium screw, CRI of 80 (minimum), color temperature of 3500 K, average rated life of 10,000 hours at three hours of operation per start, and suitable for use with dimming ballasts unless otherwise indicated.
   1. 13 W: T4, double or triple tube, ratede 900 initial lumens (minimum).
   2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
   3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
   4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
   5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
   6. Reflector, Globe, A Shape, Spiral, EL/T, EL/0, or SLS bulbs with 900 initial lumens (minimum)

2.4 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. Tempered Fresnel, glass prismatic glass, diffuse glass, clear glass, prismatic acrylic, or clear UV-stabilized acrylic.
   2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   3. Glass: Annealed crystal glass unless otherwise indicated.

4. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

D. Housings:
1. Extruded-aluminum housing and heat sink.
2. Clear or painted finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
1. Label shall include the following lamp characteristics:
a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI for all luminaires.

2.5 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.

2.6 LUMINAIRE FIXTURE SUPPORT COMPONENTS

A. Adequately support luminaire to wood framing members.
B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish shall match luminaire.
C. Wires: ASTM A 641/A 641M, 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 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1 and NFPA 70.
B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
C. Install lamps in each luminaire.
D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:
1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:
1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

G. 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 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.

H. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.3 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.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

END OF SECTION 265119

SECTION 31 10 00

SITE CLEARING

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. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, site utilities.
8. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary measures and controls.

2. Section 312513 “Erosion Controls” for erosion and sedimentation measures

1.3 DEFINITIONS

A. 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.

B. 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.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to reasonably able to be protected during construction.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to reasonably able to be protected during construction.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise to remain on Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

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 plant designated to remain.

B. Topsoil stripping and stockpiling program.

C. Rock stockpiling program.

D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 CLOSE OUT SUBMITTALS

A. Prepare an accurate plan showing abandoned in place and new utilities

1.8 QUALITY ASSURANCE

A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.9 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. Improvements on Adjoining Property: No work is to take place on adjoining property.

C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises contractor located and identified storage area..

D. Utility Locator Service: Notify Call Before You Dig for area where Project is located before site clearing.

E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

F. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."

G. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

B. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #23 (surface-tolerant, anticorrosive metal primer) or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

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.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner and MCA.

3.2 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, according to erosion- and sedimentation-control drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site as directed by MCA and identified in the pre-construction conference.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain and those that are damaged by construction operations.

3.4 EXISTING UTILITIES

A. Contractor will arrange for location and disconnecting and sealing indicated utilities that serve existing structures before site clearing.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities.

1. Arrange with utility companies to shut off indicated utilities.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. 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 MCA not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without MCA's written permission.
3. Prepare and accurate plan showing the location of existing utilities.

E. Excavate for and remove underground utilities necessary for project work as directed by MCA.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods or air spade for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material 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.

2. Return to site three (3) seasons after substantial completion and repair depressions.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

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.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within protection zones.

3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 STOCKPILING ROCK

A. Remove from construction area naturally formed rocks that measure more than 1 foot across in least dimension. Do not include excavated or crushed rock.

1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

B. Stockpile rock away from edge of excavations without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.

1. Limit height of rock stockpiles to 36 inches.
2. Do not stockpile rock within protection zones.
3. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.

3.8 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.9 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 non-recyclable 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

SECTION 31 20 00

EARTH MOVING

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. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.

B. Related Requirements:

1. Section 01 32 00 "Construction Progress Documentation" for recording pre-excavation and earth-moving progress.
2. Section 31 10 00 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
3. Section 31 23 19 "Dewatering" for lowering and disposing of ground water during construction.
4. Section 31 50 00 "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
5. Section 32 92 00 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
6. Section 32 93 00 "Trees and Shrubs" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength 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.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

F. Fill: Soil materials used to raise existing grades.

G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 1.5 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.

H. 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.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. 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.

K. Unauthorized Excavation: Excavation Beyond indicated elevations, dimensions, and lines. Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by MCA. Unauthorized excavation, as well as remedial work directed by MCA, shall be without additional compensation.

L. Unsatisfactory Soil: Soil determined not to meet the intent of the project needs.

M. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct preexcavation conference at Project site.

1. Review methods and procedures related to earthmoving, including, but not limited to, the following:

a. Personnel and equipment needed to make progress and avoid delays.
b. Coordination of Work with utility locator service.

c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
d. Extent of trenching by hand or with air spade.
e. Field quality control.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Geofoam.
4. Warning tapes.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 1557.

C. Preexcavation Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.7 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.8 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving 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 traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Not Allowed

C. Utility Locator Service: Notify "Call Before You Dig" for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 01 50 00 "Temporary Facilities and Controls", Section 31 25 13 “Erosion Controls”, and Section 31 10 00 "Site Clearing" are in place.

E. Do not commence earth-moving operations until plant-protection measures are in place as specified in drawings and Section 31 1000 “Site Clearing”.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. 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.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Processed Aggregate (3/4" size): Material shall consist of sound, tough, durable particles of crushed or uncrushed gravel, free from soft, thin, elongated or laminated pieces and vegetable or other deleterious substances. It shall be hard and durable enough to resist weathering, traffic abrasion and crushing. Use materials conforming to the requirements of Articles M.02.02 and M.02.06 of CT-DOT Form 816. Grading "C" shall be used.

Grading "C" (in accordance w/ CT-DOT Form 816)	
Sieve Size	Percent Passing
1.5 inch	100
3/4"	45-80
1/4"	25-60
#10	15-45
#40	5-25
#100	0-10
#200	0-5

G. Requirements for Offsite Soils: Offsite soils brought in for use as backfill shall be tested for TPH, BTEX and full TCLP including ignitability, corrosivity and reactivity. Backfill shall not be able to be described as polluted soil and must have no detectable level of total hydrocarbons (TPH), Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX). TPH concentrations shall be determined by using EPA 600/4-79/020 Method 418.1. BTEX concentrations shall be determined by using EPA SW-846.3-3a Method 5030/8020. TCLP shall be performed in accordance with EPA SW-846.3-3a Method 1311. Provide Borrow Site Testing for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site for a maximum of one sample for each 100 cubic yards.

H. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

I. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

J. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

K. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

L. Sand: ASTM C 33/C 33M; fine aggregate.

M. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. The geotextile shall be non-woven, non-rotting, acid and alkali resistant and have sufficient strength and permeability for the purpose intended, including handling and backfilling operations. Fibers shall be low water absorbent. The fiber network must be dimensionally stable and resistant to delamination. The geotextile shall be free of any chemical treatment or coating that will reduce its permeability. The geotextile shall also be free of any flaws or defects, which will alter its physical properties. Torn or punctured geotextiles shall not be used. For each specific use, only geotextiles, which are already on the Connecticut Department of Transportation's "Qualified Products List" for the geotextile type, will be used. For Subsurface drainage, Class B shall be used. For Separation (including use in construction entrance), high survivalibility shall be used. The Engineer reserves the right to reject any geotextile, which he deems unsatisfactory for a specific use. The brand name shall be labeled on the geotextile or the geotextile container. Geotextiles, which are susceptible to damage from sunlight or heat, shall be so identified by suitable warning information on the packaging material.

2.3 CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

A. Controlled Low-Strength Material or Flowable Fill: Self-compacting, low-density, flowable concrete material produced from the following:

1. Portland Cement: Type I/ Type II
2. Fly Ash: None
3. Normal-Weight Aggregate: ASTM C 33/C 33M, 3/8-inch nominal maximum aggregate size.
4. Foaming Agent: ASTM C 869/C 869M.
5. Water: ASTM C 94/C 94M.
6. Air-Entraining Admixture: ASTM C 260/C 260M.

B. Produce low-density, controlled low-strength material with the following physical properties:

1. Unit Weight (wet): 70-110 lb/cf or as specified by MCA, at point of placement, when tested according to ASTM C 138/C 138M.
2. Compressive Strength: 70-100 psi or as specified when necessary for project work, when tested according to ASTM C 495/C 495M.

3. Air Entrainment: 15-30%

2.4 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. 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 as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

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 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 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, unauthorized 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.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

   a. 24 inches outside of concrete forms other than at footings.
   b. 16 inches outside of concrete forms at footings.
   c. 6 inches outside of minimum required dimensions of concrete cast against grade.
   d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
   e. 6 inches beneath bottom of concrete slabs-on-grade.
   f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 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. 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. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.

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.

3.6 EXCAVATION FOR PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

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.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade 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 subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. 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.

3.8 SUBGRADE INSPECTION

A. Notify MCA when excavations have reached required subgrade.

B. If MCA determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade beneath pavements to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by MCA, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the work as set forth in other divisions. Unit Prices set forth in Section 01 22 00 “Unit Prices” shall be ineffect.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by MCA, without additional compensation.

3.9 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 MCA.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by MCA at no additional compensation.

3.10 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.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, damp proofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 03 30 53 "Miscellaneous Cast-in-Place Concrete."

D. Backfill voids with satisfactory soil while removing shoring and bracing.

E. Initial Backfill: Shall be one of the following;

1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

    a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

F. Final Backfill :Shall be one of the following;

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

3.13 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 follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 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.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 12 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 92 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 85 percent.

3.16 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 to restore site substantially to the condition it existed prior to commencement of construction activity.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve restoration of site to conditions that existed prior to the commencement of construction, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch and as directed by MCA.
2. Walks: Plus or minus 1 inch and as directed by MCA.
3. Pavements: Plus or minus 1 inch and as directed by MCA.

C. Grading inside Building Lines: As directed by MCA.

3.17 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 if directed by MCA under pavements and walks as follows:
1. Place base course material over subbase course under hot-mix asphalt pavement.
2. Shape subbase course and base course to required crown elevations and cross-slope grades.
3. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
4. 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.
5. 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.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.18 FIELD QUALITY CONTROL

A. Special Inspections: Contractor will engage at their expense a qualified special inspector to perform the following special inspections:

1. Determine (prior to placement of fill) that site has been prepared in compliance with requirements.
2. Determine that fill material classification and maximum lift thickness comply with requirements.
3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Contractor will engage at their expense a qualified geotechnical engineering testing agency to perform tests and inspections. Coordinate with MCA.

C. 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.

D. 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 MCA.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 500 square feet or less of paved area or building slab but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 50 feet or less of wall length but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 75 feet or less of trench length but no fewer than two tests.

F. 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.

3.19 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.

1. Scarify or remove and replace soil material to depth as directed by MCA; reshape and recompact.

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.

3.20 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

SECTION 31 23 19

DEWATERING

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 technical provisions for construction dewatering that are not anticipated to be necessary for project work. Any construction dewatering and other provisions of this section shall be provided by the contractor at no additional cost

B. Related Requirements:
   1. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
   3. Review geotechnical report.
   4. Review proposed site clearing and excavations.
   5. Review existing utilities and subsurface conditions.
   6. Review observation and monitoring of dewatering system.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.

   1. Include plans, elevations, sections, and details.
   2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.

3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor and professional engineer.

B. Field quality-control reports.

C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work.

1.7 FIELD CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.

1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.
2. The geotechnical report is included elsewhere in Project Manual.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
3. Prevent surface water from entering excavations by grading, dikes, or other means.
4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
5. Remove dewatering system when no longer required for construction.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations 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 dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls as directed by MCA and as specified in Section 015000 "Temporary Facilities and Controls," Section 311000 "Site Clearing," during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.

1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

B. Survey-Work Benchmarks: Resurvey benchmarks biweekly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify MCA if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

D. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION

SECTION 31 25 13

EROSION CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Silt Fence.
   2. Silt Boom.
   3. Baled Hay.
   4. Seeding and Mulching.
   5. Construction Entrance.

B. Related Sections:
   1. Section 31 10 00 - Site Clearing.
   2. Section 31 20 00 – Earth Moving.
   3. Section 32 92 00 – Turfs and Grasses
   4. Section 32 93 00 – Trees and Shrubs

1.2 REFERENCES

A. Connecticut Council on Soil and Water Conservation:
   1. “2002 Connecticut Guidelines for Soil Erosion and Sediment Control”

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on geotextiles and mulching.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the State of Connecticut Department of Transportation (CT-DOT) Form 816, "Standard Specifications for Roads, Bridges and Incidental Construction 2004", including Supplemental Specifications.

B. Perform Work in accordance with the most current edition of the Connecticut DEP Guidelines for Soil Erosion and Sediment Control.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

PART 2 PRODUCTS

2.1 BALED HAY MATERIALS

A. 20" x 20" x 30" - 40 lbs/bale minimum. Wire or nylon bound bales, oriented around sides, rather than over and under.
   1. Bales shall be free from weed seeds and rough or woody materials.
   2. Stakes for bales shall be made of sound hardwood 2” x 2” in size or steel reinforcing bars of at least No. 4 size. Lengths shall be approximately three feet.

2.2 MATS AND NETTINGS

A. Jute matting shall be of open weave, single jute yarn averaging 130 pounds per spindle of 14,400 yards. The yarn shall be of loosely twisted construction, not varying the thickness by more than ½ its normal diameter. The woven material shall be 48 inches wide, plus or minus one 1 inch, and with approximately 78 warp ends per width of cloth and 41 weft ends per linear yard. The woven material shall weigh 1.22 pounds per linear yard with a tolerance of plus or minus 5 percent.

B. Excelsior matting shall be wood excelsior, at least 35 inches in width, and weighing 0.8 pounds per square yard plus or minus 5 percent. The excelsior material shall be covered with a netting on one side to facilitate handling and to increase strength.

C. Staples shall be number 11 (or heavier) plain iron wire, made from lengths of at least 12 inches each or as specified by manufacturer.

2.3 SILT FENCE

A. Fabricated or prefabricated unit consisting of the following filter fabric properties:

1. Grab Tensile Strength (lbs)	120	ASTM D4632
2. Elongation at Failure (%)	12.5	ASTM D4632
3. Mullen Burst Strength (psi)	285	ASTM D3786
4. Puncture Strength (lbs)	62	ASTM D4833
5. Trapezoidal Tear (lbs)	60	ASTM D4533
6. Permittivity (sec $^{-1}$)	0.04	ASTM D-4491
7. UV Resistance @500 hours (%)	75	ASTM D-4355

2.4 SILT BOOM

A. Prefabricated unit consisting of the following properties:
   1. Polypropylene
   2. Minimum 12 inch diameter
   3. Filtrexx Siltsoxx or equal

2.5 POLYETHYLENE SHEETING (POLY)

A. All polyethylene sheeting used for covering stockpiled materials shall have a minimum thickness of 6 mils.

B. Sandbags used to secure polyethylene sheeting covers shall have a minimum weight of 20 lbs.

C. Silt fencing shall be located down gradient of any stockpiled materials. Silt fencing shall be appropriately maintained.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify gradients and elevations are correct.

3.2 SILT FENCE

A. Excavate a 6 inch trench along the upstream side of the desired fence location.

B. Drive fence posts a minimum of 12” into the ground. Install fence, well-staked at maximum eight foot intervals in locations as shown on Drawings. Secure fabric to fence and bury fabric end within the six inch deep trench cut.

C. Lay lower 12 inches of silt fence into the trench, 6 inches deep and 6 inches wide. Backfill trench and compact.

D. Overlap joints in fabric at post to prevent leakage of silt at seam.

3.3 SILT BOOM

A. Secure in place using No. 4 steel rebar or 2 inch by 2 inch by 36 inch long wooden stakes at maximum distance of 10 foot on center.

B. Do not drive over silt boom with construction vehicles or vehicles. Remove silt boom from the construction entrance in the morning prior to construction activities. Reinstall at end of the day immediately before fence is closed and secured.

C. Remove sediment on upslope side once accumulation has reached 50% of effective height.

3.4 BALED HAY

A. Excavation shall be to the width of the bale and the length of the proposed barrier to a minimum depth of 4 inches.

B. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another. In swales and ditches the barrier shall extend to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale.

C. Staking shall be accomplished to securely anchor bales by driving at least two stakes or rebars through each bale to a minimum depth of 18 inches.

D. The gaps between bales shall be filled by wedging straw in the gaps to prevent water from escaping between the bales.

E. The excavated soil shall be backfilled against the barrier. Backfill shall conform to ground level on the downhill side and shall be built up to 4 inches on the uphill side. Loose straw shall then be scattered over the area immediately uphill from a straw barrier.

F. Inspection shall be frequent and repair or replacement shall be made promptly as needed.

3.5 MULCHING, MATTING, AND SEEDING (TURF ESTABLISHMENT)

A. Mulching:
   1. Mulching shall be done immediately after each area has been properly prepared.
   2. When seed for erosion control is sown prior to placing the mulch, the mulch shall be placed on the seeded areas within 24 hours after seeding. Hay that has been thoroughly fluffed shall be applied at approximately three tons per acre unless otherwise ordered or noted.
   3. Blowing chopped mulch will be permitted when authorized. Authorization will be given when it can be determined that the mulch fibers will be of such length and applied in such a manner that there will be a minimum amount of matting that would retard the growth of plants.
   4. Hay mulch should cover the ground enough to shade it, but the mulch should not be so thick that a person standing cannot see ground through the mulch. Matted mulch or bunches shall be removed or otherwise taken care of.
   5. In order to prevent the wind from displacing the mulch, after the mulch has been spread to the required depth, a light covering of loose branches, a system of pegs and strings, or other approved anchoring method shall be employed. Unless otherwise ordered, such means of control shall be removed prior to the acceptance of the project.
   6. All baling wire or rope, such as that used in the shipment of mulch shall be disposed of outside the limits of the project in approved areas

B. Seeding: Seed any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 92 00 at 75 percent of permanent application rate with no topsoil.
   3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 00 permanent seeding specifications.

C. Stabilize diversion channels, sediment traps, and stockpiles immediately. Stockpile and waste pile heights shall not exceed 10 feet. Slope stockpile sides at 2:1 or flatter

3.6 STABILIZED CONSTRUCTION ENTRANCE

A. Install a stabilized construction entrance at the site to minimize tracking of site soil and sediment onto nearby roads.

B. Ensure that the stabilized construction entrance is a minimum of 24 feet wide by 50 feet long and modify as necessary to accommodate site constraints. Place an adequate radius at the intersection with the road to prevent tracking of mud at the edge of the entrance.

C. Remove all vegetation and any objectionable material from the foundation area. Divert all surface runoff and drainage from the stabilized construction entrance to a sediment trap or basin. Install a non-woven geotextile fabric on the CT Dot Qualified Product List before placing any stone. If necessary, install a culvert pipe across the entrance to provide positive drainage. Place the aggregate stone at a minimum depth of 6 inches uniform on top of the geotextile fabric.

D. Inspect stabilized construction entrances every seven (7) days. Check for mud and sediment buildup and pad integrity. Wash, replace, or add stone whenever the entrance fails to perform effectively or as directed by the inspector. The stone in the entrance should be washed or replaced whenever the entrance fails to reduce mud being carried offsite by vehicles. Frequent washing will extend the useful life of the stone.

E. Reshape stone pad as needed for drainage and runoff control. Brush or sweep up soil that has been tracked offsite immediately for proper disposal. Flushing should only be used when the water can be discharged to a sediment trap or basin. Maintain the stabilized construction entrance until the remainder of the construction site has been fully stabilized. Repair any broken pavement immediately.

F. If the aggregate material is being tracked offsite, limit larger vehicles from the construction site or use a larger diameter stone. If excessive sediment is being tracked onto the roadway, increase the length of the stabilized construction entrance.

3.7 DUST CONTROL

A. Throughout the project the Contractor shall carry on an active program for the control of fugitive dust within all site construction zones, or areas disturbed as a result of construction. Control methods shall include the following: Apply fine mist of water at a uniform rate in areas subject to blowing. For emergency control of dust apply water to affected areas. The source of supply and the method of application for water are the responsibility of the Contractor. The Contractor shall comply with all applicable requirements of the stormwater discharge permit for construction.

B. The frequency and methods of application for fugitive dust control shall be as directed by MCA.

3.8 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

3.9 CLEANING

A. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

B. Do not damage structure or device during cleaning operations.

C. Do not permit sediment to erode into construction or site areas or natural waterways.

D. Clean channels when depth of sediment reaches approximately one half channel depth.

END OF SECTION

SECTION 31 50 00

EXCAVATION SUPPORT AND 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.

1.2 SUMMARY

A. Section includes technical provisions for temporary excavation support and protection systems that are not anticipated to be necessary for project work. Any excavation support and protection systems and other provisions of this section shall be provided by the contractor at no additional cost

B. Related Requirements:
   1. Section 312000 "Earth Moving" for excavating and backfilling and for controlling surface-water runoff and ponding.
   2. Section 312319 "Dewatering" for dewatering excavations.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Review geotechnical report.
   2. Review existing utilities and subsurface conditions.
   3. Review coordination for interruption, shutoff, capping, and continuation of utility services.
   4. Review proposed excavations.
   5. Review proposed equipment.
   6. Review monitoring of excavation support and protection system.
   7. Review coordination with waterproofing.
   8. Review abandonment or removal of excavation support and protection system.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.

B. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.
3. Indicate type and location of waterproofing.
4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor and professional engineer.

B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Existing Conditions: Using photographs and video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.

D. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.6 FIELD CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify MCA no fewer than three days in advance of proposed interruption of utility.
2. Do not proceed with interruption of utility without MCA's written permission.

B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. MCA is not responsible for interpretations or conclusions drawn from the data.

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection according to the performance requirements.
2. The geotechnical report is included elsewhere in Project Manual.

C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. The contractor shall either be responsible for the design, monitoring, and maintenance of excavation support and protection system(s) as described under B. or delegate these services to a professional engineer as described under C.

B. Be responsible for the design, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads. The system shall:

1. Prevent surface water from entering excavations by grading, dikes, or other means.
2. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
3. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

C. Delegate design services for the design of excavation support and protection systems including a comprehensive engineering analysis to a qualified professional engineer. The contractor shall then, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads to a qualified professional engineer. The contractor shall also;

1. Prevent surface water from entering excavations by grading, dikes, or other means.
2. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
3. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

2.2 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

1. Corners: Roll-formed corner shape with continuous interlock.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application.

E. Shotcrete: Comply with American Concrete Institute (ACI) 506.2-13 – "Specification for Shotcrete"

F. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

G. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

H. Tiebacks: Steel bars, ASTM A 722/A 722M.

I. Tiebacks: Steel strand, ASTM A 416/A 416M.

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 that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

3.2 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks weekly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify MCA if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.3 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
2. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earth Moving."
3. Repair or replace, as approved by MCA, adjacent work damaged or displaced by removing excavation support and protection systems.

B. Leave excavation support and protection systems permanently in place.

END OF SECTION

SECTION 31 62 19

TIMBER PILES

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 pressure treated (PT) round timber piles.

1.3 UNIT PRICES

A. Contract Sum: Base Contract Sum on number and dimensions of piles indicated from tip to cutoff, plus not less than 12 inches of overlength for cutting piles at cutoff elevations.

B. Work of this Section is affected as follows:

1. Additional payment for pile lengths in excess of that indicated, and credit for pile lengths less than that indicated, is calculated at unit prices stated in the Contract, based on net addition or deduction to total pile length as determined by MCA and measured to nearest 12 inches.
   a. Additional payment for splices required to extend pile lengths in excess of that indicated is calculated at unit prices stated in the Contract.

2. Additional payment for number of piles in excess of that indicated, and credit for number of piles less than that indicated, is calculated at unit prices stated in the Contract.
3. Unit prices include labor, materials, tools, equipment, and incidentals for furnishing, driving, cutting off, capping, and disposing of cutoffs.
4. Test piles that become part of permanent foundation system are considered as an integral part of the Work.
5. No payment is made for rejected piles, including piles driven out of tolerance, defective piles, or piles damaged during handling or driving.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For timber piles. Show fabrication and installation details for piles, including details of driving shoes, tips or boots, and pile butt protection.
   1. Pile Splice Design.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Round timber pile treatment data as follows, including chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material:

   1. For each type of preservative-treated timber product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
   2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.

C. Pile-Driving Equipment Data: Include type, make, and rated energy range; weight of striking part of hammer; weight of drive cap; and, type, size, and properties of hammer cushion.

D. Static Pile Test Reports: Submit within three days of completing each test.

E. Pile-Driving Records: Submit within three days of driving each pile.

F. Certified Piles Survey: Submit within seven days of pile driving completion.

G. Field quality-control reports.

H. Material Certificates: For preservative-treated piles. Indicate type of preservative used and net amount of preservative retained.

I. Preconstruction Photographs: Photographs or video of existing conditions of adjacent construction. Submit before the Work begins.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

   1. Installer's responsibility includes engaging a qualified professional engineer to prepare pile-driving records.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

1.8 PRECONSTRUCTION TESTING

A. General: Static pile tests are used to verify driving criteria and pile lengths and to confirm allowable load of piles.

1. Furnish test piles 60 inches longer than production piles.
2. Determination of actual length of piles is based on results of static pile tests.

B. Pile Tests: Arrange and perform the following pile tests:

1. Axial Compressive Static Load Test: ASTM D 1143/D 1143M. Procedure A, Quick Test.

C. Equip each test pile with two telltale rods, according to ASTM D 1143/D 1143M, for measuring deformation during load test.

D. Provide pile reaction frame, anchor piles, equipment, and instrumentation with enough reaction capacity to perform tests. Notify MCA at least 48 hours in advance of performing tests. On completion of testing, remove testing structure, anchor piles, equipment, and instrumentation.

1. Allow a minimum of seven days to elapse after driving test piles before starting pile testing.
2. Number of Test Piles: One pile.

E. Drive test piles at locations indicated to the minimum penetration or driving resistance indicated. Use test piles identical to those required for Project, and drive with appropriate pile-driving equipment operating at rated driving energy to be used in driving permanent piles.

1. Pile Design Load: As indicated.

F. Approval Criteria: Allowable load shall be the load acting on the test pile when the lesser of the following criteria are met, divided by a factor of safety of 2.0:

1. Net settlement, after deducting rebound, of not more than 0.01 inch/ton of test load.
2. Total settlement exceeds the pile elastic compression by 0.15 inch, plus 1.0 percent of the tip diagonal dimension.
3. A plunging failure or sharp break in the load settlement curve.

G. Test Pile-Driving Records: Prepare driving records for each test pile, compiled and attested to by a qualified professional engineer. Include same data as required for driving records of permanent piles.

H. Test piles that comply with requirements, including location tolerances, may be used on Project.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver piles to Project site in such quantities and at such times to ensure continuity of installation. Handle and store piles at Project site to prevent breaks, cuts, abrasions, or other physical damage and as required by AWPA M4.

1. Do not drill holes or drive spikes or nails into pile below cutoff elevation.

1.10 FIELD CONDITIONS

A. Protect structures, underground utilities, and other construction from damage caused by pile driving.

B. Site Information: A geotechnical report has been prepared for this Project and is included elsewhere in the Project Manual for information only.

C. Preconstruction Photographs: Inventory and record the condition of adjacent structures, underground utilities, and other construction. Document conditions that might be misconstrued as damage caused by pile driving.

PART 2 - PRODUCTS

2.1 TIMBER PILES

A. Round Timber Piles: ASTM D 25, unused, clean peeled, one piece from butt to tip; of the following species and size basis:

1. Species: Southern yellow pine.
2. Size Basis: Timber piles shall be tapered with a minimum butt diameter of 14 inches and a tip diameter of 9 inches

B. Pressure-treat round timber piles according to AWPA U1 as follows:

1. Service Condition: UC5A Marine Waters
2. Treatment:
   a. Waterborne preservative (ACQ, ACZA, or CA)
      1) Minimum retention of preservatives in lbs per cubic foot:
         a) ACQ 1.5 lbs per cubic foot

2.2 PILE ACCESSORIES

A. Driving Shoes: Fabricate from ASTM A 1011/A 1011M, hot-rolled carbon-steel strip to suit pile-tip diameter, of the following type and thickness, and secure to pile tip so as to not affect pile alignment during driving:

1. Type: Flat boot.
2. Thickness: 1/4 inch.

2.3 FABRICATION

A. Pile Tips: Cut and shape pile tips to accept driving shoes. Fit and fasten driving shoes to pile tips according to manufacturer's written instructions.

B. Pile Butt: Trim pile butt and cut perpendicular to longitudinal axis of pile. Chamfer and shape butt to fit tightly to driving cap of hammer.

C. Field-Applied Wood Preservative: Treat field cuts, holes, and other penetrations according to AWPA M4.

1. Coal-tar roofing cement for treating drilled holes or sealing cutoffs shall be free of asbestos.

D. Pile Splices: No pile splice shall be allowed with 10’ of finished grade.

E. Pile-Length Markings: Mark each pile with horizontal lines at 12-inch intervals; label the distance from pile tip at 60-inch intervals. Maintain markings on piles until driven.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Conditions: Do not start pile-driving operations until earthwork fills have been completed or excavations have reached an elevation of 6 to 12 inches above bottom of footing or pile cap.

3.2 DRIVING EQUIPMENT

A. Pile Hammer: Air-, steam-, hydraulic-, or diesel-powered type capable of consistently delivering adequate peak-force duration and magnitude to develop the ultimate capacity required for type and size of pile driven and character of subsurface material anticipated.

B. Hammer Cushions and Driving Caps: Between hammer and top of pile, provide hammer cushion and steel driving cap as recommended by hammer manufacturer and as required to drive pile without damage.

C. Leads: Use fixed, semifixed, or hanging-type pile-driver leads that hold the full length of pile firmly in position and in axial alignment with hammer.

3.3 DRIVING PILES

A. General: Continuously drive piles to elevations or penetration resistance indicated. Establish and maintain axial alignment of leads and piles before and during driving.

B. Spudding: Drive spud piles through overlying highly resistant strata or obstructions and withdraw for reuse.

C. Predrilling: Provide pre-excavated holes where indicated, to depths indicated. Drill holes with a diameter less than the largest cross-section dimension of pile.

1. Firmly seat pile in predrilled hole by driving with reduced energy before starting final driving.

D. Heaved Piles: Redrive heaved piles to tip elevation at least as deep as original tip elevation with a driving resistance at least as great as original driving resistance.

E. Driving Tolerances: Drive piles without exceeding the following tolerances, measured at pile heads:

1. Location: 4 inches from location indicated after initial driving, and 6 inches after pile driving is completed.
2. Plumb: Maintain 1 inch in 48 inches from vertical, or a maximum of 4 inches, measured when pile is aboveground in leads.
3. Batter Angle: Maximum 1 inch in 48 inches from required angle, measured when pile is aboveground in leads.

F. Withdraw damaged or defective piles and piles that exceed driving tolerances, and install new piles within driving tolerances.

1. Fill holes left by withdrawn piles using cohesionless soil material such as gravel, broken stone, and gravel-sand mixtures. Place and compact in lifts not exceeding 72 inches.
2. Fill holes left by withdrawn piles as directed by MCA.

G. Abandon and cut off rejected piles as directed by MCA. Leave rejected piles in place and install new piles in locations as directed by MCA.

H. Cut off butts of driven piles square with pile axis and at elevations indicated.

1. Cover cut-off piling surfaces with caps overlapping pile end by minimum 2 inches according to AWPA M4.

I. Pile-Driving Records: Maintain accurate driving records for each pile. Include the following data:

1. Project name and number.
2. Name of Contractor.
3. Pile species.
4. Pile location in pile group and designation of pile group.

5. Sequence of driving in pile group.
6. Pile dimensions.
7. Ground elevation.
8. Elevation of tips after driving.
9. Final tip and cutoff elevations of piles after driving pile group.
10. Records of redriving.
11. Elevation of splices.
12. Type, make, model, and rated energy of hammer.
13. Weight and stroke of hammer.
14. Type of pile-driving cap used.
15. Cushion material and thickness.
16. Actual stroke and blow rate of hammer.
17. Pile-driving start and finish times, and total driving time.
18. Time, pile-tip elevation, and reason for interruptions.
19. Number of blows for every 12 inches of penetration, and number of blows per 1 inch for the last 6 inches of driving.
20. Pile deviations from location and plumb.
21. Preboring, jetting, or special procedures used.
22. Unusual occurrences during pile driving.

J. Certified Piles Survey: Engage a land surveyor to prepare a piles survey showing final location of piles in relation to the property survey and existing benchmarks.

1. Notify MCA when deviations from locations exceed allowable tolerances.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Contractor will engage a qualified special inspector to perform the following special inspections:

1. Pile foundations.

B. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.

3.5 DISPOSAL

A. Remove withdrawn piles and cutoff sections of piles from site and legally dispose of them off Owner's property.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Erection, maintenance, and dismantling of temporary fencing around construction site and materials storage areas.
   2. Refer to Drawings for temporary fence type, layout, and location of gates.

1.2 SUBMITTALS

A. Shop drawing indicating layout of temporary fencing, location and size of gates, existing pavement and other site specific conditions.

PART 2 PRODUCTS

2.1 TEMPORARY CHAIN LINK FENCING

A. Unless otherwise indicated, type of temporary chain link fencing shall be Contractor's option. The following types are acceptable:
   1. New materials or previously used salvaged chain link fencing in good condition and at least 6 feet in height.
   2. Posts: Galvanized steel pipe of diameter to provide rigidity. Post shall be suitable for setting in concrete footings, driving into ground, anchoring with base plates, or inserting in precast concrete blocks.
   3. Fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.

B. Gates: Provide personnel and vehicle gates of the quantity and size indicated on the Drawings or required for functional access to site.
   1. Fabricate of same material as used for fencing.
   2. Vehicle gates:
      a. Minimum width: 20 feet to allow access for emergency vehicles.
      b. Capable of manual operation by one person.

2.2 PERMANENT CHAIN LINK FENCING

A. Fence Height: 7 feet nominal.

B. Line Post Spacing: At intervals not exceeding 10 feet

C. Fence Post and Rail Strength: Conform to ASTM F1043 Heavy Industrial Fence quality.

PART 3 EXECUTION

3.1 LAYOUT

A. Installation of temporary fencing shall not deter or hinder access to existing and new hose connections and fire hydrants.
   1. Maintain 3 feet diameter clear space around fire hydrants.
   2. Where fire hydrant or hose connection is blocked by fencing, provide access gate.

B. Access: Provide gates for personnel, delivery of materials, and access by emergency vehicles.

C. Field verify location with the Engineer.

3.2 INSTALLATION

A. Chain link posts:
   1. Space at 10 feet maximum.
   2. Drive posts, set in holes and backfill, or anchor in precast concrete blocks or other provide other suitable means of anchoring.
   3. For soft and unstable ground conditions, cast concrete plug around post.
   4. Posts over pavement: Use steel post plates or precast concrete blocks.
   5. Gate posts: Use bracing or concrete footings to provide rigidity for accommodating size of gate.

B. Fabric: Securely attach to posts.

C. Gates: Install with required hardware.

D. Plastic mesh fencing: Space steel support posts to ensure mesh remains vertical and at proper height. Securely tie mesh to posts.

3.3 MAINTENANCE AND REMOVAL

A. Maintain fencing in good condition. If damaged, immediately repair.

B. Remove temporary fencing upon completion of Work or when no longer required for security or control. Backfill holes and compact. Holes in pavement shall be surfaced to match existing paving. Repair damage caused by installation of temporary fencing.

END OF SECTION

SECTION 32 92 00

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.

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Mulches
3. Topsoil

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.

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 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 and seed, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
   1. Pesticide Applicator: CT licensed, commercial.

1.7 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. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

C. 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.

1.8 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 completion.

1. Spring Planting: Shall occur between April 1 to June 15 or as approved by MCA
2. Fall Planting: Shall occur between August 15 to October 15 or as approved by MCA

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.

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 for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:

a. 35 percent Kentucky bluegrass (Poa pratensis).
b. 35 percent chewings red fescue (Festuca rubra variety).
c. 30 percent perennial ryegrass (Lolium perenne).

2.2 TOPSOIL.

A. Topsoil: Topsoil shall meet requirements of CT DOT Form 816 Section M.13.01.

1. Topsoil: Reuse surface soil stockpiled on-site and supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Verify suitability of stockpiled surface soil to produce topsoil. The Contractor shall notify MCA of the location of off-site topsoil source and get approval from MCA for its use.

2.3 FERTILIZERS

A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 8 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Manufacturers: Milorganite or equal

2. Composition: 5 percent nitrogen, 2 percent phosphorous, 1 percent potassium, and 4% iron, by weight based on manufacturer’s data.

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. Wood Fiber Mulch: wood fiber mulch shall meet requirements of CT DOT Form 816 Section M.13.05.

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.

2.6 EROSION-CONTROL MATERIALS

A. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

B. Erosion-Control Mats: Cellular, nonbiodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 3-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.

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. Tenax Corporation - USA.
b. North American Green

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 MCA 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 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 industry accepted methods.

B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade or 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 MCA's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 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.

B. Mix slurry with nonasphaltic or fiber-mulch manufacturer's recommended tackifier.

C. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.5 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.6 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.

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 2 lb/1000 sq. ft. or as recommended by the seed manufacturer..

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with erosion-control mats where directed by MCA; 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 to form a continuous blanket 1-1/2 inches 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.

G. Protect seeded areas from hot, dry weather or drying winds by applying planting soil within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.7 TURF RENOVATION

A. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
2. Install new planting soil as required.

B. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

C. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

D. Mow, dethatch, core aerate, and rake existing turf.

E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

H. Apply initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
   1. Initial Fertilizer: Slow-release fertilizer applied according to manufacturer's recommendations.

I. Apply seed and protect with straw mulch or sod as required for new turf.

J. Water newly planted areas and keep moist until new turf is established.

3.8 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: Maintain a system to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
   1. Water turf with fine spray at a minimum rate of 1 inch 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 grass to a height of 3 to 3.5 inches.

D. Turf Post fertilization: Apply slow-release fertilizer after initial mowing and when grass is dry.

3.9 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by MCA:

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. and bare spots not exceeding 5 by 5 inches.
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.10 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.

3.11 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 non-degradable erosion-control measures after grass establishment period.

3.12 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.

END OF SECTION

SECTION 32 93 00

TREES AND SHRUBS

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. Section Includes:
   1. Shrubs.
   2. Trees.
   3. Plants.

B. Related Sections:
   1. Division 31 Section 31 10 00 "Site Clearing" for protection of existing trees and plantings, topsoil stripping and stockpiling, and site clearing.
   2. Division 31 Section 31 20 00 "Earthmoving" for excavation, filling, and rough grading.
   3. Division 32 Section 32 92 00 "Turfs and Grasses" for lawn planting.

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container.

D. Bare-Root Stock: Exterior 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 minimum root spread according to ANSI Z60.1 for type and size of exterior plant required.

E. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with 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 exterior plant required.

F. Finish Grade: Elevation of finished surface of planting soil.

G. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

H. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

I. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

J. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each of the following:
   1. Edging materials and accessories, of manufacturer's standard size, to verify color selected.

C. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

   1. Manufacturer's certified analysis for 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.

D. Material Test Reports: For imported topsoil.

E. Warranty: 2 year minimum for plants, shrubs, and trees.

1.5 QUALITY ASSURANCE.

A. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

   1. Selection of exterior plants purchased under allowances will be made by MCA, who will tag plants at their place of growth before they are prepared for transplanting.

B. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above the ground for trees up to 4-inch caliper size, and 12 inches above the ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver exterior plants freshly dug.

1. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

B. Do not prune trees and shrubs before delivery except as approved by MCA. Protect bark, branches, and root systems from sun scald, drying, 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 exterior plants during delivery. Do not drop exterior plants during delivery and handling.

C. Handle planting stock by root ball.

D. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants and trees in shade, protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.7 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: April 15 to June 15.
2. Fall Planting: August 15 to September 15.

B. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns unless otherwise acceptable to MCA.

1. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

1.8 WARRANTY

1. Warranty Periods from Date of Substantial Completion:

a. Trees and Shrubs: Two years.

b. Plants: Two Years

2. Include the following remedial actions as a minimum:

a. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.
b. Replace exterior 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 exterior plant will be required except for losses or replacements due to failure to comply with requirements.
d. Provide extended warranty for replaced plant materials; warranty period equal to original warranty period.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

A. General: Match existing trees and shrubs, and plants to be removed during construction operations.

B. Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

C. Provide trees and shrubs of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to MCA, 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 shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

E. Label each tree and shrub with securely attached, waterproof tag bearing legible designation of botanical and common name.

F. Label at least one tree and one shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

2.2 SHADE AND FLOWERING TREES

A. General: Match existing trees and shrubs, and plants to be removed during construction operations.

B. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.

1. Provide as specified on the plans.

C. Flowering Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:

1. Provide as specified on the plans.

2.3 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 6 percent organic material content and a maximum of 20% organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth. The topsoil shall meet USDA textural classification of loamy sand, sandy loam, loam, or silt loam (with a maximum of 60% silt).

1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land**,** bogs or marshes. The Contractor shall notify MCA of the location of off-site topsoil source and get approval from MCA for its use.

2.4 INORGANIC SOIL AMENDMENTS

A. Lime: agricultural ground dolomitic limestone meet CT DOT Form 816 Section M.13.02 with minimum calcium carbonate equivalent shall be 90.

1. The material must comply with the following gradation:

Square Mesh Sieves	Percentage Passing By Weight
Pass #10	100
Pass #20	90
Pass #100	40

2.5 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following:

1. Type: Cedar Bark Mulch (consisting of Shredded hardwood with no added color)

2. Color: As specified by Owner.

2.6 WEED-CONTROL BARRIERS

A. Nonwoven Fabric: Polypropylene or polyester fabric, 3 oz/sq. yd. minimum.

2.7 TREE STABILIZATION MATERIALS

A. Stakes and Guys:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.

B. Root-Ball Stabilization Materials:

1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated; stakes pointed at one end.
2. Wood Screws: ASME B18.6.1.
3. Proprietary Devices: Proprietary at- or below-grade stabilization system to secure each new planting by root ball; sized as indicated and per manufacturer's written recommendations.

   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) Border Concepts, Inc.; Tomahawk Tree Stabilizers.
      2) Foresight Products, LLC; Duckbill Rootball Fixing System.
      3) Tree Staple, Inc.; Tree Staples.

C. Palm Bracing: Battens or blocks, struts, straps, and protective padding as indicated.

1. Battens or Blocks and Struts: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-4-inch nominal by lengths indicated.
2. Straps: Adjustable steel or plastic package banding straps.
3. Padding: Burlap.

2.8 MISCELLANEOUS PRODUCTS

A. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4-inch-wide minimum, with stretch factor of 33 percent.

B. Planter Filter Fabric: Woven or nonwoven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

2.9 PLANTING SOIL MIX

A. Planting Soil Mix: Soil material to be used for plant backfill shall meet CT DOT Form 816 M.13.02; Mix with soil amendments and fertilizers in the quantities as recommended by tree nursery or supplier.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

B. Provide 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 MCA's acceptance of layout before planting. Make minor adjustments as required.

D. Lay out exterior plants at locations directed by MCA. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

E. Trunk Wrapping: Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping. Wrap trees of 2-inch caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling.

F. 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.

3.3 PLANTING BED ESTABLISHMENT

A. Loosen subgrade of planting beds to a minimum depth of 8 inches. Remove stones larger than 1 inchin any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply superphosphate fertilizer directly to subgrade before loosening.

2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.

    a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
    b. Mix lime with dry soil before mixing fertilizer.

3. Spread planting soil mix to a depth of 8 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

    a. Spread approximately one-half the thickness of planting soil mix over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil mix.

B. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Before planting, restore planting beds if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.

1. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.
2. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
3. If drain tile is shown or required under planted areas, excavate to top of porous backfill over tile.

B. Subsoil removed from excavations may not be used as backfill.

C. Obstructions: Notify MCA if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

D. Drainage: Notify MCA if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE AND SHRUB PLANTING

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1.

B. Set balled and burlapped stock plumb and in center of pit or trench with top of root ball flush with adjacent finish grades.

1. Remove burlap and wire baskets from tops of root balls and partially 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.
2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

C. Set balled and potted stock plumb and in center of pit or trench with top of root ball flush with adjacent finish grades.

1. Carefully remove root ball from container without damaging root ball or plant.
2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

D. Set fabric bag-grown stock plumb and in center of pit or trench with top of root ball flush with adjacent finish grades.

1. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.

E. Set and support bare-root stock in center of pit or trench with trunk flare flush with adjacent finish grade. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated. Plumb before backfilling, and maintain plumb while working backfill around roots and placing layers above roots. Tamp final layer of backfill. Remove injured roots by cutting cleanly; do not break.

F. Organic Mulching: Apply 2-inch average thickness of organic mulch extending 12 inches beyond edge of planting pit or trench. Do not place mulch within 3 inches of trunks or stems.

G. Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping. Wrap trees of 2-inch caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling.

H. Trunk Wrapping: Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping. Wrap trees of 2-inch caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling.

3.6 TREE AND SHRUB PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees and shrubs as directed by MCA.

C. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise indicated by MCA, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character.

3.7 TREE STABILIZATION

A. Trunk Stabilization: provide trunk stabilization as follows:

1. Upright Staking and Tying: Stake trees of 2- through 5-inchcaliper. Stake trees of less than 2-inchcaliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend one third of trunk height above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
2. Use 2 stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; 3 stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.
3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
4. Support trees with two strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Guying and Staking: Guy and stake trees exceeding 14 feet in height and more than 3 inches in caliper unless otherwise indicated. Securely attach no fewer than 3 guys to stakes 30 inches long, driven to grade.

1. For trees more than 6 inches in caliper, anchor guys to pressure-preservative-treated deadmen 8 inches in diameter and 48 inches long buried at least 36 inches below grade. Provide turnbuckle for each guy wire and tighten securely.
2. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
3. Support trees with strands of cable or multiple strands of tie wire encased in hose sections at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
4. Attach flags to each guy wire, 30 inches above finish grade.
5. Paint turnbuckles with luminescent white paint.

C. Root-Ball Stabilization: provide at- or below-grade stabilization system to secure each new planting by the root ball.

1. Wood Hold-Down Method: Horizontal wood hold-down stake placed across top of root ball and screwed at each end to a vertical stake against side of root ball and driven into subsoil.

a. Provide stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation. Saw stakes off at horizontal stake.
b. Install screws through horizontal hold-down and penetrating at least 1 inch into stakes. Predrill holes if necessary to prevent splitting wood.
c. Install second set of stakes on other side of root trunk for larger trees as indicated.

3.8 PLANT MAINTENANCE

A. Tree and Shrub Maintenance: Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, adjusting and repairing stakes and guy supports and root-ball stabilization, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings.

B. Ground Cover and Plant Maintenance: Maintain and establish plantings by watering, weeding, fertilizing, mulching, and other operations as required to establish healthy, viable plantings.

3.9 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

3.10 DISPOSAL

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose off Owner's property.

END OF SECTION

SECTION 33 05 00

COMMON WORK RESULTS FOR UTILITIES

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. This Section includes the following:

1. Piping joining materials.
2. Transition fittings.
3. Dielectric fittings.
4. Sleeves.
5. Identification devices.
6. Piped utility demolition.
7. Piping system common requirements.
8. Equipment installation common requirements.
9. Metal supports and anchorages.

1.3 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

C. CPVC: Chlorinated polyvinyl chloride plastic.

D. PE: Polyethylene plastic.

E. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Identification devices.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.8 COORDINATION

A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.

C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Section 033053 "Miscellaneous Cast-in-Place Concrete.".

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:
1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
3. PVC to ABS Piping Transition: ASTM D 3138.

H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 TRANSITION FITTINGS

A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

B. Transition Couplings NPS 1-1/2 and Smaller:

1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
2. Aboveground Piping: Specified piping system fitting.

C. AWWA Transition Couplings NPS 2 and Larger:
   1. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

D. Plastic-to-Metal Transition Fittings:
   1. Description: CPVC and PVC, one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint or threaded end.

E. Plastic-to-Metal Transition Unions:
   1. Description: MSS SP-107, CPVC and PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

F. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:
   1. Description: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.3 DIELECTRIC FITTINGS

A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:
   1. Description: Factory fabricated, union, NPS 2 and smaller.

      a. Pressure Rating: 150 psig minimum at 180 deg F.
      b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.

C. Dielectric Flanges:
   1. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 and larger.

      a. Pressure Rating: 150 psig minimum.
      b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:
   1. Description: Nonconducting materials for field assembly of companion flanges, NPS 2-1/2 and larger.

      a. Pressure Rating: 150 psig minimum.
      b. Gasket: Neoprene or phenolic.
      c. Bolt Sleeves: Phenolic or polyethylene.
      d. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 and smaller.

   a. Pressure Rating: 300 psig at 225 deg F.
   b. End Connections: Threaded.

F. Dielectric Nipples:
   1. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.

      a. Pressure Rating: 300 psig at 225 deg F.
      b. End Connections: Threaded or grooved.

2.4 SLEEVES

A. Mechanical sleeve seals for pipe penetrations are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.5 IDENTIFICATION DEVICES

A. General: Products specified are for applications referenced in other utilities Sections. If more than single type is specified for listed applications, selection is Installer's option.

B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

   1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
   2. Location: Accessible and visible.

C. Stencils: Standard stencils prepared with letter sizes complying with recommendations in ASME A13.1. Minimum letter height is 1-1/4 inches for ducts, and 3/4 inch for access door signs and similar operational instructions.

1. Material: Fiberboard.
2. Stencil Paint: Exterior, oil-based, alkyd-gloss black enamel, unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, oil-based, alkyd enamel in colors according to ASME A13.1, unless otherwise indicated.

D. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semi rigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

E. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.

F. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.

G. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.

H. Lettering: Manufacturer's standard preprinted captions as selected by MCA.

I. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

1. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.

J. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils thick.

1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches; 2-1/2 inches for larger pipes.
2. Color: Comply with ASME A13.1, unless otherwise indicated.

K. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Include 5/32-inch hole for fastener.

1. Material: 0.032-inch-thick, polished brass.
2. Material: 0.0375-inch-thick stainless steel.
3. Material: 3/32-inch-thick plastic laminate with 2 black surfaces and a white inner layer.
4. Material: Valve manufacturer's standard solid plastic.
5. Size: 1-1/2 inches in diameter, unless otherwise indicated.
6. Shape: As indicated for each piping system.

L. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.

M. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
2. Thickness: 1/8”, unless otherwise indicated.
3. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
4. Fasteners: Self-tapping, stainless-steel screws or contact-type permanent adhesive.

N. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Brown: Energy reclamation equipment and components.
4. Blue: Equipment and components that do not meet criteria above.
5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
6. Terminology: Match schedules as closely as possible. Include the following:

   a. Name and plan number.
   b. Equipment service.
   c. Design capacity.
   d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

7. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

O. Plasticized Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with mat finish suitable for writing.

1. Size: 3-1/4 by 5-5/8 inches.
2. Fasteners: Brass grommets and wire.
3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.

P. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in piped utility identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of piped utility systems and equipment.

1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

2.6 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

A. Refer to Section 02 41 19 "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 DIELECTRIC FITTING APPLICATIONS

A. Dry Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 and Smaller: Dielectric unions.
2. NPS 2-1/2 to NPS 12: Dielectric flanges or dielectric flange kits.

B. Wet Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 and Smaller: Dielectric couplings or dielectric nipples.
2. NPS 2-1/2 to NPS 4: Dielectric nipples.
3. NPS 2-1/2 to NPS 8: Dielectric nipples or dielectric flange kits.
4. NPS 10 and NPS 12: Dielectric flange kits.

3.3 PIPING INSTALLATION

A. Install piping according to the following requirements and the sections of utility specifications pertaining to piping systems.

B. 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 the Coordination Drawings.

C. 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.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Sleeves are not required for core-drilled holes.

J. Permanent sleeves are not required for holes formed by removable PE sleeves.

K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

L. Verify final equipment locations for roughing-in.

M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.4 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.

I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End PE Pipe and Fittings: Use butt fusion.
2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.5 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Install dielectric fittings at connections of dissimilar metal pipes.

3.6 EQUIPMENT INSTALLATION

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

3.7 PAINTING

A. Painting of piped utility systems, equipment, and components is specified in Section 099000 "Painting and Coatings".

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.8 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: According to ASME A13.1.
2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.

3. Locate pipe markers on exposed piping according to the following:

    a. Near each valve and control device.
    b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
    c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
    d. At manholes and similar access points that permit view of concealed piping.
    e. Near major equipment items and other points of origination and termination.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.

1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches, 1/2 inch high for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

END OF SECTION