PROJECT MANUAL

Project # 901376

Storrs, Connecticut
New Engineering and Science Building

Bid Documents
Volume 1 of 2

UCONN
UNIVERSITY OF CONNECTICUT

State of Connecticut

University of Connecticut
Planning, Architectural and Engineering Services

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President

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SECTION 01-1000 - SUMMARY

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 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work under separate contracts.
4. Time of Completion.
5. Access to site and Contractor Parking.
6. Coordination with occupants.
7. Work restrictions.
8. Work Sequence.
9. Miscellaneous provisions.

B. Related Requirements:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

2. Division 01 Section "Temporary Tree and Planting Protection" for general protection and pruning of existing trees and plants that are affected by the execution of the Work.

3. Division 01 Section “Submittal Procedures” for submittal requirements prior to start of work.

4. Division 01 Section 01 74 19 Construction and Demolition Waste Management

5. Division 01 Section 01 81 13 VOC Limits for Adhesives, Sealants, Paints and Coatings

6. Division 01 Section 01 81 19 Construction Indoor Air Quality (IAQ) Management

C. University Contractors –HB Communications, Simplex, Security Technologies, Inc.

1.4 PROJECT INFORMATION

A. Project Identification: New Engineering and Science Building, Project #901376

1. Project Location: Storrs CT

B. Owner: University of Connecticut

1. Owner's Representative: Sallyann Beaudet, Architectural and Engineering Services, 31 LeDoyt Road Unit 3038, Storrs CT 06269-3038

C. Architect: Mitchell/Giurgola Architects, LLP 630 Ninth Avenue, New York, NY 10036

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. MEP/IT Engineers: Bard, Rao + Athanas Consulting, 105 Madison Avenue, 10th Floor, New York, NY 10016, (212) 840-0060

2. Structural Engineers: Severud Associates, 469 Seventh Avenue, Suite 900, New York, NY 10018, (212) 986-3700

3. Civil Engineers: Alfred Benesch & Company, 90 National Drive, Glastonbury, CT 06033, (860) 633-8341

4. Landscape Architect: Dirtworks, PC, 200 Park Avenue South, New York, NY 10003, (212) 529-2263

5. Geotechnical Engineer: Haley & Aldrich, 100 Corporate Place, Suite 105, Rocky Hill, CT 06067, (860) 282-9400

6. Security: Aggleton & Associates, 448-450 Manville Road, Pleasantville, NY 10570

E. Other Owner Consultants: The Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Commissioning Agent: BVH Integrated Services, P.C., 50 Griffin Road South, Bloomfield, CT 06220, (860) 286-9171

2. AC Consultant: ACT Associates, LLC, 922F Stafford Road, Storrs, CT 06268, (860) 429-5938

3. Insurance Carrier: FM Global, 270 Central Avenue, P.O. Box 7500, Johnston, RI 02919, (401) 275-3000

1.5 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Build a new 5 story plus basement and penthouse research laboratory facility of approximately 118,000 gsf with associated sitework. The building is a Construction Type 1B structure with an Occupancy Classification B, (Business) with an Accessory A-3 (Assembly) Occupancy.

2. Removal of all debris caused by this Contract.

3. Protection for the public, building, grounds from damage during this contract is the responsibility of the Contractor for this project at all times.

4. Repair or replace landscaping including trees, shrubs or other planting disturbed during the Work of the contract with new to match existing, unless otherwise noted. Regrade and reseed any grass area damaged as a result of the Work. Repair any walkways or paved areas damaged as a result of the Work.

1.6 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with contractors that may have been issued separate contract(s) to perform certain construction operations at the site prior to construction activity under this contract so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

B. A separate contract has been issued to Connecticut Natural Gas (CNG) to install and relocate existing gas lines within the construction limit lines. Those operations will happen during the course of construction.

1.7 TIME OF COMPLETION

A. Work required by the project shall commence immediately upon receipt of a Notice to Proceed.

1. Substantial Completion as defined in the Contract Documents must be achieved and evidenced by a Certificate of Substantial Completion no later than **December 22, 2016.**

2. Due to the nature of this institution, it is required that the academic schedule must be maintained. Contractor shall cooperate and coordinate with the University to assure that the academic schedule will be maintained.

3. No Work may be conducted during University exam periods without the written permission from the University Representative. Exam periods which may affect this project are scheduled per attached link: http://www.registrar.uconn.edu/calendar.htm

1.8 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to areas indicated; allow for Owner occupancy and use by the public. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to areas within Contract Limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
3. Burial of Waste Materials: No not dispose of organic and hazardous material on site, either by burial or by burning.
4. All grounds including construction site within contract limit shall be kept neat and orderly at all times.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weather tight condition throughout construction period. Repair damage caused by construction operations. Take all precautions necessary to protect this building and adjacent buildings and its occupants during the construction period.

D. Contractor's Parking: Contractors working for the University of Connecticut at the regional campus will work with the University Representative to determine where contractors are allowed to park during the course of the Project.

1. Construction vehicles may park within the fenced construction area. Personal vehicles are not considered construction vehicles.
2. Restore all lawn, sidewalk, paved areas damaged by vehicles and or construction activities to their original condition.
3. Contractors working for the University of Connecticut at Storrs Campus are required to obtain a parking permit through the Parking Services Office. For additional information please contact the Parking Services Office at 860-486-4930. **Parking permits for Lots C & W can be purchased for $100 per/month.** The Contractor is responsible for payment of all fees for parking permits.
   a. The University will provide a maximum of three (3) contract parking places in the vicinity of the work. Additional parking required by the Contractor will be designated at a location specified by the Owner's Representative.
   b. Construction vehicles are exempt from this requirement.

E. Contractor shall restrict use of construction related trucks on local roads, such as Hillyndale, Eastwood and Westwood Road.

F. Refer to Section 01-3300 Par 2.1.L Safety Plan for submittal requirements prior to site access

1.9 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy site and building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

B. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building, prior to Substantial Completion provided that such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. A Certificate of Substantial Completion will be executed for each specific portion of the Work to be occupied prior to Owner occupancy.

2. This project has been identified as a Threshold Building subject to the requirements of Connecticut General Statutes Section 29-276b. Obtain a Certificate of Occupancy from Building Officials prior to Owner occupancy.

3. Certifications. The Contractor at completion of construction shall provide to the University a “Certificate of Substantial Compliance with the State Building and Fire Safety Codes” bearing original signatures of an officer of the company stating: “This is the CERTIFY that in my professional opinion the complete structure/renovations described above is in substantial compliance with the approved construction documents on file with the University of Connecticut. Minor deviations and special stipulations are noted below (if any)”.

4. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy the Owner will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.

1.10 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 4:30 p.m., Monday through Friday, unless otherwise indicated. Permission must be requested and approved in writing to perform work outside the normal working hours or on a State Holiday.

1. Early Morning Hours for Dormitory Work: No noisy activities can take place prior to 8:00 am when working on or in the vicinity of a student dormitory.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Obtain Owner Representative written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner Representative not less than two days in advance of proposed disruptive operations.

E. Controlled Substances: Use of tobacco products and other controlled substances is not permitted.

F. In addition to reasons determined by the University, approval of deviations in work hours is dependent upon availability of University supervisory personnel.

1. No person shall be employed to work or permitted to work more than eight hours in any day or more than forty hours in any week on any work provided for under this Contract. The observance of such limitations of hours of work may be suspended during an emergency, upon approval of the Executive Director of Architectural and Engineering Services.

G. If the Contractor determines that work on this project must be performed during a time other than normal working hours of the University, costs for any premium time must be included in the Base Bid.

H. No Work may be conducted during University exam periods without the written permission from the University Representative. Exam periods which may affect this project are scheduled per attached link: http://www.registrar.uconn.edu/calendar.htm

1.11 WORK SEQUENCE

A. The responsibility of phasing the Work falls entirely on the Contractor.
1. Site Enabling being completed under separate contract.

1.12 MISCELLANEOUS PROVISIONS

A. Certifications

1. The Contractor, at completion of construction, shall provide to the University a "Certificate of Substantial Compliance" bearing original signatures of an officer of the company stating: "this is to CERTIFY that, in my professional opinion, the complete structure/renovations described above is in substantial compliance with the approved construction documents on file with the University of Connecticut. Minor deviations and special stipulations are noted below (if any)"

2. Prior to Owner's approval and acceptance, mechanical and electrical systems shall be fully operational and tested.

3. Original construction drawings are provided for information and reference only and do not represent exact conditions existing in the buildings. The Contractor is responsible for all work described in the scope of work regardless of information provided in the reference drawings. This information is offered in good faith for information only, solely for the purpose of placing the Contractor in receipt of all information known to the University at this time. Unless otherwise provided, this data is not to be considered a part of the contract documents. The University does not warrant or represent that the information contained in these reports is complete or accurate but only that it constitutes a disclosure of the information known to the Owner at this time regarding these conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01-1000

SECTION 01-2200 - 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.

1. A unit price is an amount stated on the Proposal Form or in the Specifications 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 quantities of Work required by the Contract Documents are increased or decreased.

2. Unit Prices include all necessary material, overhead, profit, and applicable taxes.

3. Refer to individual Specification Sections for construction activities requiring the establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

B. Related Requirements:

1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Division 01 Section "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 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: Removal of unsatisfactory soil and replacement with satisfactory soil material.

1. Description: Unsatisfactory soil excavation and replacement with satisfactory fill material or engineered fill from off site, as required, according to Division 31 Section "Building Earthwork". Disposal to be paid as a separate unit price item.
2. Unit of Measurement: Cubic yard of soil excavated, based on survey of volume removed.

B. Unit Price 2: Removal of unsuitable soil and replacement with Lean Concrete Fill.

1. Description: Unsuitable soil excavation and replacement with Lean Concrete Fill, as required, according to Division 31 Section "Building Earthwork." Disposal to be paid as a separate unit price item.
2. Unit of Measurement: Cubic yard of soil excavated as authorized, based on survey of volume removed.

C. Unit Price 3: Removal of unsuitable soil and replacement with Compacted Granular Fill.

1. Description: Unsuitable soil excavation and replacement with imported Compacted Granular Fill, as required, according to Division 31 Section "Building Earthwork." Disposal to be paid as a separate unit price item.
2. Unit of Measurement: Cubic yard of soil excavated as authorized, based on survey of authorized volume removed.

D. Unit Price No. 4: Rock excavation and replacement with Crushed Stone.

1. Description: Classified rock excavation and replacement with Crushed Stone, as required, according to Division 31 Section "Building Earthwork." Disposal of excavated materials to be in accordance with Division 31 Section “Excavated Soil and Material Management”.

2. Unit of Measurement: Cubic yard of rock excavated as authorized, based on survey of volume removed.

E. Unit Price No. 5: Disposal of "Group I-1 clean" soil
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group I-1 soils, as required, according to Division 31 Section "Excavated Soil and Materials Management".
2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

F. Unit Price No. 6: Disposal of "Group I-2a polluted" soil
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group I-2a soils, as required, according to Division 31 Section "Excavated Soil and Materials Management".
2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

G. Unit Price No. 7: Disposal of "Group I-2b polluted" soil
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group I-2b soils, as required, according to Division 31 Section "Excavated Soil and Materials Management"
2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

H. Unit Price No. 8: Disposal of "Group I-3 polluted" soil
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group I-3 soils, as required, according to Division 31 Section "Excavated Soil and Materials Management"
2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

I. Unit Price No. 9: Disposal of "Group II-1 contaminated" soil
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group II-1 soils, as required, according to Division 31 Section "Excavated Soil and Materials Management"
2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

J. Unit Price No. 10: Disposal of "Group II-2 contaminated" soil
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group II-2 soils, as required, according to Division 31 Section "Excavated Soil and Materials Management"
2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

K. Unit Price No. 11: Disposal of "Group II-3 contaminated" soil
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group II-3 soils, as required, according to Division 31 Section "Excavated Soil and Materials Management"

2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

L. Unit Price No. 12: Disposal of "Group II-4 contaminated" soil
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group II-4 soils, as required, according to Division 31 Section "Excavated Soil and Materials Management"
2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

M. Unit Price No. 13: Disposal of "Group II-5 contaminated" soil
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group II-5 soils, as required, according to Division 31 Section "Excavated Soil and Materials Management"
2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

N. Unit Price No. 14: Disposal of "Group II-6 contaminated" soil
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group II-6 soils, as required, according to Division 31 Section "Excavated Soil and Materials Management"
2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

O. Unit Price No. 15: Disposal of "Group III-1 hazardous" soil
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group III-1 soils, as required, according to Division 31 Section "Excavated Soil and Materials Management"
2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

P. Unit Price No. 16: Disposal of "Group III-2 hazardous" soil
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group III-2 soils, as required, according to Division 31 Section "Excavated Soil and Materials Management"
2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

Q. Unit Price No. 17: Disposal of "Group IV solid waste"
1. Description: Stockpiling (as required), loading, transporting, and disposal off site of Group IV materials, as required, according to Division 31 Section "Excavated Soil and Materials Management"
2. Unit of Measurement: Ton of soil excavated, based on weight slips of trucks received at off-site disposal facilities.

R. Unit Price No. 18 - Painting & finishing of Gypsum Drywall

1. Description: Paint Gypsum drywall complete according to Division 099000 Section "Painting and Finishing".
2. Unit of Measurement: including labor & material per SF_____

S. Unit Price No. 19 - Painting & finishing of CMU wall

1. Description: Paint CMU wall complete according to Division 099000 Section "Painting and Finishing".
2. Unit of Measurement: including labor & material per SF_____

T. Unit Price No. 20 - Carpet

1. Description: Furnish and install Carpet flooring according to Division 096816 Section "Carpet (Glue Down)".
2. Unit of Measurement: including labor & material per SF_____

U. Unit Price No. 21 - Rubber Base

1. Description: Furnish and install Rubber Base according to Division 096519 Section "Resilient Tile Flooring".
2. Unit of Measurement: including labor & material per LF_____

V. Unit Price No. 22 - Rubber Flooring

1. Description: Furnish and install Rubber Flooring according to Division 096519 Section "Resilient Tile Flooring".
2. Unit of Measurement: including labor & material per SF_____

W. Unit Price No. 23 - Vinyl Composition Tile (VCT)

1. Description: Furnish and install Vinyl Composition Tile according to Division 096519 Section "Resilient Tile Flooring".
2. Unit of Measurement: including labor & material per SF_____

X. Unit Price No. 24 - Glass Marker Board

1. Description: Furnish and install Glass Marker Board per details A7.11 according to Division 10100 Section "Visual Display Surfaces".
2. Unit of Measurement: including labor & material per each_____

Y. Unit Price No. 25 - Concealed Sprinkler head

1. Description: Furnish and install Concealed Sprinkler head w/ 10’ of piping according to Division 211000 Section "Fire Protection”.
2. Unit of Measurement: including labor & material per each _____

Z. Unit Price No. 26 - Semi Recessed Sprinkler head

1. Description: Furnish and install Semi Recessed Sprinkler head w/ 10’ of piping according to Division 211000 Section "Fire Protection”.
2. Unit of Measurement: including labor & material per each _____

AA. Unit Price No. 27 - Exposed Sprinkler head

1. Description: Furnish and install Exposed Sprinkler head w/ 10’ of piping according to Division 211000 Section "Fire Protection”.
2. Unit of Measurement: including labor & material per each _____

BB. Unit Price No. 28 - Fire Alarm Pull Station (Complete)

1. Description: Furnish and install Fire Alarm Pull Station (Complete) according to Division 283110 Section "Fire Alarm System”.
2. Unit of Measurement: including labor & material per each _____

CC. Unit Price No. 29- Fire Alarm Horn/Strobe (Complete)

1. Description: Furnish and install Fire Alarm Horn/Strobe (Complete) according to Division 283110 Section "Fire Alarm System”.
2. Unit of Measurement: including labor & material per each _____

DD. Unit Price No. 30 - Fire Alarm Smoke Detector (Complete)

1. Description: Furnish and install Fire Alarm Smoke Detector (Complete) according to Division 283110 Section "Fire Alarm System”.
2. Unit of Measurement: including labor & material per each _____

EE. Unit Price No. 31 - Exit Light/Sign wall/ceiling mounted

1. Description: Furnish and install Exit Light/Sign wall/ceiling mounted Install, 10’ of conduit and wire (Complete): according to Electrical Drawings
2. Unit of Measurement: including labor & material per each _____

END OF SECTION 01-2200

SECTION 01-2300 - 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.

E. Alternates shall be valid for the life of the contract and may be selected within 30 days from notice to proceed at no additional cost to the owner. Alternates may be negotiated as applicable, in the event the owner selects the alternate beyond the 30 day period from notice to proceed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Exterior Wall Base

1. Base Bid: Stone base as specified in Division 042000 "Unit Masonry"
2. Alternate: Cast stone base as specified in Division 047200 "Cast Stone"

Alternate No. 2: Interior Wall Base

1. Base Bid: Solid wood base at laboratory corridor walls as detailed on 10/A7.11 and specified in Division 064023 "Architectural Woodwork"
2. Alternate: Rubber base in lieu of solid wood base at laboratory corridor walls as specified in Division 096519 "Resilient Tile Flooring"

Alternate No. 3: Curtain Wall Performance Mockup Requirement

1. Base Bid: Performance Mock-up Testing as specified in Division 084413 "Curtain Walls, Storefront and Entrances" sections 1.05B and 4.01.
2. Alternate: Delete Performance Mock-up Testing requirement as specified in Division 084413 "Curtain Walls, Storefront and Entrances" sections 1.05B and 4.01.

Alternate No. 4: Controlled Environmental Rooms

1. Base Bid: Provide Controlled Environmental Rooms 210A, 312A, **~~316A~~ 316EA**, 410A, **~~512B~~ 412B** and 510A as identified on the drawings and specified in Division 132100 "Controlled Environmental Rooms"
2. Alternate: Provide Controlled Environmental Rooms 210A, 312A, 316A as identified on the drawings and specified in Division 132100 "Controlled Environmental Rooms". Delete Controlled Environmental Rooms 410A, 512B and 510A.

Alternate No. 5: Dichroic Glass Fins

1. Base Bid: Provide dichroic glass fins “X-G” as identified on Exterior Elevations A3.01, A3.02 and A3.03 and specified in Division 084413 “Curtain Walls, Storefront and Entrances”.
2. Alternate: Delete dichroic glass fins “X-G” as identified on Exterior Elevations A3.01, A3.02 and A3.03 and specified in Division 084413 “Curtain Walls, Storefront and Entrances”.

Alternate No. 6: Epoxy Resin Flooring at Penthouse Level

1. Base Bid: Provide Epoxy Resin Flooring “F4” in rooms PH1, PH2, PH5, PH6, VPHA and VPHB as identified on Penthouse Plan A2.06 and specified in Division 096724 “Resinous Flooring For Mechanical Equipment Rooms”
2. Alternate: Provide Sealed Concrete “F7” in rooms PH1, PH2, PH5, PH6, VPHA and VPHB as identified on Penthouse Plan A2.06 and specified in Division 099000 “Painting and Finishing”

Alternate No. 7: Roofing

1. Base Bid: Provide Fluid Applied Roofing as specified in Division 075625 “Fluid Applied Roofing System” at all roofs.
2. Alternate: Provide EPDM Roofing at Roof Type R1 and R3 as Specified in Division 075300 “Membrane Roofing and Roof Insulation”. (See Addendum #1)

Alternate No. 8:

1. Base Bid: Fit out CGI Server Room 322 as documented.
2. Alternate: Fit out Room 322 to office space. (See Addendum #1)

Alternate No. 9:

1. **Base Bid: Complete Structured Horizontal Cabling Systems Fit-out of Levels 1, 4, and 5 per Drawings T101, T104, and T105 per plans and specifications. Installation of Telecommunication Backbone cabling, grounding infrastructure and Telecommunication IDF Build-outs per drawings T301, T302, T601, T602, T603, T604, T605, T606, T607, T608. T609.**

2. **Alternate: Complete Fit-out of Levels 1, 4, and 5 per Drawings T101, T104, and T105 for Structured Horizontal Cabling Systems pathways and spaces only. These pathways and spaces shall include the installation all required horizontal and vertical conduits, back-boxes, cable tray and surface mounted raceways per plans and specifications. Installation of Telecommunication Backbone cabling ,grounding infrastructure and Telecommunication IDF Build-outs per drawings T301, T302, T601, T602, T603, T604, T605, T606, T607, T608 and T609. Horizontal Structured Cabling Systems per plans and specifications shall be installed at a future date**

Alternate No. 10:

1. **Base Bid: Complete Structured Horizontal Cabling Systems Fit-out of Levels 2 and 3 per Drawings T102 and T103 per plans and specifications. Installation of Telecommunication Backbone cabling, grounding infrastructure and**

Telecommunication IDF and Server Room Build-outs per drawings T301, T302, T601, T602, T603, T604, T605, T606, T607, T608. T609 and T610

2. **Alternate: Complete Fit-out of Levels 2 and 3 per Drawings T102 and T103 for Structured Horizontal Cabling Systems pathways and spaces only. These pathways and spaces shall include the installation all required horizontal and vertical conduits, back-boxes, cable tray and surface mounted raceways per plans and specifications. . Installation of Telecommunication Backbone cabling ,grounding infrastructure and Telecommunication IDF and Server Room Build-outs per drawings T301, T302, T601, T602, T603, T604, T605, T606, T607, T608 and T609 and T610. Horizontal Structured Cabling Systems per plans and specifications shall be installed at a future date**

END OF SECTION 01-2300

SECTION 01-2500 - 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 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Division 01 Section "Allowances" for products selected under an allowance.
2. Division 01 Section "Alternates" for products selected under an alternate.
3. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
4. Division 01 Section 01 74 19 Construction and Demolition Waste Management
5. Division 01 Section 01 81 13 VOC Limits for Adhesives, Sealants, Paints and Coatings
6. Division 01 Section 01 81 19 Construction Indoor Air Quality (IAQ) Management
7. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.4 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.

1.5 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 architects and owners.
    h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    i. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
    j. Cost information, including a proposal of change, if any, in the Contract Sum.
    k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
    l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
   b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.6 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.

1.7 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 Thirty (30) days prior to time required for preparation and review of related submittals.

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

   a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   b. 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.

j. Requested substitution does not require additional design changes to be performed by the architect/engineer in order to incorporate the substitution into the work.

B. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01-2500

SECTION 012600 - CONTRACT MODIFICATION 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 handling and processing Contract modifications.

B. Related Requirements:

1. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue through the University Representative supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on **AIA Document G710, "Architect's Supplemental Instructions."**

1.4 PROPOSAL REQUESTS/BULLETINS

A. Owner-Initiated Proposal Requests: Architect or University Representative will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect or University Representative are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
- Provide subcontractor labor rate sheet and include a PCO summary form.

- Any material over $500.00 requires back-up.

d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect or University Representative.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect or University Representative

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Division 01 Section "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

B. Unit-Price Adjustment: See Division 01 Section "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Architect or University Representative will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect or University Representative may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 01-3100 - 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.
   a. Pre-construction conference
   b. Pre-installation conference
   c. Progress meetings
   d. Coordination meetings

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

C. Related Requirements:

1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

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

1.4 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 of CSI Form 1.5A is recommended. 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: Within fifteen (15) days of starting construction operations, submit a list of key personnel assignments, including project manager, superintendent, safety engineer 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. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

2. The University requires as a minimum, the following Key Personnel be assigned to this project. Each position shall be a full-time individual, dedicated to the position listed.

   a. Project Manager (on site a minimum of once a week)
   b. Project Superintendent (on-site full time for duration of project)
   c. Safety Engineer (part time with a minimum of 2 site visits per week and mandatory during welding of any kind: **AS REQUIRED BY CONTRACT**
   d. Project Engineer (Project specific)

3. Each individual listed above shall have not less than five (5) years experience performing work of a similar nature to this project and in a comparable position to the position assigned on this project. Resumes will be required on all key personnel prior to acceptance. Removal of any personnel denoted as Key Personnel from the project will require Owner's prior approval.

1.5 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. Weekly inspections of project by the safety officer are required. Safety inspector report to be submitted weekly to the University Representative.
3. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
4. Make adequate provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and 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 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. Project closeout activities.
7. 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.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: **PRIOR TO START OF WORK:** Prepare coordination drawings using BIM/REVIT software 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 and modeled 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 Architect 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, fire-alarm, 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, fire-alarm, 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. Fire-Protection System: Show the following:

   a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect 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 Architect determines that coordination drawings are not being prepared

in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.

10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Division 01 Section "Submittal Procedures."

1.7 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. Architect will return RFIs submitted to Architect 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 Architect.
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.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow five (5) working days for Architect's response for each RFI. RFIs received by Architect after 2:00 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 Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within five (5) days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly or as directed by Owner’s representative. Use CSI Log Form 13.2B is recommended. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 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 Architect 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 Owner and Architect, within three (3) days of the meeting.

B. Preconstruction Conference: The successful bidder shall attend a preconstruction conference and organizational meeting at the University of Connecticut Office of Architectural and Engineering Services, with the University Representative prior to any field work to review responsibilities and personnel assignments and to insure that Specifications, drawings and all conditions are understood to properly complete this Contract.

1. The meeting will be scheduled by the University Representative.
2. Attendees: The Owner, University Tree Warden, Architect, 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. Labor Market Regulations.
   e. Designation of key personnel and their duties.
   f. Lines of communications and emergency phone numbers.
   g. Procedures for processing field decisions and Change Orders.
   h. Procedures for RFIs.
   i. Procedures for testing and inspecting.
   j. Procedures for processing Applications for Payment.
   k. Distribution of the Contract Documents and correspondence.
   l. Submittal procedures.
   m. Sustainable design requirements.
   n. Preparation of record documents.
   o. Use of the premises, including dust and noise control.
   p. Parking and parking permits
   q. Work restrictions including working hours.
   r. Owner's occupancy requirements.
   s. Responsibility for temporary facilities and controls.
   t. Procedures for moisture and mold control.
   u. Procedures for disruptions and shutdowns.
   v. Construction waste management and recycling.
   w. Office, work, and storage areas.
   x. Equipment deliveries and priorities.
   y. First aid.
   z. Unacceptable behavior
   aa. Security.
   bb. Progress cleaning.
   cc. UConn Construction Safety Manual, Safety procedures, including the University's Hazard Communication Program and policies on pest control, asbestos, lead-based paints, lockout/tagout procedures, excavation and trenching, disposal of PCB

containing light ballasts, use of solvents, solvent or epoxy based paints, confined space entries and use of open flames.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, and Owner's Representative of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

   a. Contract Documents.
   b. Options.
   c. Related RFIs.
   d. Related Change Orders.
   e. Purchases.
   f. Deliveries.
   g. Submittals, shop drawings, product data, and quality control samples.
   h. Sustainable design requirements.
   i. Review of mockups.
   j. Possible conflicts.
   k. Compatibility requirements.
   l. Time schedules.
   m. Weather limitations.
   n. Manufacturer's written instructions.
   o. Warranty requirements.
   p. Compatibility of materials.
   q. Acceptability of substrates.
   r. Temporary facilities and controls.
   s. Space and access limitations.
   t. Safety.
   u. Regulations of authorities having jurisdiction.
   v. Testing and inspecting requirements.
   w. Installation procedures.
   x. Coordination with other work.
   y. Required performance results.
   z. Protection of adjacent work.
   aa. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at the Project Site at regularly (minimum bi-weekly) scheduled intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, 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) Status of submittals.
      4) Status of stainable design documentation, if required.
      5) Deliveries.
      6) Off-site fabrication problems.
      7) Access.
      8) Site utilization.
      9) Temporary facilities and controls.
      10) Progress cleaning.
      11) Quality and work standards.
      12) Status of correction of deficient items.
      13) Field observations.
      14) Status of RFIs.
      15) Status of proposal requests.
      16) Pending changes.
      17) Status of Change Orders.
      18) Pending claims and disputes.
      19) 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. Contractor

shall distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report. Submit report no later than 3 days after each progress meeting date.

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.

E. Coordination Meetings: Conduct Project coordination meetings at regular intervals convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: Every party currently involved in coordination or planning for the construction activities involved. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01-3100

SECTION 01-3200 - 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. Contractor's construction schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Material location reports.
5. Site condition reports.
6. Special reports.

B. Related Requirements:

1. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
2. Division 01 Section "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 Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to Owner.
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.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL 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. Three (3) paper copies.

B. 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. Submit schedule to the University Representative within 20 calendar days after the Contract Award

C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Daily Construction Reports: Submit at monthly intervals.

F. Material Location Reports: Submit at monthly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

H. Special Reports: Submit at time of unusual event.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, 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 to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. 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 Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

D. 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.

E. 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.

F. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. CPM Schedule: Prepare Contractor's construction schedule of sufficient detail to indicate all significant construction activities. The level of detail should be such that no activity should exceed 20 working days. Where similar activities continue beyond the 20 day limit, these activities should be broken into subgroups, specific areas, or phases so that the 20 day maximum duration is maintained. The Schedule of Values will correspond to CPM Schedule and provide adequate detail.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 20 calendar days after date established for the Notice to Proceed.

   a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
3. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
4. As the Contractor’s construction schedule is updated the baseline dates shall be maintained.

B. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Testing.
    i. Punch list and final completion.
    j. Activities occurring following final completion.
    k. Owner Furnished Items

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily 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. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.

16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. 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.

2.4 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one (1) day 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 monthly 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 Architect, Owner, 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 01-3200

SECTION 01-3233 - PHOTOGRAPHIC 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 the following:

1. Project Documentation (Photo Sets).
2. Complete Documentation Services.
3. Add Alernates.

B. Related Requirements:

1. Division 01 Section "Submittal Procedures" for submitting photographic documentation.
2. Division 01 Section "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
3. Division 02 Section "Selective Demolition" for photographic documentation before selective demolition operations commence.

1.3 PROJECT DOCUMENTATION

A. 22 (max) Exterior Progressions taken from key perspectives along site perimeters and 360 degrees around each building envelope during erection.

B. 5 (max) regular Interior Progressions of all levels to begin on each level at time of substantial framing or as directed by the Owner.

C. Detailed Interior MEP Exact-Built of all levels, to be conducted after rough-ins are complete, just prior to insulation and or drywall, or as directed by Owner.

D. Slideshows will be taken each visit to the site, which allow for the inclusion of timely images that do not fit into any regular monthly progressions.

E. Additional Photographs: Architect or Owner may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.

3. Circumstances that could require additional photographs include, but are not limited to, the following:

   a. Special events planned at Project site.
   b. Immediate follow-up when on-site events result in construction damage or losses.
   c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
   d. Substantial Completion of a major phase or component of the Work.
   e. Extra record photographs at time of final acceptance.
   f. Owner's request for special publicity photographs.

1.4 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

1.5 COMPLETE DOCUMENTATION SERVICES

In addition to the foregoing, all documentation packages include:

A. Pre-documentation consultation(s) with the Owner identifying project-specific needs, appropriate documentation intervals and common or custom elements requiring detailed photo sets. If, based on these consultations, it is determined that the Scope of Services should be increased or decreased, a revised proposal or addendum will be executed, with a revised fee, prior to documentation commencement.

B. Baseline schedule analysis in order to evaluate and estimate appropriate photo set intervals and durations.

C. Determination of optimal photograph locations/perspectives (“hotspots”) based on the site plans and building floor plans provided by the Owner or his agent(s) and designed to capture the total progress of construction at the agreed upon intervals and/or milestones.

D. A highly representative number of digital photographs at such intervals and for such durations, and at the specified milestones, as requested by the Owner and set forth in Section 1.3, above.

E. Linking each photo set to the appropriate location on the site plans and/or floor plans of the Owner.

F. On-line web hosting of the documentation for the construction period covered by the documentation, accessible from anywhere internet is accessible.

G. Password protected access to the documentation.

PART 2 - ADD ALTERNATES

2.1 PHOTOGRAPHIC MEDIA

A. Site Survey (pre construction) to capture the site and its immediate surrounding area to carefully memorialize conditions before the project begins.

B. Foundation Exact-Built to capture the foundation pre and post waterproofing or as directed by the Owner**.**

C. Underground Plumbing Exact-Built to capture the MEP's under the slab prior to backfill.

D. Exterior Elevation Exact-Built to capture the installation of the exterior skin in 16 site visits max.

END OF SECTION 01-3233

SECTION 01-3300 - 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 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver

1.3 LEED BUILDING SUBMITTAL REQUIREMENTS:

A. The contractor or subcontractor shall submit the following LEED Building Certification Items:

1. A completed LEED Building Materials Certification Form (Sample Included at the end of this section). Information to be supplied for this form shall include:

   a. Material cost(s) for the building materials included in the contractor's or subcontractor's work. The material costs shall not include costs associated with contractors or subcontractors' labor or equipment.
   b. The amount of post consumer and/or post industrial recycled content in the supplied products
   c. The location of origin and location of manufacturer for the supplied products
   d. The amount of FSC Certified wood products used.
   e. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the product information supplied on the LEED Building Materials Certification Form.

2. Product cut sheets for all materials that meet the LEED Building Performance criteria identified in each specification.

3. Documentation for all new wood products, including FSC Certified. Provide vendor invoices for all permanently installed wood products, FSC Certified or not. Each wood product must be identified on a line-item basis, FSC products must be identified as such on a line item basis, the dollar value of each line item must be shown, the vendors Chain-of-Custody certificate number must be shown on any invoice that includes FSC products.

4. Material Safety Data Sheets (MSDS) for all applicable products. Applicable products include but are not limited to adhesives, sealants, carpets, paints, coatings, flooring systems, and composite wood materials. MSDS shall indicate the Volatile Organic Compound (VOC) content of products submitted (if an MSDS sheet does not contain the VOC content, manufacturer letters or product data sheets must be provided that indicate the VOC contents).

5. The LEED Building Submittal information shall be assembled into one package per specification section (or per subcontractor) and sent to the Architect for review. Incomplete or inaccurate LEED Building submittals may be used as the basis for the Architects rejection of products or assemblies.

1.4 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals, including;

1. Contractor’s construction schedule
2. Submittal schedule
3. Shop Drawings
4. Coordination Drawings and Layout
5. Daily Construction Reports
6. Product Data
7. Samples
8. Site Mobilization Plan
9. Project Specific Safety Plan
10. Performance and Payment Bonds
11. Insurance Certificates
12. List of Subcontractors
13. Schedule of Value
14. Guarantees / Warranties

B. Related Requirements:

1. AIA Document A101 Contract Article 5 "Payments" for submitting Applications for Payment and the schedule of values.
2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.

3. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Division 01 Section 01 74 19 Construction and Demolition Waste Management
6. Division 01 Section 01 81 13 VOC Limits for Adhesives, Sealants, Paints and Coatings
7. Division 01 Section 01 81 19 Construction Indoor Air Quality (IAQ) Management

1.5 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect'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 Architect'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.

1.6 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 Architect 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. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 30 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. 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. Scheduled date for Architect's final release or approval.

1.7 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. 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. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 10 days for review of each resubmittal.
4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor. No extension of time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the work to permit processing.

C. 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 Architect.
3. Include the following information for processing and recording action taken:

   a. Project name.
   b. Date.

c. Name of Architect.
d. Name of Contractor.
e. Name of subcontractor.
f. Name of supplier.
g. Name of manufacturer.
h. 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).

i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to University Representative. Final approved submittal is provided to the Owner by the Architect of Record. Two paper copies.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor.

a. Transmittal Form for Paper Submittals: Use AIA Document G810

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 Architect.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name of Contractor.
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Specification Section number and title.
h. Related physical samples submitted directly.
i. Indication of full or partial submittal.
j. Transmittal number.
k. Submittal and transmittal distribution record.
l. Remarks.

E. Options: Identify options requiring selection by Architect.

F. 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 Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. 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 Architect's action stamp.

H. 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.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect'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. Transmit each submittal from Contractor to University Representative using a transmittal form.

1. Submit electronic submittals via email as PDF electronic files.

a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Submit two (2) paper copies of each submittal unless otherwise indicated. Architect will return two (2) copies.
3. Informational Submittals: Submit four (4) paper copies of each submittal unless otherwise indicated. Architect will not return copies.
4. 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. Notation of coordination requirements.

4. For equipment, include the following in addition to the above, as applicable:

   a. 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. Two (2) paper copies of Product Data unless otherwise indicated. Owner will retain two (2) copies.

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, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:

a. Two (2) opaque copies of each submittal in addition to digital PDF copy.

D. Samples: 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.

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: 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 two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: 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 (3) sets of Samples. Architect 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.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.

E. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment and Schedule of Values: Comply with requirements specified in Division 00 Section "Payment Procedures."

H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

J. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

K. Daily Reports: Comply with requirements specified in Division 01 Section “Construction Progress Documentation”.

L. Site Mobilization Plan

1. Prior to the start of operations on the site, the Contractor shall submit to the University Representative, a Site Mobilization Plan which shall indicate pertinent dates and times, logistics, construction fence, laydown area, traffic flow and compliance with the General Requirements to a level of detail commensurate with the complexity of the construction and the sensitivity of the Owner’s ongoing activities on site.

M. Safety Plan

1. Prior to, and as a condition of mobilization on site, the Contractor shall submit a project specific Safety Plan and a Job Hazard Assessment Plan before commencement of work. The project safety should consist of no less that the following information:

a. Material Safety Data Sheets for all potentially harmful substances.
b. A list of Contractor, Subcontractor, and University personnel to be notified in the event of an emergency.
c. A list of Contractor's personnel to be notified by the University in the event of an emergency during "off" hours.
d. Evacuation Plans.
e. Emergency medical procedures.
f. Locations of emergency medical equipment.
g. Completed Contactor Receipt Acknowledgement Form from the last page of the University of Connecticut, Contractor EHS Manual (http://www.ehs.uconn.edu/ppp/Contractor_EHS_Manual.pdf)

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 Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three (3) 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, design 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 University Representative. The University Representative will transmit submittals to Architect for action unless otherwise agreed upon arrangements are made.

B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "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 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return the submittal to contractor with a copy to the University Representative. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

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 Architect without action.

END OF SECTION 01-3300

LEED Buildings Material Certification Form

Steven Winter Associates, Inc. ©2008

Project Name: _____ Contractor Name: _____ Submittal Number: _____

Project Location: _____ Telephone Number: _____ Submittal Date: _____

MANUFACTURER / PRODUCT NAME	MATERIAL COST[1] Less Labor & Equip.	RECYCLED CONTENT		REGIONAL MATERIALS		RAPIDLY RE-NEWABLE[7]	FSC CERTIFIED WOOD[6] Wood Products Only		SUPPORTING DOCUMENTS[8]
		POST-CONSUMER[2]	PRE-CONSUMER[3] Post-Industrial	MANUFACTURING LOCATION[4]	RAW RESOURCES LOCATION[5]				
	($)	(%)	(%)	(City, State)	(City, State)	(%)	(%)	(COC#)	indicate type(s)
EXAMPLE: *EcoGyp-R-Us; 5/8" Gyp Bd*	*$8,550*	*5%*	*94%*	*Paterson, NY*	*Altoona, PA*	*0%*	*0%*	*n/a*	☑ MSDS or Cut Sheet ☐ Manufacturer Letter ☐ Other
									☐ MSDS or Cut Sheet ☐ Manufacturer Letter ☐ Other
									☐ MSDS or Cut Sheet ☐ Manufacturer Letter ☐ Other
									☐ MSDS or Cut Sheet ☐ Manufacturer Letter ☐ Other
									☐ MSDS or Cut Sheet ☐ Manufacturer Letter ☐ Other

[1]*Material Cost ($)*: The cost of the materials as it would appear on the manufacturer's or distributor's invoice to the contractor or subcontractor. Note: Material cost does not include labor or equipment costs associated with the installation of the product.

[2]*Post-Consumer Recycled Content (%)*: Portion (by weight) of material or product which derives from discarded consumer waste that has served its intended purpose and has been recovered for use as a raw material (e.g. a plastic bottle from a soft drink).

[3]*Pre-Consumer Recycled Content (%)*: (also called Post-Industrial) Portion (by weight) of material or product which derives from recovered industrial and manufacturing waste materials that are diverted for use in a different manufacturing process prior to use by a consumer (e.g. fly-ash in concrete and synthetic gypsum board, both use recovered waste products from coal burning electricity plants). Note: Pre-Consumer Recycled Content does not include scrap raw materials that can be reused in the same manufacturing process from which they are recovered.

[4]*Manufacturing Location (City, State)*: Manufacturing Location is the final assembly location of components into a building product that is then installed by the tradesmen (e.g. if a windows glass comes from Atlanta, GA and the aluminum casing from Charlotte, NC and the window is assembled in Baltimore, MD, then the Manufacturing Location of the window is Baltimore,MD).

[5]*Raw Resources Location (City, State)*: The location from which the building product components were extracted, harvested, or recovered (e.g. in the example above, the window would have two Raw Resources Locations: Atlanta, GA and Charlotte, NC).

[6]*FSC Certified*: Potion (by weight) of wood-based material or products that are certified by the Forest Stewardship Council (FSC). A Chain-of-Custody number (COC#) is required for all FSC certified wood products. Note: This column is only applicable to wood products.

[7]*Rapidly Renewable (%)*: Portion (by weight) of materials and products made from raw materials that are harvested within a 10-year cycle (e.g. bamboo, cork, linoleum, wool, cotton insulation, and wheatboard)

[8]*Supporting Documents*: are required to verify the accuracy of the information on this form. Please indicate the type(s) of Supporting Documents that are attached to this form. Supporting Documents may include, but are not limited to one of the following: Material Safety Data Sheets (MSDS), Cut Sheets, and Manufacturer Letters of Certification (must be provided on the manufacturer's letterhead).

VOC Compliance: For products that are Adhesives, Sealants, Paints, Coatings, Carpets Systems, Composite Wood and Agrifiber products, please fill out the LEED VOC Certification Form.

I, _____ a duly authorized representative of _____ hereby certify that the material information contained herein is an accurate representation of the material qualifications to be provided by us, as components of the final building construction. Furthermore, I understand that any change in such qualifications during the purchasing period will require prior written approval from the Construction Manager and Owner.

SECTION 01-4000 - 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 Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Requirements:

1. Division 01 Section "Allowances" for testing and inspecting allowances.
2. Divisions 02 through 33 Sections for specific test and inspection requirements.

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. 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 Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

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 Architect 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 Architect for a decision before proceeding.

1.5 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, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

D. 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.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Owner. 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.

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 on the "Statement of Special Inspections."
3. Owner-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 Architect 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.

1.7 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.

1.8 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. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect 7 days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

   a. Allow 7 days for initial review and each re-review of each mockup.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed unless otherwise indicated.
8. Reference individual Specification Sections specifying additional requirements

K. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Documents. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

L. Assemble and erect specified items with specified attachments, anchorage devices, flashings, seals and finishes.

1.9 QUALITY CONTROL

A. Owner Responsibilities: The Owner will provide independent inspections, tests, and similar quality control services specified to be performed by independent agencies and not by the

contractor, except where they are specifically indicated as the contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.

1. The Owner will employ and pay for services of an independent agency and 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. 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**,** and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: 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 the University Representative and 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 Division 01 Section "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. Comply fully with manufacturer's instructions, including each step in sequence. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.

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 Architect**,** and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify University Representative, Architect**,** 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 required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owners Representative, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner**,** as indicated in Statement of Special Inspections attached to this Section.

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 Architect.
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 Owner Representative and Architect'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.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

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 01-4000

Statement of Special Inspections

Project: *University of Connecticut*

Location: *Storrs, CT*

Owner: *University of Connecticut*

Design Professional in Responsible Charge: *Brian Falconer, P.E.*

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

☒ Structural ☐ Mechanical/Electrical/Plumbing
☐ Architectural ☐ Other: _____

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: *Every other week* or ☐ per attached schedule.

Prepared by:

Brian Falconer, P.E.
(type or print name)

1/19/2015
Signature Date

STATE OF CONNECTICUT
BRIAN NUBERT FALCONER
No. 29048
LICENSED
PROFESSIONAL ENGINEER

Design Professional Seal

Owner's Authorization:

Signature Date

Building Official's Acceptance:

Signature Date

Conformed Set - May 29, 2015

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- ☐ Soils and Foundations
- ☒ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☒ Masonry
- ☒ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☐ Spray Fire Resistant Material
- ☐ Wood Construction
- ☐ Exterior Insulation and Finish System
- ☐ Mechanical & Electrical Systems
- ☐ Architectural Systems
- ☐ Special Cases

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. **Special Inspection Coordinator**	*Severud Associates*	*469 Seventh Ave, 9th Floor* *New York, NY 10018* *(212) 986-3700* *jclear@severud.com*
2. Inspector and Testing Agency	*Terracon*	*201 Hammer Mill Road* *Rocky hill, CT 06067* *(816) 721-1900* *kjbrigandi@terracon.com*
3. Inspector		
4. Testing Agency		
5. Testing Agency		
6. Other		

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

Quality Assurance Plan

Quality Assurance for Seismic Resistance

Seismic Design Category	*B*
Quality Assurance Plan Required (Y/N)	*N*

Description of seismic force resisting system and designated seismic systems:

Quality Assurance for Wind Requirements

Basic Wind Speed (3 second gust)	*100*
Wind Exposure Category	*C*
Quality Assurance Plan Required (Y/N)	*N*

Description of wind force resisting system and designated wind resisting components:

Statement of Responsibility

Each contractor responsible for the construction or fabrication of a system or component designated above must submit a Statement of Responsibility.

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

PE/SE	Structural Engineer – a licensed SE or PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.

International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

Exterior Design Institute (EDI) Certification

EDI-EIFS	EIFS Third Party Inspector

Other

_____ _____

Cast-in-Place Concrete

Item	Agency # (Qualif.)	Scope
1. Mix Design	*2* *ACI-CCI* *ICC-RCSI*	*Review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design.*
2. Material Certification	*1, 2* *ACI-CCI* *ICC-RCSI*	*Review certified mill test reports and identification markings on reinforcing bars.*
3. Reinforcement Installation	*1, 2* *ACI-CCI* *ICC-RCSI*	*Inspect size, spacing, cover, positioning and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters*
4. Welding of Reinforcing	*1, 2* *AWS-CWI*	*Visually inspect all reinforcing steel welds. Verify weldability of reinforcing steel. Inspect preheating of steel when required.*
5. Anchor Rods	*1, 2* *ACI-CCI* *ICC-RCSI*	*Inspect size, positioning and embedment of anchor rods. Inspect concrete placement and consolidation around anchors.*
6. Concrete Placement	*1, 2* *ACI-CCI* *ICC-RCSI*	*Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.*
7. Sampling and Testing of Concrete	*2* *ACI-CFTT* *ACI-STT*	*Test concrete compressive strength (ASTM C31 & C39), slump (ASTM C143), air-content (ASTM C231 or C173), unit weight and temperature (ASTM C1064).*
8. Curing and Protection	*1* *ACI-CCI* *ICC-RCSI*	*Inspect curing, cold weather protection and hot weather protection procedures.*
9. Non-shrink grout for column baseplates.	*1, 2* *ACI-CCI* *ICC-RCSI*	*Test compressive strength (ASTM C109).*

Masonry

Required Inspection Level: ☒ **1** ☐ **2**

Item	Agency # (Qualif.)	Scope
1. Material Certification	*1*	*Review certified reports and identification markings on masonry units.*
2. Mixing of Mortar and Grout	*2* *ICC-SMSI*	*Inspect proportioning, mixing and retempering of mortar and grout.*
3. Installation of Masonry	*1, 2* *ICC-SMSI*	*Inspect size, layout, bonding and placement of masonry units.*
4. Mortar Joints	*1, 2* *ICC-SMSI*	*Inspect construction of mortar joints including tooling and filling of head joints.*
5. Reinforcement Installation	*1, 2* *ICC-SMSI* *AWS-CWI*	*Inspect placement, positioning and lapping of reinforcing steel.* *Inspect welding of reinforcing steel.*
6. Grouting Operations	*1, 2* *ICC-SMSI*	*Inspect placement and consolidation of grout. Inspect masonry clean-outs for high-lift grouting.*
7. Weather Protection	*1, 2* *ICC-SMSI*	*Inspect cold weather protection and hot weather protection procedures. Verify that wall cavities are protected against precipitation.*
8. Evaluation of Masonry Strength	*2* *ICC-SMSI*	*Test compressive strength of mortar and grout cube samples (ASTM C780).* *Test compressive strength of masonry prisms (ASTM C1314).*
9. Anchors and Ties	*1, 2* *ICC-SMSI*	*Inspect size, location, spacing and embedment of dowels, anchors and ties.*

Structural Steel

Item	Agency # (Qualif.)	Scope
1. Fabricator Certification/ Quality Control Procedures ☐ Fabricator Exempt	*1* *AWS/AISC-SSI ICC-SWSI*	*Review shop fabrication and quality control procedures.*
2. Material Certification	*1* *AWS/AISC-SSI ICC-SWSI*	*Review certified mill test reports and identification markings on wide-flange shapes, high-strength bolts, nuts and welding electrodes*
3. Bolting	*2* *AWS/AISC-SSI ICC-SWSI*	*Inspect installation and tightening of high-strength bolts. Verify that splines have separated from tension control bolts. Verify proper tightening sequence. Continuous inspection of bolts in slip-critical connections.*
4. Welding	*1, 2* *AWS-CWI ASNT*	*Visually inspect all welds. Inspect pre-heat, post-heat and surface preparation between passes. Verify size and length of fillet welds.* *Ultrasonic testing of all full-penetration welds.*
5. Shear Connectors	*1, 2* *AWS/AISC-SSI ICC-SWSI*	*Inspect size, number, positioning and welding of shear connectors. Inspect suds for full 360 degree flash. Ring test all shear connectors with a 3 lb hammer. Bend test all questionable studs to 15 degrees.*
6. Structural Details	*1, 2* *PE/SE*	*Inspect steel frame for compliance with structural drawings, including bracing, member configuration and connection details.*
7. Metal Deck	*1, 2* *AWS-CWI*	*Inspect welding and side-lap fastening of metal roof and floor deck.*

Statement of Special Inspections

Project: *University of Connecticut New Engineering and Science Building*

Location: *Storrs, CT.*

Owner: *University of Connecticut*

Design Professional in Responsible Charge:

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

☐ Structural ☐ Mechanical/Electrical/Plumbing
☐ Architectural ☒ Other: *Geotechnical*

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: or ☐ per attached schedule.

Prepared by:

(type or print name)

Signature Date

Design Professional Seal

Owner's Authorization:

Signature Date

Building Official's Acceptance:

Signature Date

Conformed Set - May 29, 2015

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- ☐ Soils and Foundations
- ☐ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☐ Masonry
- ☐ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☐ Spray Fire Resistant Material
- ☐ Wood Construction
- ☐ Exterior Insulation and Finish System
- ☐ Mechanical & Electrical Systems
- ☐ Architectural Systems
- ☐ Special Cases

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. **Special Inspection Coordinator**		
2. Inspector		
3. Inspector		
4. Testing Agency		
5. Testing Agency		
6. Other	*Haley & Aldrich, Inc.* *(Geotechnical Engineer)*	*100 Corporate Place, Suite 105* *Rocky Hill, CT 06067* *Timothy Crowl, P.E.* *tcrowl@haleyaldrich.com* *P: 860-290-3121*

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

Soils and Foundations

Item	Agency # (Qualif.)	Scope
1. Shallow Foundations	*6 PE/GE*	*Inspect soils below footings for adequate bearing capacity and consistency with geotechnical report.* *Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill*
2. Controlled Structural Fill	*6* *or* *2/4 (EIT, NRC-OP)*	*4 to perform sieve tests (ASTM D422 & D1140) and modified Proctor tests (ASTM D1557) of each source of fill material.* *6 (beneath foundations) and 2/4 (beneath floor slabs) Inspect placement, lift thickness, and compaction of controlled fill.* *Test density of each lift of fill by nuclear methods (ASTM D2922)* *Verify extent and slope of fill placement.*
3. Deep Foundations	*N/A*	
4. Load Testing	*N/A*	
4. Other:	*6*	*Review submittals for proposed fill materials*

Statement of Special Inspections

Project: *University of Connecticut New Engineering and Science Building*

Location: *Storrs, CT.*

Owner: *University of Connecticut*

Design Professional in Responsible Charge: *John W. Doherty, R.A.*

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

☐ Structural ☐ Mechanical/Electrical/Plumbing

☒ Architectural ☐ Other: _____

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: *Weekly* or ☐ per attached schedule.

Prepared by:

John W. Doherty, R.A.
(type or print name)

Signature *Feb. 20, 2015*
Date

STATE OF CONNECTICUT
JOHN W. DOHERTY
No. 12121
LICENSED
LICENSED ARCHITECT

Design Professional Seal

Owner's Authorization:

Signature Date

Building Official's Acceptance:

Signature Date

Conformed Set - May 29, 2015

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- ☐ Soils and Foundations
- ☐ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☐ Masonry
- ☐ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☒ Spray Fire Resistant Material
- ☐ Wood Construction
- ☐ Exterior Insulation and Finish System
- ☐ Mechanical & Electrical Systems
- ☐ Architectural Systems
- ☐ Special Cases

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. **Special Inspection Coordinator**		
2. Inspector		
3. Inspector		
4. Testing Agency		
5. Testing Agency		
6. Other		

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

Spray-Applied Fire Resistant Material

Item	Agency # (Qualif.)	Scope
1. Material Specifications	*1*	*Verify that materials provided conform to approved submittals.*
2. Laboratory Tested Fire Resistance Design	*1* *ICC-SFSI*	*Review UL fire resistive design for each rated beam, column, or assembly.*
3. Schedule of Thickness	*1* *ICC-SFSI*	*Review approved thickness schedule.*
4. Surface Preparation	*2* *ICC-SFSI*	*Inspect surface preparation of steel prior to application of fireproofing*
5. Application	*2* *ICC-SFSI*	*Inspect application of fireproofing.*
6. Curing and Ambient Condition	*2* *ICC-SFSI*	*Verify ambient air temperature and ventilation is suitable for application and curing of fireproofing.*
7. Thickness	*2* *ICC-SFSI*	*Test thickness of fireproofing (ASTM E605). Perform a set of thickness measurements for every 1,000 SF of floor and roof assemblies and on not less than 25% of rated beams and columns.*
8. Density	*2* *ICC-SFSI*	*Test the density of fireproofing material (ASTM E605).*
9. Bond Strength	*2* *ICC-SFSI*	*Test the cohesive/adhesive bond strength of fireproofing ASTM E736). Perform not less than one test for each 10,000 SF.*
10. Other:		

SECTION 01-5000 - TEMPORARY FACILITIES AND CONTROLS

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 temporary services and facilities, including:

1. Utilities
2. Temporary construction
3. Construction aids
4. Barriers and enclosures
5. Security
6. Access roads
7. Temporary controls
8. Traffic control
9. Project identification and signs
10. Field offices and sheds
11. Installation of Owner provided decorative banners on site enclosure fencing.

B. Related Requirements:

1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.
2. Divisions 01 Section “Temporary Tree and Plant Protection” for protection and pruning of existing trees and plants that are affected by execution of the Work.
3. Division 31 Section "Dewatering" for disposal of ground water at Project site.
4. Division 32 Section "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.
5. Division 32 Section "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

C. Temporary utilities may include but are not limited to:

1. Temporary electric power and light.
2. Temporary heating, cooling and ventilating.
3. Telephone service.
4. Water services and distribution.
5. Temporary sanitary facilities, including drinking water.
6. Temporary sewers and drainage
7. Temporary fire protection.

D. Security may include but is not limited to:

1. Permanent fire protection.
2. Covered walkways at entrances
3. Security enclosures, fences and lockups

E. Access roads and parking include but are not limited to:

1. Temporary roads and paving

F. Temporary controls may include but are not limited to:

1. Dewatering facilities and drains
2. Waste disposal
3. Rodent and pest control
4. Environmental protection
5. Nuisance dust control
6. Noise control.

1.3 USE CHARGES

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, Architect, testing agencies, and authorities having jurisdiction.

1. Contractor shall furnish and install all necessary temporary switches, wiring, fixtures, bulbs, piping and other devices as may be required to connect to existing systems.

B. Water and Sewer Service from Existing System: A moderate quantity of water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations. The University reserves the right to require the Contractor to install meters and, if obvious and excessive use is observed, to pay for these utilities.

C. Electric Power Service from Existing System: A moderate quantity of electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations. The University reserves the right to require the Contractor to install meters and, if obvious and excessive use is observed, to pay for these utilities.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion and Sedimentation Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust and HVAC control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste handling procedures.
5. Other dust-control measures.

1.5 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations and authorities having jurisdiction, including but not limited to:

1. Building Code requirements
2. Health and safety regulations
3. Utility company regulations
4. Police, Fire Department and Rescue Squad rules.
5. Environmental protection regulations.

B. Standards: Comply with NFPA Code 241, “Standard for Safeguarding Construction, Alteration, and Demolition Operations”, ANSI-A10 Series standards for “Safety Requirements for Construction and Demolition”, and NECA Electrical Design Library “Temporary Electrical Facilities.”

C. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with National Electric Code (NFPA 70).

D. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates of implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary services to use of the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire preventative measures. Do not overload facilities, or permit them to interfere with progress of work. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Supporting post shall be driven. Provide dark green reinforced scrim sheeting on all fencing.

C. Wood Enclosure Fence: 3/8” thick Plywood, minimum 6 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.

D. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

E. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

F. Gypsum Wallboard: Provide gypsum wallboard complying with requirements of ASTM C 36 on interior walls of temporary partitions.

G. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

H. Water: Provide potable water approved by local health authorities.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot square tack and marker boards.
3. Drinking water and private toilet.
4. Coffee machine and supplies.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 75 deg F.
6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

D. Provide 8 x 20 trailer to accommodate OSBI/OSFM, excluding furniture, equipment and toilet.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction.

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

D. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

E. Electrical Power Cords: Provide grounded extension cords; use “hard-service” cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

F. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixture where exposed to moisture.

G. First Aid Supplies: Comply with governing regulations.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

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

D. Noise Control: The Contractor shall make every effort to minimize noise disruption to occupants of buildings and adjacent buildings. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site. No noise generating work that interferes with classroom operation shall be tolerated. No noise generating work shall be allowed during exam periods where the noise will impact classroom functions. Examples of noise generating work include, but are not limited to sawing, drilling and hammering and/or jackhammering.

1. Avoid use of tools and equipment, which produce harmful noise. No gasoline-powered equipment shall be used during times that the buildings are occupied. No gasoline-powered equipment may be used in the interior of buildings at any time.

E. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle

hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

1. All removed materials that are salvageable are the property of the Contractor unless otherwise noted in the specifications.
2. All debris resulting from the performance of this contract will be the property of the Contractor and will be completely removed from the campus and disposed of in a legal manner.
3. Chutes and dumpster type containers designed to keep dust and spillage to a minimum will be used by the Contractor. Dumpsters will be completely covered with a waterproof covering at all times when not in use.

F. Nuisance Dust Control: The following provisions shall apply during demolition or construction phases of work:

1. It is the intent of this specification to insure that nuisance dusts resulting from demolition or construction activities do not impact occupied areas of the building. The Contractor shall take all measures necessary to accomplish this goal. These measures will include as minimum polyethylene sheeting or wet methods of fugitive dust control.
2. The Contractor shall submit a plan prior to commencement of work that will detail all methods of dust control. This plan shall be approved by the University Representative prior to commencement of work. Upon approval, this plan shall be distributed to the University Representative and the building representative on the Safety Committee.
3. Failure to comply shall result in immediate stoppage of work until effective dust control measures are employed.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.
2. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
3. The University must be notified at least 72 hours in advance of any proposed interruption in order that all affected departments may be advised and have time to adjust their schedules accordingly.
4. Any service (steam, water, electricity, etc.) shutdown which will interrupt the continuity of an experiment or be detrimental to a research project or which, in the opinion of the University, is required for other valid reasons, shall be maintained by safe and adequate temporary means and such temporary piping, wiring and associated devices shall be removed when no longer required.
5. The University reserves the right to limit the down time to a specified number of net hours and to set the date for each occasion of complete shutdown.
6. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.

7. Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.

B. Sewers and Drainage: If sewers are available, provide temporary connection to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.

1. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways before discharge.
2. Connect temporary sewers to the municipal system as directed by the sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction. Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

1. Sterilization: Sterilize temporary water piping in accordance with AWWA requirements prior to use.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Use of Owner's existing sanitary facilities will not be permitted.
2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
3. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used materials.
4. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.
   a. Provide safety showers, eyewash fountains and similar facilities for convenience, safety and sanitation of personnel
5. Drinking Water Fixtures: Provide drinking water fountains where indicated including paper supply.
6. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.
   a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

E. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on

completed installations or elements being installed. A temporary heating plan must be presented to the University and OSBI in advance for approval.

1. The Contractor shall provide temporary heat during construction for interior areas included in the Contract, and any adjacent or nearby occupied areas, to counteract low temperatures or excessive dampness and in any event, between October 15th and May 15th, maintain during said period or periods until final completion of the Contract, unless otherwise approved by the University representative in writing. Provide heat and ventilation to maintain specified conditions for construction operations and to protect materials and finishes from damage by temperature or humidity. Costs shall be paind by the Contractor. Unless otherwise specified in the Contract Documents, the temporary heating shall be sized to maintain the following conditions on a 24-hour-per-day basis:

    a. Occupied Dormitory or Living Areas: 68 degrees F
    b. Office Spaces/Laboratories/Classrooms: 68 degrees F
    c. Warehouses/Storage: 55 degrees F

2. The areas listed above are for example only. The University Representative shall have sole discretion to assign minimum heating criteria.

F. Electrical Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.

1. Except where overhead service must be used, install electric power service underground.
2. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance

G. Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction and traffic and safety conditions.
2. Install exterior yard and sign lights so that signs are visible when Work is being performed.

H. Telephones: Provide temporary or cellular telephone service for all personnel engaged in construction activities, throughout the construction period. Contractor shall arrange and pay for his own telephone service.

1. Post or maintain within a project notebook a list of important telephone numbers.

    a. Police and fire departments.
    b. Ambulance service.
    c. Contractor's home office.
    d. Contractor's emergency after-hours telephone number.

e. Architect's office.
f. Engineers' offices.
g. University Representative office.
h. Principal subcontractors' field and home offices.

I. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

J. Ventilation and Humidity Control: 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.

K. Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 “Standard for Portable Fire Extinguishers,” and NFPA 241 “Standard for Safeguarding Construction, Alterations and Demolition Operations.”

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
4. Provide supervision of all welding operations, combustion type temporary heating units, and similar sources of fire ignition.
5. No gasoline shall be stored in or close to an building at any time.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
3. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.

B. Field Offices and Sheds: A field office is not required for this project, however should the Contractor choose to provide a field office, see requirements below:

1. Provide non-combustible construction for offices, shops and sheds located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.
2. Field Offices: Provide insulate, weathertight temporary offices with electric lighting, air conditioning and heat and of sufficient size to accommodate required office personnel at the Project Site. The Field Office shall have two rooms, each approximately 150 square feet in size. The offices shall have ample natural light, a heater of sufficient capacity to maintain 70 degrees F in winter and an air conditioner of sufficient capacity to maintain 75 degrees F in summer. No trailer will be allowed on University property unless permanent markings indicating the name of the company are clearly visible. Keep the office clean and orderly of use for small progress meetings. Furnish and equip offices with a minimum of the following:

   a. Furnish with desks and chairs, file cabinets, plan tables, plan racks, waste receptacles, conference room table and at least eight chairs.
   b. Equip with a water cooler and private toilet complete with water closet, lavatory and mirror-medicine cabinet unit.
   c. Equip with a 5 lb ABC fire extinguisher and an OSHA-approved first aid kit.
      Equip with a facsimile machine and copier for use by the Contractor, University Representative and Architect/Enginner.

C. Temporary Roads and Paved Areas: Comply with the following:

1. The Contractor shall, under regulation prescribed by the University Representative, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the University Representative. When materials are transported in prosecuting the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

2. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

3. Construct and maintain temporary roads and paving to adequately support the indicated loading and to withstand exposure to traffic during the construction period. Locate temporary paving for roads, storage areas and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Architect.

    a. Paving: Comply with Division-2 Section “Asphalt Concrete Paving” for construction and maintenance of temporary paving.
    b. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.
    c. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas that are without damage or deterioration when occupied by the Owner
    d. Delay installation of the final course of permanent asphalt concrete paving until immediately before Substantial Completion. Coordinate with weather conditions to avoid unsatisfactory results.
    e. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration and supervision.

D. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."
5. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

G. Temporary Elevator Use: Use of elevators by the Contractor will not be permitted.

H. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

I. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. 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 Division 01 Section "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with the latest requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Division 31 Section "Site Clearing."

D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of the latest EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

F. Tree and Plant Protection: Comply with requirements specified in Division 01 Section "Temporary Tree and Plant Protection."

1. 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.

G. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

H. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates. All fencing to have dark green reinforced scrim sheeting.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations or as indicated on Drawings.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
3. Contractor to install owner provided decorative banners on the exterior side of the site enclosure fencing as directed by owner's representative

I. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day. University Representative and/or Police/FD require dual lock system in order to access site off hours if required to due to an emergency.

J. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

K. Temporary Egress: Maintain temporary egress from existing occupied facilities at all times and as required by authorities having jurisdiction.

L. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.

1. Construct covered walkways using scaffold or shoring framing.
2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
3. Where required by OSHA regulations provide temporary lighting under covered walkways to satisfy requirements.
4. Covered walkways shall maintain a minimum clear height of 8ft above walking surface, and shall be designed to support all imposed loads and a minimum live load of 150 psf.

M. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

N. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
4. Insulate partitions to control noise transmission to occupied areas.
5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
6. Protect air-handling equipment.
7. Provide walk-off mats at each entrance through temporary partition.

O. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with University fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
    a. Hot Work permits must be obtained from the University Fire Department before commencement of said work.

4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 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 permanent HVAC system 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 Architect.
    c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 TRAFFIC CONTROL

A. Due to the large volume of pedestrian and vehicular traffic within the campus, it shall be the responsibility of the Contractor to provide continuous traffic accessibility to all areas of the campus.

B. The Contractor shall comply with Connecticut Regulation13b-17-28, Safety to Traffic, which requires that "When portions of the traveled way are made dangerous for the movement of

vehicles or pedestrians, a sufficient number of uniformed police officers, flagmen, or traffic men, shall be employed by the permittee to direct traffic safely through the area."

C. The requirement to maintain pedestrian and vehicular traffic is further defined in the Connecticut Department of Transportation Specifications Section 9.71, Form 814, which requirements are incorporated herein by reference.

D. The Contractor may contact the University Police Department, Town of Mansfield Police Department, or other private sources to obtain the necessary manpower to comply with these regulations. The University Representative assigned to the given construction project shall be informed by the General Contractor of his traffic control procedures prior to the commencement of construction.

3.7 PROJECT IDENTIFICATION AND SIGNS

A. Project Identification Signs: Provided and installed by the University.

1. Decorative banners for the site enclosure fencing shall be provided by the Owner and installed by the Contractor.

B. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.

C. Other Signs: Any other signage shall be submitted to the University Representative for approval.

3.8 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.
2. Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

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: Unless the University Representative requests that it be maintained longer, 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. Owner reserves right to take possession of Project identification signs.
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 Division 01 Section "Closeout Procedures."

    a. Replace air filters and clean inside of ductwork and housings.
    b. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
    c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.
    d. Restore all existing facilities and grounds used during construction to specified or to original condition.

END OF SECTION 01-5000

SECTION 015639 TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. LEED BUILDING GENERAL REQUIREMENTS:

1. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.
2. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.2 SUMMARY

A. This Section includes the protection and stress reduction of existing trees and vegetation that interfere with, or are affected by, execution of the Work, whether temporary or permanent. Work is to be coordinated with Site & Landscape Improvements and Tree Preservation and Transplant Plans.

B. The following specifications apply to work of the Contract Arborist related to Protection and Stress Reduction Measures and coordination and oversight of the Tree Protection and Preservation Program by the Project Arborist. This work includes but is not limited to the following:

1. Coordination of Temporary Tree and Plant Protection

2. Selective tree removals for "Removal By Arborist" (RBA) (Contract Arborist) within Tree Protection Areas (TPAs).

3. Crown Pruning and Supportive cabling.

4. Root Pruning

5. Temporary Site and Tree protection fencing and temporary sign installation

6. Root Protection Matting for temporary construction access in TPAs

7. Root Aeration Matting for permanent grade fills

8. Composted Mulching

9. Liquid subsurface fertilization

10. Tree Growth Regulator (Paclobutrazol)

11. Soil Nutrient Testing

12. Super Silt Fence / Silt Fence "Trenchless Attachment" to Root Protection Matting (RPM) and Root Aeration Matting (RAM)

13. Temporary Limb Guying or Clearance Pruning for construction access

14. Seasonal Supplemental Watering

15. Monitoring and Treatment of Tree Health

16. Soil Decompaction with SuperSonic Air Tool (SSAT) within CRZs of Designated Trees

17. Supersonic Air Tool (SSAT) and Hand Excavation within the Critical Root Zones (CRZs)

1.3 DEFINITIONS

A. Certified Arborist: Credential of an individual arborist issued and administered by the International Society of Arboriculture. This credential must be current and valid to qualify to use the copyrighted designation of "Certified Arborist". Refer to www.isa-arbor.com for additional information.

B. Project Arborist: Arboricultural firm contracted to provide planning and design services, technical assistance and advice to the owner and design team. Duties include but are not limited to the following: site investigation and documentation (design phase inventories, assessments, root investigations, etc.); develop tree preservation plans, methods, details and specifications; and provide final document review and monitoring of the Contract Arborist. Project Arborist is contracted directly to the owner or owner representative and acts specifically on behalf of the owner concerning tree related issues. Project Arborist shall have authority over the Contract Arborist and any disputes shall be decided by the Project Arborist and Engineer.

C. Contract Arborist: Arboricultural firm contracted to implement the approved tree preservation plans on site. All crews conducting arboricultural operations on site shall consist of at least one Certified Arborist who directly oversees all work by that crew. Arboricultural operations include, but are not limited to, pruning, tree protection device installation and maintenance (fence, matting, etc.), root pruning, air tool root excavation/exploration (SSAT), soil care activities, soil testing, mulch application, tree inspections, pesticide/chemical applications and tree removal. Special qualifications submittal is required for review and approval below. Contract Arborist will be sub-contracted by the general contractor.

D. Tree Protection Area (TPA): Area indicated on Drawings surrounding individual trees or groups of trees to be protected during construction.

E. Critical Root Zone (CRZ): Area shown on Drawings for all trees within scope of this project with a circle. Estimated area is based upon an industry standard "rule of thumb" of 1.5 feet of radius per inch of diameter at breast height (DBH). CRZ is described as the minimum area of tree roots required to be protected to maintain tree health. Any impacts within the CRZ must be mitigated based on severity up to and including tree removal if the impact is severe.

F. Tree Protection Action Key (TPAK): Matrix provided on Plan sheets for each tree indicating designated protection and stress reduction measures specified in this document.

G. Supersonic Air Tool (SSAT): Hand held tool designed to focus highly compressed air (90-125 psi) provided from a large air compressor (185-375 cfm) at speeds close to 1400 mph at the tip of the tool. Widely used by arboricultural firms and consultants for multiple purposes including but not limited to: root collar investigation, CRZ investigation, root pruning (especially large roots > 1.5" diameter or were existing underground cables or conduits are located), radial mulching and restoration of compacted soils, excavation for utilities within protected CRZs to minimize root damage from constriction.

H. Tree Removal by Arborist: Action whereby the Contract Arborist removes trees designated for "Removal by Arborist" selected from inside the TPAs. Trees shall be taken down by hand sectionally, or directionally felled to minimize damage to adjacent tree canopies, root systems, or adjacent structures. Work shall be completed by a qualified Contract Arborist.

I. Crown Pruning: Action by the Contract Arborist of pruning specific tree limbs to improve tree health, reduce hazard, and / or provide construction clearance.

J. Supportive Cabling: Installation of supportive cabling for designated tree branches due to weak branch attachments.

K. Root Pruning: Action indicated on Drawings to provide a more suitable cut for protected tree roots to minimize ripped or torn roots during excavations and grading with standard construction equipment. Various methods may be used.

L. Mulching of Trees: Application of a wood mulch product to areas surrounding designated trees. Mulch increases moisture-holding capacity, helps mitigate soil compaction, and increases needed soil organic composition.

M. Soil Amendments: Various product components applied to existing soil environment of protected trees, as indicated on Plan notes.

N. Tree Growth Regulator (*Paclobutrazol*): Products applied to designated trees used to regulate plant growth in such a way as to restrict canopy growth and free stored or produced energy for other uses in the tree. For highly impacted trees, more energy may be made available for fibrous root growth (to combat root loss), thicker darker leaves (allowing for increased photosynthesis, and increased drought tolerance), and pest tolerance (often an issue with construction stressed trees); among other potential benefits.

O. Limits of Disturbance (LOD) (also called Limits of Construction): Specific outer limits of all construction activities for the entire project.

P. DBH (Diameter at Breast Height): Tree trunk diameter measured at 4.5 feet above grade.

Conformed Set - May 29, 2015

Q. Soil Decompaction with SuperSonic Airtool (SSAT) within CRZs of Designated Trees: This work is typically prescribed for urban park or campus trees where existing compacted soils and associated trees will benefit. It involves pneumatic de-compaction in the upper soils using Supersonic Air tools (SSAT) by trained and qualified arborists. Amendments as specified are mixed into the soils.

1.4 SUBMITTALS

The Contract Arborist shall provide submittals as follows:

A. Product Data: For each type of product indicated.

B. Certification: For each phase, the Contract Arborist shall certify for each tree designated to remain has been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged. Damages to tree crowns, trunk, and root system shall be noted. Damages to include incursion of vehicles, staging, or stockpile within designated Tree Protection Areas without authorization.

C. Qualification Data: For Contract Arborist Firm Qualifications, submit firm and individual qualifications as follows.

1. Submit a minimum of two resumes and detailed qualifications from staff or team individuals assigned to this project as detailed under Quality Assurance below. Due to the complexity of this project, standard arboricultural experience may not qualify.

2. Provide references for above from a minimum of three commercial, nongovernmental or governmental projects for whom similar tree preservation programs have been successfully implemented. Include the following information:

a. Project name, size and scope

b. Number and species of trees involved

c. Relevant photos or aerials

d. Tree preservation budget

e. Scope of services provided

f. Name and contact for project owner, designer, or contractor

D. Pedestrian/Property Protection Plan: Contract Arborist to submit a written plan describing all protective measures proposed to be used to minimize potential impact to pedestrians, parked cars, workers and other public and private property. Protection measures shall be required for all on-site tree care activities including but not limited to Supersonic Air Tool excavation, root pruning, canopy pruning, etc.

E. Maintenance Prescription: Contract Arborist shall submit for care and protection of trees as a result of construction, changes in weather patterns or events, and response in health from individual trees during and after completing the Work.

F. Soil Samples: Submit soil sample for analysis during site work phase of this project. Take the samples during April through October. Take representative soil samples from all areas of protected trees (landscape areas and street tree planting pits). Samples and procedures per local cooperative extension shall be followed. Forward reports to Engineer and Project Arborist.

G. Soil Amendments: Contract Arborist shall submit specific fertilizer formulations, application rates and methods for review by Project Arborist. All fertilization and soil amendments shall be in conformance with soil test results.

H. Site Documentation: Submit weekly reports to owner and Project Arborist containing complete documentation of all tree impacts and tree preservation activities including but not limited to: root pruning, tree protection fencing, excavation within critical root zones, tree fertilization or other treatments, etc. Documentation shall include tree numbers of trees impacted and/or treated. Complete daily photographic record is also required.

I. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or videotape.

2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.5 QUALITY ASSURANCE

A. On-site Arborist (individual) Qualifications: An arborist certified by the International Society of Arboriculture (ISA) and licensed in the jurisdiction where project is located. All work performed by Contract Arborist including any oversight and documentation work, shall be performed or directly supervised by at least one on-site arborist with these minimum qualifications.

B. Contract Arborist Firm Qualifications:

1. Contract Arborist Firm shall comply with the following:

a. Established business with documented experience of at least five years.

b. Experience working on a minimum of three commercial, nongovernmental or governmental projects where similar tree preservation programs have been successfully implemented.

c. Properly licensed and insured to perform arboricultural work in the jurisdiction where the project is located.

2. Provide names of each individual to comply with the following:

a. Minimum BS degree in forestry, arboriculture, or related field

b. Certification by ISA (Certified Arborist or Board Certified Master Arborist)

c. Resumes should reflect combined 10 years full time experience on similar tree preservation projects.

d. Provide individual(s) names, certifications, and each anticipated role in this project. "Role(s)" shall be defined as one or more of the following:

i. Project Manager

ii. Technical oversight

iii. Field Arborist / Technician

3. For each staff member, list a minimum of three construction projects and a minimum three years experience in the following technical applications:

a. Soil amendment prescriptions and applications

b. Supersonic Air Tool Excavations for underground utilities exceeding 24" depth

c. Root Protection Matting or similar applications

d. Root Aeration Matting or similar applications

e. Construction oversight and monitoring on large projects

f. Coordination of arboricultural activities with construction project managers on large projects

C. Publications listed herein are part of this work to extent referenced:

1. ANSI A300 Standard Practices for Trees, Shrubs, and Other Woody Plant Maintenance

2. Part 1-2001, Tree Pruning;

3. Part 2-3004, Fertilization;

4. Part 3-2000, Cabling, Bracing, Guying of Established Trees;

5. Part 4-2002, Lightning Protection Systems.

6. ANSI Z133.1 - 1994 and most recent updates, Tree Care Operations - Safety Requirements

D. Fertilizer and pesticides will be applied in strict accordance with the manufacturers label instructions and applicable federal, state, and local requirements. Fertilizer, soil conditioners, and pesticide applications must be approved by the owner prior to application. Material Safety Data Sheets (MSDS) will be available for fertilizers and pesticides in the Contract Arborists' possession while on the site.

E. Pre-Construction Meeting: Conduct meeting at the project site prior to commencement of any project related site activities.

1. Contract Arborist, Project Arborist, Project Design Team, Owner and Contractors shall attend.

2. Review methods and procedures related to tree protection and preservation including, but not limited to, the following:

a. Construction schedule - verify availability of materials, personnel, and equipment needed to make progress and avoid delays.

b. Enforcement of requirements for tree protection areas

c. Responsibilities of all parties, including coordination, access and timing requirements

d. Field quality control

1.6 PROJECT CONDITIONS

A. The following practices are prohibited within all tree protection areas except as specifically indicated herein:

1. Storage or stockpiling of construction materials, fuels, chemicals, debris, or excavated materials

2. Parking vehicles, trailers, generators or equipment

3. Foot traffic

4. Erection of sheds or structures

5. Impoundment or discharge of water

6. Excavation or other digging unless otherwise indicated

7. Attachment of signs or other materials to, or wrapping materials around trees or plants unless otherwise indicated

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temporary Root Protection Matting (RPM): geocomposite material comprised of a tri-planar geonet structure with thermally bonded nonwoven geotextiles on both sides.

1. Material shall be SynTec ROADRAIN T-7 or approved equivalent.

2. AlturnaMATS® or 1" thick steel plates may be used in lieu of RPM.

3. Submit shop drawings / cut sheets and material samples for review by Project Arborist and project civil.

4. Wood chip mulch and/or gravel is required with these materials.

B. Temporary Trunk/Limb Protection Wrap: to provide specific protection to tree trunks when construction activities are expected to be in close proximity.

1. Material shall be SynTec ROADRAIN T-7 or approved equivalent.

2. Alternative methods and materials may be submitted for review.

C. Permanent Root Aeration Matting (RAM): geocomposite material comprised of a tri-planar geonet structure with thermally bonded nonwoven geotextiles on both sides.

1. Material shall be SynTec ROADRAIN T-7 or approved equivalent.

2. Submit shop drawings / cut sheets and material samples for review by Project Arborist and project civil.

D. Temporary Tree Protection Fence

1. Chain-Link Fence: Galvanized steel chain-link fence fabric of 10- 11 gauge wire fabric; 6 feet high; with 1.9-inch- diameter line posts; 2-3/8-inch- diameter terminal and corner posts; with tie wires, hog ring ties, gates, and other accessories for a temporary fence system.

2. Welded Wire Fence: 48" ht, 14 gauge, 4"x2" galvanized fabric with 6' steel T-posts, metal wire clips, tree protection signs.

E. Silt Soxx - Woven Silt Tube-three-dimensional tubular sediment control and storm water runoff filtration device typically used for perimeter control of sediment and soluble pollutants (such as phosphorus and petroleum hydrocarbons), on and around construction activities.

1. Refer to manufacturer's instructions for materials and installation: www.filtrexx.com or equivalent.

F. Wood Chip Mulch

1. Double ground hardwood, aged a minimum 6 months from production, free from deleterious materials. Green chips, chips from alien invasive species, or mulch aged less than 6 months shall not be used. Walnut mulch shall not be used. Submittal shall include original material source(s), number and type of grindings / chippings, duration of aging, timing of turning /aeration.

G. Hardwood Destructive Borer /Beetle Control: Bifenthrin, such as *Onyx* or equivalent. Applied per label.

H. Tree Growth Regulator (*Paclobutrazol*)

1. Paclobutrazol is a compound used to regulate plant growth in such a way as to restrict canopy growth and free stored or produced energy for other uses in the tree. For highly impacted trees, this means more energy may be made available for fibrous root growth (to combat root loss), thicker darker leaves (allowing for increased photosynthesis, and increased drought tolerance), and pest suppression (often an issue with construction stressed trees); among countless other potential benefits. Trade name Cambistat® or equal.

I. Soil Care/Soil Amendments

1. Fertilizer and soil amendment selection shall be based upon soil test results and recommendations.

J. Mycorrhizal fungi:

1. Soil conditioner, beneficial mycorrhizal fungi and bacteria with the following minimum live spore or live bacteria count:

   a. VA Endomycorrhizal Fungi: 300 spores Vesicular Arbuscula fungi/ 60z

   b. Pt Ectomycorrhizal Fungi: 40 million spores Pisolityus tinctorius fungi/ 6 0z

   c. Nitrogen fixing bacteria: Approximately 100 million per pound

   d. Phosphorous Solubilizing bacteria: Approximately 100 million per pound

   e. Growth Promoting Bacteria: Approximately 100 million per pound

2. Soil conditioners shall include humic acid (30% by weight), complex carbohydrates, dried yeast, amino acids, yucca plant extract, sea kelp and Terra-Sorb.

3. Mycorrhiza shall be Mycor Tree, Root Saver, as manufactured by Plant Health Care, Inc. Pittsburgh, PA; 800 421 9051 or approved equal.

K. Expanded Shale:

1. Rotary kiln expanded shale or slate, ASTM C-330-89. No by-product slags or cinders permitted.

2. Non-corrosive with less than 100 PPM chloride.

3. Sieve Size: 3/8" - #8

Sieve Designation	Percent Passing
3/8 inch	100%

#4	77%
#8	47%
#16	30%

4. Dry loose unit weight shall be less than 55 Lb./cf. (880 kg/m3)

5. Expanded shale shall be "Solite" as manufactured by Solite Corporation, Richmond, Va., or approved equal.

L. Organic Matter:

1. Leaf matter and yard waste composted sufficiently to break down all woody fibers, seeds and leaf structures, free of toxic and non-organic matter. Organic Matter shall be commercially prepared compost “Uaja Compost” by Bluemont Quarry or “Leaf Gro Compost” or approved equal. Submit a one-pound sample and supplier’s literature for approval.

M. Soil Decompaction Backfill Mix:

1. A mixture of two parts Expanded Shale, one part Organic matter. To the mix, add Mycorrhiza and fertilizer at rates as recommended by the Mycorrhiza manufacturer. Mycorrhiza and fertilizer shall be added to the mix just prior to pouring the mixture into the vertical mulch hole.

PART 3 - EXECUTION

3.1 TREE REMOVAL

A. All trees and shrubs or hedges designated for removal shall be marked in red for review and approval by Engineer.

B. All trees designated for removal, shall be taken down sectionally, or directionally felled to minimize damage to adjacent tree canopies or root systems by a qualified Contract Arborist. Gouges in turf from impacts shall be filled with topsoil and seeded at the direction of the Owner. Damage to adjacent trees shall be reviewed by Project Arborist and Owner for remedial recommendations or replacement.

C. All work shall be done by hand, bucket truck or crane operated equipment.

D. Motorized equipment shall operate on existing pavement and not enter tree preservation areas without prior approval. Temporary root protection matting may be required for such access to prevent rutting and compaction.

E. Stumps shall be ground to 8” below grade and grindings raked and removed from site; backfill holes with approved topsoil and mulch or seed per Owner. Coordinate with underground utilities locators prior to grinding. All stump grinding shall be performed by the Contract Arborist.

1. For tree pits where a new tree is proposed, the stump may be ground out completely (as determined by the Contract Arborist) to allow the proposed tree to be planted. Backfill as above.

2. Only trees with stumps within deep excavations may have stumps removed by excavator. Stump excavation to be performed by Site Contractor and under the direct supervision of the Contract Arborist.

F. Removal of shrubs and hedges designated for removal for each phase shall be cut and stumps ground out or hand dug to remove stumps. Prior to removal, verify with Engineer.

G. Remove all wood debris from site promptly. All wood debris shall be removed by each day unless directed otherwise by Owner.

3.2 TREE PROTECTION AND STRESS REDUCTION MEASURES

A. General

1. Refer to the TPAK for specific measures determined for each tree.

2. Installation/implementation of the following measures shall be performed in the field by an ISA Certified Arborist as provided by the Contract Arborist.

3. All work, substitutions and/or modifications shall be subject to review and approval by the Owner and Project Arborist.

4. All work shall conform to applicable federal, state and local regulations and industry standards.

5. The Contract Arborist shall be responsible for all items in this section.

B. Coordination of Temporary Tree and Plant Protection and Transplants. The work of the Contract Arborist coordination to include but not limited to the following:

1. Existing underground utility marker conflicts brought to the attention of the Contractor for resolution as well uncovered underground utilities as a result of work.

2. Coordinate necessary survey layout of proposed construction elements in order to provide accurate locations for tree protection measures.

3. Layout location of designated tree protection based upon proposed construction and methods of construction for that area.

4. Site walk with Project Arborist and Site Superintendent to verify location of all tree protection measures prior to execution.

5. Notify Site Superintendent and Project Arborist if construction adjacent to tree protection does not appear to follow specifications or prior agreement or conflicts with tree protection seem eminent.

6. Coordinate with Site Superintendent, Construction Managers, Owner, and Security for access of deliveries, crews, equipment, start up, and clean up of each item of work.

7. Provide “as built” of any change to location of tree protection.

8. Attend progress meetings as requested.

9. Provide submittals as required.

10. Notify Superintendent and Project Arborist of any breach or damage to tree protection requiring attention

C. Pruning and Supportive Cabling

1. Specific canopy pruning for tree health, risk reduction, and construction clearance per Plan documents.

2. Size, health, species, and impact from proposed construction will be taken into consideration in determining pruning type for each designated tree. Risk Reduction Pruning will remove dead, dying, and declining limbs 2" diameter and larger. No interior green branching including sprouts will be removed unless approved by Project Arborist.

3. Contractor, Contract Arborist, and Engineer shall meet at site to determine overhead clearance conflicts between trees and construction equipment/activities to prevent breakage, impacts, or aesthetic concerns. Project Arborist may be consulted if questions arise.

4. All work shall conform to ANSI A-300 arboricultural standards. An aerial assessment shall be made for all trees climbed to report any structural weakness of concern to the Project Arborist and Owner.

5. Prior to climbing any tree a risk assessment will be performed using visual, sounding, or basic drilling as needed by the Contract Arborist. Trees deemed high risk should not be climbed; alternative methods should be used and the tree reported to the Project Arborist and Owner immediately.

6. Supportive Cabling of weak unions may be recommended by the Contract Arborist if the need is discovered during pruning operations. ANSI Standards apply. Cabling may be included only if submitted to the Engineer and Add Alts approved by the Owner.

D. Root Prune

1. Purpose of the root pruning is to provide a more suitable cut so as to not rip or tear roots during excavations and grading with standard construction equipment. The exact location and depth along the LOD or edge of utility excavation will be determined during the layout by an ISA Certified Arborist.

2. Root Pruning for urban sites with specimen trees or for transplanting requires the use of SSAT excavation for hand pruning. Refer to SSAT specifications in this section.

3. Sufficient moisture is necessary for reducing the level of dust, increase work efficiency, and provide a hospitable environment for the tree roots and pedestrians.

4. At a pre-work site inspection by the Contract Arborist more than 72 hours in advance of work start, subsurface probing to 24-36" with a tile probe or similar method will determine if sufficient soil moisture exists. If sufficient moisture is not found, immediate coordination with the site managers shall be made to irrigate the proposed work areas. Methodology may be soaker hose, sprinklers, soaker cans with small

drilled holes to release water slowly or other methods. A second follow up inspection shall be made to determine final sufficiency to begin.

5. All root pruning operations shall be performed by the Contract Arborist and directed in the field by an ISA Certified Arborist with documented experience in similar SSAT excavation and root pruning.

E. Temporary Tree Protection Fence

1. Type and placement of fence to be designated on Plans and Details.

2. Attach tree protection area signs @ 30' spacing facing construction LOD. For fence lower than 6' in height, attach minimum 3 strips glow-flagging 2' long for each fence panel.

3. Tree protection area signs shall be high visibility and all weather to last the duration of the project / phase. Phone number of responsible contact person shall be included on sign.

4. Install after root pruning if shown, and prior to demolition, clearing & excavation.

5. Install at 6"-12" outside (construction side) of the Root Prune line or within the Root Prune trench.

6. Silt fence will be outside (construction side) the tree protection fence, unless super silt fence is used in lieu of tree protection. Trenchless installation method shall be employed per Detail if Root Protection Matting is designated.

7. Exact placement of fence will be determined in walk through with Contractor, Project Arborist, Contract Arborist, Engineer and Owner.

8. Sequencing of the tree protection fence will be determined during the initial site walk. In any case, no construction activities shall occur in each phase or section until approved protection is installed.

F. Root Protection Mat (RPM)

1. The purpose of the RPM is to reduce compaction, rutting, and contamination of soils and root systems of trees to be retained should staging, temporary stockpile, or equipment access be required within the CRZ areas due to extreme site constraints.

2. RPM shall be used for all access within CRZ areas of trees to remain. Matting is not required where existing pavement or concrete will remain undisturbed.

3. Trees anticipated receiving temporary or repetitive materials staging, footing traffic, or equipment access within protected root zone are to receive RPM. Wood chip mulch 4-6" shall be installed under matting to further protect soils and roots.

4. If short duration access is needed, such as one day or less, the use of "AlturnaMATS", 1" steel plate, or approved equal may be needed to avoid rutting and compaction. These materials may be shifted and re-used as work progresses.

5. All-weather staging, stockpile, or other repetitive construction operations may require 12" stone layer over RPM to allow heavy vehicles have the potential to cause dynamic compaction yet without rutting original surface soils and roots. In this situation, the stone may be contained by silt fence or super silt fence where adjacent to or within a TPA.

6. All temporary RPM areas to be used beyond a single day or beyond continuous on site supervision of the Contract Arborist shall be surrounded by temporary tree protection fence as per specifications. For temporary staging of soils beyond 24 hours "trenchless" silt fence fabric shall be installed on the lower / downhill side or as directed by the Project Arborist.

7. If Silt Fence is required for Erosion Control in RPM areas, installation of silt fence shall be coordinated with the Contract Arborist and must be performed by the Contract Arborist to prevent damage to tree roots from trenching operations. Erosion control socks may be used in lieu of silt fabric if approved by the Engineer.

G. Root Aeration Matting (RAM)

1. The purpose of the RAM is to reduce compaction of existing soils and tree roots from permanent grade fills and provide separation from newly placed and compacted materials. It also provides an opportunity for air and water exchange to the existing soils where roots exist.

2. Areas to receive RAM shall be protected from disturbance prior to the specific RAM and fill placement. Temporary Tree Protection Fence shall be used for this purpose.

3. If temporary access is needed within RAM areas prior to the time of RAM and fill placement, a temporary placement of Root Protection Matting (RPM) with mulch shall be made to prevent soil compaction. Steel Plates or other temporary protection methods for short-term use may be used. Refer to "Root Protection Matting" in this section for additional detail.

4. Sites shall be prepared by the Contract Arborist. Any debris shall be removed by hand. Existing soils shall remain undisturbed and un-compacted unless otherwise approved. If site preparation (grading, excavation, etc.) is needed, all work shall be done in accordance with this section. Refer to "Excavation for Proposed Sidewalk within Tree Protection Areas" in this section.

5. RAM material shall be placed on undisturbed and un-compacted soil except as described herein. RAM placement shall be made by the Contract Arborist.

6. RAM material shall extend to the toe of the proposed slope and "daylight".

7. RAM shall be pinned to the ground to prevent it from moving during fill placement. Pins shall be 12" "landscape nails" or approved alternative.

8. Seams within the RAM placement shall overlap by at least 2' or be connected or installed as designated by the manufacturer.

9. Fill materials (aggregate, soil, or other approved fill) shall be placed directly on the RAM and compacted only to the minimum necessary as directed by the Engineer.

10. RAM shall remain in place permanently and shall not be removed or disturbed by the contractor.

11. Filter fabric (silt fence fabric) shall be installed in 2 layers as shown in the detail (not trenched) to protect the RAM core from contamination. Installation of silt fence for erosion control shall be coordinated with the Contract Arborist and must be performed by the Contract Arborist to prevent damage to tree roots from trenching operations. Erosion control socks may be used in lieu of silt fabric if approved by the Engineer.

H. Temporary Tree Trunk and Limb Protection Wrap

1. Temporary trunk protection to cover the root flare and up to 12' height, or to the scaffold branches, or as determined for the situation.

2. Tree trunk (or limbs, as determined by Project Arborist) shall be wrapped with geocomposite material. More than one layer may be installed to reach suitable protection from the equipment or operations designated for work in the area. Attach with banding or strong tape that will not girdle the tree during the project timeframe. No nails or other devices are to penetrate the trunk.

3. Wrap shall be removed promptly after construction is complete.

I. Hand Excavation within Tree Protection Areas

1. For excavation within CRZ areas of trees to remain, the intent is to minimize tree and root damage from excavation activities.

2. Excavation shall be performed using SSAT, hand tools (shovels, etc), or other approved non-damaging method. Roots shall not be damaged by the excavation except for approved root pruning.

3. Refer to "Supersonic Air Tool Excavation" and "Construction Oversight by Arborist" specifications in this section for additional requirements.

4. All work shall be directly supervised by ISA Certified Arborist (provided by the Contract Arborist) in collaboration with the Owner's trades and sub-contractors.

5. RPM shall be installed along trench sides to allow for temporary soil stockpile and access.

6. Excavate along the edge of the proposed trench closest to the trees to be protected as shown on the plans. Roots shall be uncovered and care taken to avoid damage to roots and bark.

7. Contract Arborist shall prune the exposed roots. Excavation shall not extend beyond the line where roots were pruned.

8. Contractor may proceed with conventional excavation methods or with hand excavation methods if clearance to the tree is inadequate for equipment access.

9. No roots may be cut by the contractor.

J. Supersonic Air Tool (SSAT) Excavation

1. Refer to "Hand Excavation within Tree Protection Areas" specification in this section for additional requirements.

2. At a minimum, all SSAT work shall include the use of a barrier system such as temporary walls or tents to protect property and pedestrians from flying debris.

3. Excavate along the edge of the proposed trench closest to the trees to be protected as shown on the plans. Roots shall be uncovered and care taken to avoid damage to roots and bark.

4. Excavation shall proceed per the "Hand Excavation within Tree Protection Areas" specification in this section.

K. Special Demolition of Hardscape within Tree Protection Areas

1. Sidewalks and other hardscape items to be removed from within Tree Protection Areas (TPAs) shall be removed under direct supervision of the Contract Arborist. Site restoration, if required, shall also be supervised by the Contract Arborist.

2. No mechanized equipment shall enter the TPAs. All work shall be either done by hand (with hand-operated equipment such as jackhammers) or with equipment staged outside the TPA. Alternatives for specific situations shall be reviewed by Project Arborist and Engineer.

3. Sequence of work shall be reviewed and coordinated with the work of the Contract Arborist by the construction manager, contractor, Contract Arborist, Project Arborist, Engineer, and owner as appropriate for the project. Methods of protection of overhead branches, trunks, and roots shall be reviewed. Refer to specifications for approved methods of temporary wrapping, or selective pruning.

4. Small equipment may operate upon existing hardscape or upon designated root protection matting if approved by the Project Arborist and Engineer. All staging or stockpiling of materials shall occur outside the TPA.

5. Demolition of paving shall not damage protected roots outside the limit of work nor below existing hardscape. Approved options include jackhammer and pick up by hand or break up by small excavator operating upon existing hardscape. Once hardscape is removed, no equipment shall operate upon stone base unless inspected and approved by arborist as roots may have grown into base below hardscape.

6. Refer to "Hand Excavation within Tree Protection Areas" and "Supersonic Airtool Excavation" specifications in this section.

L. Excavation for Proposed Sidewalk within Tree Protection Areas

1. Excavation for site preparation shall be done by SSAT or by hand.

2. Excavation shall be done by the Contract Arborist or with direct supervision by the Contract Arborist.

3. Excavation for base preparation shall not damage tree roots, trunks or branches. Areas shall be assessed for overhead clearance prior to commencement.

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4. Excavation shall be the minimum necessary to achieve the required grades for the new sidewalk section. Sidewalk section and required grades shall be determined by the Engineer.

5. Root Aeration Matting (RAM) shall be installed once lowest grade is reached and aggregate base for sidewalk section shall be placed on this RAM. Ram must "daylight" out at the toe of the final proposed fill slope. Refer to "Root Aeration Matting" specifications in this section.

6. Compaction of the new aggregate base shall be the minimum necessary as dictated by the Engineer.

7. Refer to "Hand Excavation within Tree Protection Areas" and "Supersonic Airtool Excavation" specifications in this section.

M. Wood chip mulch

1. Mulching for the duration of construction for protection and stress reduction. Mulching will increase moisture-holding capacity, minimize soil compaction, and increase needed organic composition.

2. Mulch area options:

   a. For individual trees designated on the TPAK within the TPA or curvilinear TPA install mulch to a radius equal to trunk diameter inches equated to mulch ring diameter in feet (24" trunk diameter = 24' diameter mulch ring). Where planting pit areas are restricted by hardscape or other restrictions, mulch the greatest area possible.

   b. For linear TPAs along LOD Install mulch strips a minimum 10' wide the length of critical root zones along the outside of the LOD/ Root Prune line (just inside the Tree Protection Zone) for designated significant trees impacted by proposed construction.

   c. Either option may be used as appropriate for the area.

3. For privately owned trees, any installation is contingent upon receipt of owner's permission. Owners may decline.

4. Motorized equipment shall not enter the TPA unless specifically approved by the Project Arborist and specific conditions met (RPM, AlturnaMATS, etc). Any such motorized equipment shall be operated by a certified arborist while inside the TPA.

5. Do not allow mulch to contact trunk/ root flare.

6. Mulch depth shall be 3" – 4".

7. Mulch shall remain for the duration of construction and may remain permanently if the owner approves.

8. If the mulch is to be removed after construction, it must be removed by hand only. No equipment may be used.

N. Tree Growth Regulator (*Paclobutrazol*)

1. Paclobutrazol is a compound used to regulate plant growth in such a way as to restrict canopy growth and free stored or produced energy for other uses in the tree. For highly impacted trees, this means more energy may be made available for fibrous root growth (to combat root loss), thicker darker leaves allowing for increased photosynthesis, and increased drought tolerance.

2. Specific methods and dosages are contained on the label and are determined by size and species, and applied by a state licensed pesticide applicator. Designated trees are shown on the TPAK.

O. Supplemental Watering

1. This action is for high impact trees of significance during seasonal drought times of project construction. Based upon the number and size of trees various strategies can be considered to maintain adequate soil moisture during these times. These strategies may include but are not limited to the following:

   a. Fire hydrant connection battery powered timer and drip irrigation hose / tubing

   b. Water tank trunk and hand applied as directed;

   c. Temporary above grade poly tank with battery-powered timers for drip or soaker hoses at each TPA.

   d. 30-50 gallon watering cans with 6-8 drilled holes in bottom to allow slow seeping of water; spacing and rotation to reach desired gallons. Equivalent means of effectively watering trees as approved by Engineer or Project Arborist

2. Trees requiring this treatment are indicated in the TPAK. Other trees will not receive this treatment.

3. Drought times shall be defined as:

   a. Periods during the growing season of two weeks or longer, where daytime high temperatures reach 80 degrees Fahrenheit or higher and less than ¾" rainfall is recorded per week. Or,

   b. Periods during the growing season designated as "abnormally dry" or "drought" of any severity, by the U.S. Drought Monitor: (http://www.drought.unl.edu/dm/monitor.html). Or,

   c. Any period of extraordinary circumstance, as determined by the Project Arborist or Owner.

4. A prescription for the number of gallons and strategy for watering designated trees will be developed. Large mature trees with impacts to root systems require as much as 100-250 gallons per week during 90 degree days during summer drought times.

5. Periodic inspections by an ISA Certified Arborist (provided by the Contract Arborist) at this time are critical. Depth of moisture in soils shall be determined by soil sample tube or other exploratory means.

6. Minimum watering shall be considered to be 6 applications per growing season typically July thru October with the exact timing and duration to be determined by the ISA Arborist in conjunction with the Engineer. Additional unit costs per watering designated trees at prescribed rates one time.

P. Overhead Clearance

1. Trees to remain shall be assessed prior to construction for overhead clearance for construction activities. Contract Arborist shall recommend either canopy pruning, temporary guying/tying of select limbs, or alternative construction methods.

2. Pruning for clearance shall not remove branches above 12' or over 6" diameter.

3. All pruning proposed by the Contractor and/or Contract Arborist shall first be reviewed and approved by the Owner and Project Arborist.

4. Equipment exhaust should be directed away from trees as much as possible. Stationary equipment shall not exhaust directly under or towards trees.

5. Contractor shall use appropriate equipment near trees to ensure that trees are not damaged by construction. Contractor shall provide any specialized equipment needed at no additional cost to the owner.

6. Any pruning shall also conform to the pruning specifications in this section.

Q. Soil Tests and Soil Care/Fertilization

1. Initial soil testing within tree protection areas is required. Conduct individual soil tests for separate tree protection areas (small adjacent areas may be tested together). Soil test shall be a representative sample from each area. Soil testing shall include a texture analysis (sand, silt, and clay percentages), soluble salts, and sodium tests.

2. Treatments to the tree protection areas for specified trees (see TPAK) shall be based on the results of the soil analysis. Fertilization should be consistent with the recommendations of the ANSI A-300 (Part 2) Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Fertilization) 2004, except as described herein.

3. Application rates shall not exceed a rate of 1 pound of actual nitrogen per 1,000 square feet annually.

4. Fertilizer used should include humic acids, soluble seaweed extracts and soil biological inoculants (mycorrhizae, etc.).Applications to confined areas (i.e. street tree planting pits) should be made by soil injection. In areas where adequate application rates cannot be achieved, injection should be made to the point of refusal.

R. Soil Decompaction with SuperSonic Airtool (SSAT) within CRZs of Designated.

1. This work is typically prescribed for urban park or campus trees where existing compacted soils and associated trees will benefit. It involves pneumatic de-compaction in the upper soils using Supersonic Air tools (SSAT) by trained and qualified arborists.

2. This work may be also prescribed as "Contingency or Remedial Work" due to unwarranted construction incursion into the protected TPAs.

3. This work has several benefits:

   a. Allows prior root damage open to examination.

   b. Allows the arborist get a "feel" for the soil layers, level of quality, contamination, and composition.

   c. Provides vertical and horizontal aeration to compacted soils

   d. Allows backfill of suitable organic compost and aggregate amendments

4. Refer to plan drawings for indicated area / trees for this work. The Contract Arborist shall layout the boundaries with wire flagging for review by the Architect and Project Arborist. The Architect and Project Arborist shall review the startup of work and determine any adjustments to the width, depth, or approach.

5. The work consists of using the SSAT in a parallel series of linear trenches to fracture the upper soil layers down to significant root zones. The size of the trench is generally 12-15” deep and 9-12” wide, although fracturing of horizontal soil layers may extend beyond this dimension. .

6. Do not perform this operation during drought months without adequate supplemental moisture in order to reach a minimum of 50% field capacity prior to the work. Pre-start up testing of soil shall be done using a sharp probe, surveyors pin or long screwdriver. Penetration should meet 10” depth with hand probing only.

7. Do not dispose of the excavated soils. Dispose of exposed trash or debris encountered. Mark exposed utilities and irrigation lines.

8. Soil amendments shall be worked into the trenches during the SSAT work to mix and distribute the material or spread and then “stirred” with the SSAT to mix into existing soils. Backfill each trench prior to the end of workday unless approved otherwise by the Architect and Project Arborist.

9. Rough grading with hand rakes shall be done by the Landscape Contractor unless otherwise directed by the Architect or Owner.

10. Refer to the MATERIALS section for the amended backfill.

S. SSAT Landscape Planting Excavation

1. Proposed landscape planting of B&B plants within critical root zones within TPAs shall be reviewed by the Contract Arborist, contractor, and owner in the field to determine potential for damage to priority roots of select trees and layout the limit of work.

2. Pre-watering of the proposed areas of excavation during summer and fall months is recommended to maintain root / soil moisture.

3. The Contract Arborist shall provide a qualified arborist crew experienced with the SSAT and landscape planting excavation to protect adjacent natural resources and construction work, open the excavation, hand prune minor roots, and identify and protect priority roots to remain. Coordination with the appropriate sub-contractor shall be made to determine appropriate width, depth, and sequencing.

3.3 FIELD QUALITY CONTROL AND MONITORING

A. Tree Condition Monitoring

1. An ISA Certified Arborist (provided by the Contract Arborist) shall perform monitoring twice per month year round to monitor insects, disease, soil moisture levels, weather, and health changes on all trees designated on Tree Protection Action Key.

2. The monitoring will include a report that details problematic areas that have been addressed, treatments provided to reduce the problem, and anticipated treatments forecast for 30 days. This report will be forwarded to the Project Arborist, Engineer and Owner for documentation.

3. Any treatments recommended by the Contract Arborist not already included in the project scope shall be noted in the reports for review by the Project Arborist, Engineer and Owner. No additional work is to be performed unless approved in writing by the Owner.

B. Construction Oversight by Contract Arborist

1. Any work within CRZs of retained trees shall be directly supervised by the Contract Arborist.

2. If roots are encountered during excavations, work shall progress as directed by the Contract Arborist. Contract Arborist, in coordination with the construction and design teams, shall determine appropriate means and methods to address the roots. Options may include, but not be limited to, severing the roots, hand or SSAT excavation. Contractor shall not cut roots.

3. Refer to “Hand Excavation within Tree Protection Areas” specification in this section.

4. All work shall be documented thoroughly, including photo documentation. Refer to site documentation submittal requirements.

3.4 CONTRACTOR DAMAGES AND PENALTIES

A. Remedial Measures

1. Any damage caused to the trees by the work of this contract through negligence by the contractor shall be immediately remedied by the contractor. Contractor shall be responsible for any associated costs.

2. Remedial work may include pruning, cabling, or any other measures up to and including removal and replacement, as determined by the Project Arborist and Engineer.

3. Remedial work shall be performed by the Contract Arborist, as approved by the Project Arborist and Engineer.

4. All required remedial work shall be performed to the satisfaction of the Project Arborist and Engineer, at no additional cost to the owner.

B. Tree Replacement

1. If damage to any tree is severe, because of negligence by the contractor as determined by the Project Arborist and Engineer, it shall be replaced with a new tree of equal size caliper and species as that of the damaged tree.

2. If a replacement tree of equal size caliper is not possible as determined by the Project Arborist and Engineer, it shall be replaced on an inch for inch basis with new trees of a minimum caliper size of 2-3".

3. Replacement trees shall be supplied and installed at no additional costs to the owner, including all incidental costs including the costs of inspection of the tree at the nursery and any other incidental costs associated with tree replacement.

END OF SECTION

SECTION 01-5719 - TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.

B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
   1. Adversely effect human health or welfare,
   2. Unfavorably alter ecological balances of importance to human life,
   3. Effect other species of importance to humankind, or;
   4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.

C. Definitions of Pollutants:
   1. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.
   2. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
   3. Sediment: Soil and other debris that has been eroded and transported by runoff water.
   4. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
   5. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "water of the United States" and would require a permit to discharge water from the governing agency.
   6. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
   7. Sanitary Wastes:
      a. Sewage: Domestic sanitary sewage and human and animal waste.
      b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.2 QUALITY CONTROL

A. Establish and maintain quality control for the environmental protection of all items set forth herein.

B. Record on daily reports any problems in complying with laws, regulations, and ordinances. Note any corrective action taken.

1.3 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

B. U.S. National Archives and Records Administration (NARA): 33 CFR 328 Definitions

1.4 SUBMITTALS

A. In accordance with Section, 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:

1. Environmental Protection Plan: After the contract is awarded and prior to the commencement of the work, the Contractor shall meet with the Resident Engineer to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than 20 days after the meeting, the Contractor shall prepare and submit to the Resident Engineer and the Contracting Officer for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:

a. Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan.

b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site.

c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.

d. Description of the Contractor's environmental protection personnel training program.

e. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.

f. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.

g. Procedures to provide the environmental protection that comply with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.

h. Permits, licenses, and the location of the solid waste disposal area.

i. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials. Include as part of an Erosion Control Plan approved by the District Office of the U.S. Soil Conservation Service and the Department of Veterans Affairs.

j. Environmental Monitoring Plans for the job site including land, water, air, and noise.

k. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for

marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.

B. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.5 PROTECTION OF ENVIRONMENTAL RESOURCES

A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.

B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Resident Engineer. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.

1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
   a. Box and protect from damage existing trees and shrubs to remain on the construction site.
   b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
   c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
   a. Sediment Basins: Trap sediment from construction areas in temporary or permanent sediment basins that accommodate the runoff of a local 2 year design storm. After each storm, pump the basins dry and remove the accumulated sediment. Control overflow/drainage with paved weirs or by vertical overflow pipes, draining from the surface.
   b. Reuse or conserve the collected topsoil sediment as directed by the Resident Engineer. Topsoil use and requirements are specified in Section 31 20 00, EARTH MOVING.
   c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.

5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's activities. Construct or install all temporary and permanent erosion and sedimentation control features shown on the Erosion and Sedimentation Control Plan and associated details and specifications. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
6. Manage borrow areas on and off Government property to minimize erosion and to prevent sediment from entering nearby water courses or lakes.
7. Manage and control spoil areas on and off Government property to limit spoil to areas shown on the Erosion and Sedimentation Control Plan and prevent erosion of soil or sediment from entering nearby water courses or lakes.
8. Protect adjacent areas from despoilment by temporary excavations and embankments.
9. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
10. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
11. Handle discarded materials other than those included in the solid waste category as directed by the Resident Engineer.

C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
2. Control movement of materials and equipment at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
3. Monitor water areas affected by construction.

D. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.

E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of Connecticut DEEP Regulation // and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.
1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.

2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.

F. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Resident Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified.

1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 6:00 p.m unless otherwise permitted by local ordinance or the Resident Engineer. Repetitive impact noise on the property shall not exceed the following dB limitations:

Time Duration of Impact Noise	Sound Level in dB
More than 12 minutes in any hour	70
Less than 30 seconds of any hour	85
Less than three minutes of any hour	80
Less than 12 minutes of any hour	75

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:

   a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):

EARTHMOVING		MATERIALS HANDLING	
FRONT LOADERS	75	CONCRETE MIXERS	75
BACKHOES	75	CONCRETE PUMPS	75
DOZERS	75	CRANES	75
TRACTORS	75	DERRICKS IMPACT	75
SCAPERS	80	PILE DRIVERS	95
GRADERS	75	JACK HAMMERS	75
TRUCKS	75	ROCK DRILLS	80
PAVERS, STATIONARY	80	PNEUMATIC TOOLS	80
PUMPS	75	BLASTING	//--//
GENERATORS	75	SAWS	75
COMPRESSORS	75	VIBRATORS	75

b. Use shields or other physical barriers to restrict noise transmission.
c. Provide soundproof housings or enclosures for noise-producing machinery.
d. Use efficient silencers on equipment air intakes.
e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
f. Line hoppers and storage bins with sound deadening material.
g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.

3. 3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 55 dB(A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face. Submit the recorded information to the Resident Engineer noting any problems and the alternatives for mitigating actions.
4. During exam periods no noise producing activities are allowed, no exception.
5. In addition to requirements of this Section, work shall also be performed in accordance with Specification Section 31093 (Vibration and Sound Monitoring).

G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.

H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Resident Engineer. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

END OF SECTION 01-5719

SECTION 01-6000 - 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 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver

1.3 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. Division 01 Section "Allowances" for products selected under an allowance.
2. Division 01 Section "Alternates" for products selected under an alternate.
3. Division 01 Section "Substitution Procedures" for requests for substitutions.
4. Division 01 Section 01 74 19 Construction and Demolition Waste Management
5. Division 01 Section 01 81 13 VOC Limits for Adhesives, Sealants, Paints and Coatings
6. Division 01 Section 01 81 19 Construction Indoor Air Quality (IAQ) Management

1.4 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.

1.5 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. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
    b. Use product specified if Architect 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 Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.6 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, Architect will determine which products shall be used.

1.7 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 weathertight 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.

1.8 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 Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "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," Architect 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: Product selection is governed by the Contract Documents and governing regulations and not by previous Project experience. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where Specifications name only 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. Semiproprietary Specification Requirements: Where Specifications name three or more products or manufacturers, provide one of the products indicated. Comparable products or substitutions for Contractor's convenience will not be considered.

a. Where products or manufacturers are specified by name, accompanied by the term “or equal,” or “or approved equal” comply with the provisions concerning “substitutions” to obtain approval for use of an unnamed product.

3. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contact requirements. Comply with provisions concerning “substitutions” to obtain approval for use of an unnamed product.

4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.

   a. Manufacture’s recommendations may be contained in published product literature, or by the manufacturer’s certification of performance.

6. 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.

7. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

   a. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.

8. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

9. Allowances: Refer to individual Specification Sections and provisions in Section 01-2100, Allowances, for allowances that control product selection, and for procedures required for processing such selections.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect 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. Proposed changes are in keeping with the intent of Contract Documents.
3. The request is timely, fully documented and properly submitted.
4. The request is directly related to an “or equal” clause or similar language in the Contract Documents.
5. The specified product or method of construction cannot be provided within the Contract Time.
   a. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
7. A substantial advantage is offered the Owner, in terms of cost, time, energy conversation or other considerations of merit, after deduction offsetting responsibilities the Owner may be required to bear.
   a. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.
8. The specified product or method of construction cannot be provided in a manner that is compatible with other material, and where the Contractor certifies that the substitution will overcome the incompatibility.
9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.
11. 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.
12. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
13. Samples, if requested.

B. The Contractor’s submittal and Architect’s acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS:

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01-6000

SECTION 01-6100 – UNIVERSITY PRODUCT STANDARD

A. Asbestos Certification

Contractor shall certify that all material/equipment installed in any portion of the Work shall be asbestos free. The owner may perform sampling to verify all suspect material/equipment is asbestos free. If any material/equipment is found to contain asbestos, the Contractor shall pay for the lawful and proper removal and disposal of product(s), and re-install acceptable material/equipment all at its sole expense.

B. For purposes of this requirement, materials include, **but are not limited to** the following:

2.1 Surfacing Treatments

Fireproofing Acoustical Plaster
Finish Plasters, Skim Coats of Joint Compound, Fibrous Type Paint Applications, Sprayed-on applications

2.2 Thermal System Insulation

Equipment Insulation, Gaskets, Valve Packings,
Boiler, Breeching, Boiler Rope, Duct or Tank Insulation,
Cement or Mortar used for boilers and refractory brick.
Piping and Fitting Insulations including but not limited to Wrapped Paper, Millboard, Rope, Cork, Preformed Plaster, Job Molded Plaster and Coverings over Fibrous Glass Insulation.

2.3 Roofing and Siding Materials

Insulation Board, Vapor Barriers, Felts, Coatings & Adhesives,
Flashing, Shingles, Cementitious Board (Transite),
Galbestos, Non-Metallic or Non-Wood Roof Decking

2.4 Other Miscellaneous Materials

Cove Base, Floor Leveling Compound,
Ceiling & Floor Tiles, Vibration Isolators, Laboratory Tables and Hoods,
Mastics, Adhesives, Coatings & Caulks,
Wallboard & Joint Compounds,
Friction Products, Gaskets,
Fire Door Materials, Cementitious Products (Transite)

The Contractor certifies that all material/equipment installed in any portion of the Work shall be asbestos free:

Contractor Signature: _____ Date: _____

Print Name: _____

Company: _____

Please keep a completed copy of this document in the department's project files and mail or fax a copy to: University of Connecticut, Department of Environmental Health and Safety, Unit 4097, 486-1106 (FAX)

END OF SECTION 01-6100

SECTION 01-7300 - 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. Division 01 Section "Summary" for limits on use of Project site.
2. Division 01 Section "Submittal Procedures" for submitting surveys.
3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Division 02 Section "Selective Structure Demolition" for demolition and removal of selected portions of the building.
5. Division 07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

B. 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 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect 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.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner

that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements in Division 01 sustainable design requirements Section.

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 Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning 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 University Representative 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. And 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 Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a CT licensed 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 Architect 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 Architect.

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 Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect 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.

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. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. 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.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. 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.

J. 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 Division 01 Section "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: 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 Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

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 Division 01 Section "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01-7300

SECTION 017419: CONSTRUCTION & DEMOLITION WASTE MANAGEMENT

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

Related Sections:
The following Sections contain requirements that relate to this Section:

1. All sections of the Specifications involving demolition or construction activities.

PERFORMANCE REQUIREMENTS

LEED BUILDING – GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction-Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

REQUIREMENTS FOR CONSTRUCTION WASTE MANAGEMENT

Overview:
Prepare and submit a Construction Waste Management Plan (CWM) to the Owner and Architect for approval. The CWM Plan shall outline the provisions to be implemented to recycle and salvage demolition and construction waste generated during the project. The end-of-project recycling rate shall equal, at minimum, 75% (by weight) of the total waste from construction, demolition, and land clearing activities.

Upon approval of the CWM Plan by the Owner and Architect, it shall be implemented throughout the duration of the project, and documented in accordance with the Submittal Requirements of this Specification.

Further Construction Waste Management requirements are as follows:

1) Construction Waste Management Plan:
   The Construction Waste Management Plan shall include, but not be limited to, the following components:

A) *Listing of Targeted Materials*: Develop a list of the waste materials from the Project that will be targeted for reuse, salvage, or recycling. The following materials shall be accounted for (materials that will not be recycled shall be indicated as such):

i) Cardboard, paper, packaging
ii) Clean dimensional wood, palette wood
iii) Beverage containers
iv) Land clearing debris
v) Concrete
vi) Bricks
vii) Concrete Masonry Units (CMU)
viii) Asphalt
ix) Metals from banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
x) Drywall
xi) Carpet and pad
xii) Paint
xiii) Asphalt roofing shingles if applicable for any existing building demolition
xiv) Rigid Foam
xv) Glass
xvi) Plastics

B) *Landfill Information*: Provide the name of the landfill(s) where trash will be disposed of and the applicable landfill tipping fee(s).

C) *Sorting Method*: Provide a description of the proposed means of sorting and transporting the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site for off-site sorting).

D) *Packaging Waste*: Provide an estimate of packaging materials generated, and note whether suppliers will eliminate or take back packaging.

E) *Field Conditions:* Include provisions in the Construction Waste Management Plan for addressing conditions in the field that do not adhere to the CWM Plan, including provisions to implement a stop work order, or to rectify non-compliant conditions.

F) *Recycling facilities:* Provide the name of the recycling facilities(s) where materials will be sent for recycling, how it will be recycled, and the applicable fee(s).

G) *Additional Information:* Include any additional information deemed relevant to describe the scope and intent of the CWM Plan to the Owner and Architect.

2) Subcontractor Requirements:
Construction Waste Management and recycling requirements shall be incorporated into all Subcontractor's contracts.

SUBMITTALS

LEED BUILDING Submittal Requirements:

The Contractor and/or Subcontractors shall submit the following LEED BUILDING certification items:

1) A copy of the Construction Waste Management Plan, as defined in the REQUIREMENTS FOR CONSTRUCTION WASTE MANAGEMENT section of this specification.
2) Calculations and supporting documentation to demonstrate end-of–project recycling rates meeting the requirements for Construction Waste Management in this Specification. The process for recording and assembling documentation shall be as follows:

   A) Record and document the total weight (in tons) of all demolition and construction waste materials sent to the landfill. Monthly Waste Management Reporting Forms (sample included at the end of this section identified as Exhibit "A") shall be used as the basis for determining the total amount of waste landfilled for the project. The monthly reporting forms shall specify:

      i) The number of dumpsters or other containers sent to the landfill for that month;
      ii) The volume (in cubic yards) of each dumpster or container sent to the landfill for that month;
      iii) The type of waste contained in each dumpster or container; and
      iv) The weight of the waste in each dumpster or container. If the weight of the waste is not directly measured for each dumpster or container, the following Solid Waste Conversion Factors shall be used to convert the volume of waste to weight:

      <u>Solid Weight Conversion Factors</u>:

Mixed Waste	350 lbs/cubic yard
Wood	300 lbs/cubic yard
Cardboard	100 lbs/cubic yard
Gypsum Wallboard	500 lbs/cubic yard
Rubble	1,400 lbs/cubic yard
Steel	1,000 lbs/cubic yard

      v) Identification of the landfill.

      In addition, provide the name of the landfill that will be accepting the materials. Receipts or other proof of facility reception of materials is required.

   B) Record and document the total weight (in tons) of all demolition and construction waste materials recycled or salvaged. Monthly Waste Management Reporting Forms shall be used as the basis for determining the total amount of waste recycled or salvaged for the project. The monthly reporting forms shall specify:

      i) The number of dumpsters or other containers of recycled or salvaged materials for that month;
      ii) The volume (in cubic yards) of each dumpster or container of recycled or salvaged materials for that month;
      iii) The type of recycled or salvaged material contained in each dumpster or container; and
      iv) The weight of the recycled or salvaged material in each dumpster or container. If the weight of the material is not directly measured for each dumpster or container, the Solid Waste Conversion Factors listed for landfill waste (see above) shall be

used, where applicable, to convert the volume of material to weight. For materials not contained in the Solid Waste Conversion Factors above (e.g. glass), propose a conversion factor for review by the Owner and Architect.

In addition, provide the name of the receiving facilities/companies that will be purchasing or accepting the recycled or salvaged materials. Receipts or other proof of facility reception of materials is required.

For materials separated for recycling off-site, establish a method for tracking the weight of the recycled material. The method shall be included in the CWM Plan for the Owner's and Architect's review and approval

C) Calculate the end-of-project recycling rate percentage by dividing the recycled and salvaged waste (in tons) by the total waste generated (recycled, salvaged, and landfilled waste – also in tons), and multiplying by 100.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Implementation:
Implement the Construction Waste Management Plan, and coordinate the Plan with all affected trades. Designate one individual as the Construction Waste Management Representative, who will be responsible for communicating the progress of the Plan with the Owner and Architect on a regular basis, and for assembling the required LEED documentation.

Meetings:
Conduct Construction Waste Management meetings. Meetings shall include Subcontractors affected by the CWM Plan. At a minimum, waste management goals and issues shall be discussed at the following meetings:
a. Pre-bid meeting.
b. Pre-construction meeting.
c. Regular job-site meetings

Monthly Waste Management Reporting Forms:
Monthly Waste Management Reporting Forms shall be submitted to the Owner and Architect for review throughout the duration of the project.

END OF SECTION 017419

(Project Name) (Exhibit "A")
CONTRACTOR C&D WASTE MANAGEMENT FORM
For Waste Generated On-Site

Company: _____
Contact: _____
Phone: _____

Date	**Material Description** (Include packaging waste if applicable)	**Ticket #**	**Total Weight (Tons)**	**% Reused on-site**	**% Recycled off-site**	**% Sent to landfill**	**Material Recipient**

SECTION 01-7700 - 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. Warrantee Requirements
4. Submittal of Warranties.
5. Revenue Services Requirements
6. Final cleaning.
7. Repair of the Work.

B. Related Requirements:

1. Division 01 Section "Photographic Documentation" for submitting final completion construction photographic documentation.
2. Division 01 Section "Execution" for progress cleaning of Project site.
3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Division 01 Section “Demonstration and Training” for requirements for instructing Owner’s personnel
6. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

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.

D. Gas Purging Plan: Contractor must supply a Gas Purging Plan to the UConn Fire Department for review and approval at least (1) week in advance . Plans must meet the provisions of the CT Gas Code regulation 29-329-3 adopted 1996 NFPA 54 edition for testing and 2009 NFPA 54 TIA for purging.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

D. Consent of Surety

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 10 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 Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by University Representative. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item

and name and number of related Specification Section. Obtain University Representative signature for receipt of submittals.

5. Submit test/adjust/balance records.
6. Submit sustainable design submittals required in Division 01 sustainable design requirements Section and in individual Division 02 through 33 Sections.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 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. Submit demonstration and training video recordings when specified in Division 01 Section "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
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, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. 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 request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

2. Submit an updated final Application for Payment statement, accounting for final additional charges to the Contract Sum.
3. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
4. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
5. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.
6. Submit consent of surety to final payment.
7. Submit a final liquidated damages settlement statement.

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, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Upon completion of reinspection, the University Representative with advice of the Architect will prepare a Certificate of Final Acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
3. If necessary, reinspection will be repeated.

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.

1. Organize list of spaces in sequential order.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Page number.

4. Submit list of incomplete items in the following format or format approved by Owner:

   a. PDF electronic file. Architect will return annotated file.

1.9 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.10 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. All work shall be covered by the standard one (1) year guarantee as set forth in the General Conditions. The Contractor shall visit the project site at 11 months into the guarantee period to determine the scope of any required guarantee work. The Contractor shall contact the University Representative prior to this visit so that the University Representative may attend.

C. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

D. Specific requirements for warranties for the Work and products and installations that are specified to be warrantee are included in the individual Sections of Divisions 2 through 33.

E. Disclaimers and limitations: Manufacturer’s disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor

does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

F. 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. Address to: Executive Director of Architectural and Engineering Services, Office of Architectural and Engineering Services, University of Connecticut Box Unit-3038, Storrs, Connecticut 06269-3038
3. 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.
4. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name and number, and name of Contractor.
5. 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.
6. All required guarantees/warranties will be by the respective company made out to the University of Connecticut.
7. All guarantees/warranties supplied by subcontractors or manufacturers shall be countersigned by the General Contractor.

G. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.11 REVENUE SERVICES REQUIREMENTS

A. Upon receipt of the Certificate of Substantial Completion, the Contractor shall submit the following information required by the Connecticut Department of Revenue Services.

1. The identity and addresses of all subcontractors performing work on the project.

2. The Connecticut tax registration numbers of the General Contractors and all subcontractors.

3. The Federal Social Security account numbers, or Federal Employer Identification numbers, or both, if applicable, for the General Contractor and all subcontractors.

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.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

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. Clean catch basins affected by construction activities.
c. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
d. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
e. Remove tools, construction equipment, machinery, and surplus material from Project site.
f. Remove snow and ice to provide safe access to building.
g. 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.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
i. 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.

j. Remove labels that are not permanent.
k. Clean and polish tile and other glazed surfaces affected by construction activity.
l. Clean and polish finish hardware affected by construction activity.
m. Clean exposed surfaces of diffusers, registers, and grills affected by construction activity.
n. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency that were affected by construction activity.
o. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls." Prepare written report.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not fury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

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.

3.3 CERTIFICATIONS

A. The Contractor, at complete of construction, shall provide to the University a "Certificate of Substantial Compliance" bearing original signatures of an officer of the company stating: "this is to CERTIFY that, in my professional opinion, the complete structure/renovations described above is in substantial compliance with the approved construction documents on file with the University of Connecticut. Minor deviations and special stipulations are noted below (if any)"

B. Prior to Owners' approval and acceptance, mechanical and electrical systems shall be fully operational.

PART 4 - SCHEDULES

4.1 SCHEDULE OF WARRANTIES/GUARANTEE

A. Schedule: Provide warranties and bonds on products and installations as specified in the following Sections:

1. Section 033000 - Cast-In-Place Concrete
2. Section 042800 - Terra Cotta Assembly
3. Section 057700 - Structural Glass Canopy
4. Section 071326 - Sheet Membrane Waterproofing
5. Section 074213 - Aluminum Composite Panels
6. Section 074510 - Preformed Metal Siding
7. Section 075625 - Fluid Applied Roofing System
8. Section 076200 - Sheet Metal Work
9. Section 078100 - Sprayed Fire Resistive Materials
10. Section 079200 – Joint Sealers
11. Section 081433 – Stile and Rail Wood Doors
12. Section 084413 – Curtain Walls, Storefronts and Entrances (CWSE)
13. Section 084510 – Interior Glazed Walls
14. Section 088813 - Fire-Rated Glass and Framing System
15. Section 087100 – Finish Hardware
16. Section 089000 - Louvers and Vents
17. Section 096416 - Edge Grain Wood Flooring
18. Section 096728 – Elastomeric Liquid Flooring
19. Section 096727 - Thin Set Epoxy Terrazzo
20. Section 096816 - Carpet (Glue Down)
21. Section 101100 - Visual Display Surfaces
22. Section 102113 - Toilet Partitions
23. Section 116100 - High Performance Laboratory Fume Hoods
24. Section 116200 - Laboratory Equipment
25. Section 122413 - Window Shades
26. Section 125100 - Laboratory Darkroom Curtains
27. Section 131146 - Tank Filtration Equipment
28. Section 132100 - Laboratory Environmental Rooms
29. Section 133413 - Fiberglass Tank Construction
30. Section 142100 - Traction Elevators

31. Section 210500 - Basic Fire Protection Materials and Methods
32. Section 220500 – Basic Plumbing Materials and Methods
33. Section 223000 – Plumbing Equipment
34. Section 226000 – Laboratory Plumbing Systems
35. Section 230500 – Basic Mechanical Materials and Methods
36. Section 230514 - Variable Frequency Drives
37. Section 230519 - Meters
38. Section 230533 – Electrical Heat Tracing
39. Section 233319 - Sound Attenuators
40. Section 233600 - Air Terminal Boxes
41. Section 233620 - Laboratory System
42. Section 234100 - Filters
43. Section 236415 - Air Cooled Water Chiller
44. Section 236500 – Cooling Towers
45. Section 237323 - Factory Built-Up Air Handling Units
46. Section 238216 - Coils
47. Section 238235 - Terminal Heat Transfer Units
48. Section 238900 – Steam Humidifiers
49. Section 250500 - Basic Materials and Methods
50. Section 251000 – Direct Digital/Automatic Temperature Controls
51. Section 255000 – Instrumentation Terminal Devices
52. Section 260510 - Electrical Special Conditions
53. Section 260520 - Basic Materials and Methods
54. Section 260530 – Wiring Methods
55. Section 260920 – Lighting Control System
56. Section 261120a – Secondary Unit Substations Normal Power Double Ended
57. Section 261120b – Secondary Unit Substations Emergency Power Single Ended
58. Section 262010 – Low Voltage Distribution
59. Section 263010 – Electrical Power Generation
60. Section 264110 – Lightning
61. Section 264310 – Electrical Special Conditions
62. Section 265010 – Lighting Fixtures
63. Section 265100 – Architectural Lighting
64. Section 270510 - Telecommunications
65. Section 281000 – Security Systems
66. Section 283110 – Fire Alarm Systems
67. Section 329001 - Transplanting
68. Section 329300 - Plants

END OF SECTION 01-7700

Advancement of Construction Technology

PUNCH LIST

Project: _____

_____

To (Contractor): _____

_____

From (A/E): _____

Site Visit Date: _____

A/E Project Number: _____

Contract For: _____

The following items require the attention of the Contractor for completion or correction. This list may not be all-inclusive, and the failure to include any items on this list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Item Number	Room Number	Location (Area)	Description	Correction/Completion Date	Verification A/E Check

☐ Attachments

Signed by: Date:

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

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CSI Form 14.1A

SECTION 01-7823 - OPERATION AND MAINTENANCE DATA

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 preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

2. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

   a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
   b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies, separately bound. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Name and contact information for Commissioning Authority, (if applicable).
8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
9. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names

used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.

9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."

G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01-7823

SECTION 01-7839 - 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. Division 01 Section "Closeout Procedures" for general closeout procedures.
2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

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 one (1) paper-copy set of marked-up record prints.
2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit one (1) paper-copy set of marked-up record prints.
2) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy 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 of each submittal.

E. Reports: Submit written report monthly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

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 Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings 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. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect and or Construction Manager.
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. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders and record Drawings where applicable.

B. Format: Submit Record Specifications as paper copy.

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] and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy.

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.

B. Format: Submit miscellaneous record submittals as paper copy.

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 Architect's and Owner Representative’s reference during normal working hours.

END OF SECTION 01-7839

SECTION 01-7900 - DEMONSTRATION AND TRAINING

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 instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

B. Related Requirements:

1. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

1.6 PRODUCTS

1.7 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

a. System, subsystem, and equipment descriptions.
b. Performance and design criteria if Contractor is delegated design responsibility.
c. Operating standards.
d. Regulatory requirements.
e. Equipment function.

f. Operating characteristics.
g. Limiting conditions.
h. Performance curves.

2. Documentation: Review the following items in detail:

a. Emergency manuals.
b. Operations manuals.
c. Maintenance manuals.
d. Project record documents.
e. Identification systems.
f. Warranties and bonds.
g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.

8. Repairs: Include the following:

   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 2 - EXECUTION

2.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

B. Set up instructional equipment at instruction location.

2.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

   1. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

   1. Schedule training with Owner through Owners Representative with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

SECTION 018113: VOLATILE ORGANIC COMPOUND (VOC) LIMITS FOR ADHESIVES, SEALANTS, PAINTS AND COATINGS

PART 1 - GENERAL

Summary
This Section includes requirements for volatile organic compound (VOC) content in adhesives and sealants used for the project. The criteria are included as part of the LEED Building requirements for the project.

Related Sections:
The following Sections contain requirements that relate to this Section:

1. All sections in the Specifications with Interior adhesive or sealant

2. Division 1, Section 018119: "Construction Indoor Air Quality (IAQ) Management", for requirements for the Construction IAQ Management Plan.

PERFORMANCE REQUIREMENTS

LEED BUILDING – GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

REFERENCES

A. Rule 1168 – "Adhesive and Sealant Applications", amended 7 January 2005: South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov
B. GreenSeal Standard 36 (GS-36) for Commercial Adhesives, effective date October 19, 2000.
C. GreenSeal Standard 11 (GS-11), First Edition, May 20, 1993
D. GreenSeal Standard 03 (GS-03), Anti-Corrosive Paints, Second Edition, January 7, 1997
E. Rule 1113 – "Architectural Coatings". Rule in effect January 1, 2004. South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov

VOC REQUIREMENTS FOR INTERIOR ADHESIVES AND SEALANTS

The volatile organic compound (VOC) content of interior adhesives and sealants used in this project shall not exceed the limits defined in Rule 1168 – "Adhesive and

Sealant Applications" of the South Coast Air Quality Management District (SCAQMD), of the State of California.

The VOC limits defined by SCAQMD are as follows. All VOC limits are defined in grams per liter, less water and less exempt compounds.

General:
Unless otherwise specified below, the VOC content of all adhesives and sealants shall not be in excess of **250 grams per liter.**

For specified building construction related applications, the allowable VOC content is as follows:

Adhesive VOC Limits

Architectural Applications:

Indoor carpet adhesive	50
Carpet pad adhesive	50
Wood Flooring adhesive	100
Rubber floor adhesive	60
Subfloor adhesive	50
Ceramic tile adhesive	65
VCT and asphalt tile adhesive	50
Drywall and panel adhesive	50
Cove base adhesive	50
Multipurpose construction adhesive	70
Structural glazing adhesive	100

Specialty Applications:

PVC welding	510
CPVC welding	490
ABS welding	325
Plastic cement welding	250
Adhesive primer for plastic	550
Contact Adhesive	80
Special Purpose Contact Adhesive	250
Adhesive Primer for Traffic Marking Tape	150
Structural Wood Member Adhesive	140
Sheet Applied Rubber Lining Operations	850
Top and Trim Adhesive	250

Substrate Specific Applications:

Metal to metal	30
Plastic foams	50
Porous material (except wood)	50
Wood	30
Fiberglass	80

Sealant VOC Limits:

Architectural	**250**
Single Ply Roof Material Installation/Repair	450
Nonmembrane Roof Installation/Repair	300
Other	420

Sealant Primer:

Architectural – Nonporous	250
Architectural – Porous	775
Other	750

VOC LIMTS FOR PAINTS AND COATINGS

The volatile organic compound (VOC) content of interior paints, primers, and coatings used in this project shall not exceed the limits below as defined in GreenSeal Standard 11 (GS-11), First Edition, May 20, 1993.

Paints, Primers, and Coatings:

Flat Finishes	50
Non-Flat Finishes (i.e. satin, gloss)	150

The volatile organic compound (VOC) content of interior anti-corrosive and anti-rust paints used in this project shall not exceed the limits defined in GreenSeal Standard 03 (GS-03), Anti-Corrosive Paints, Second Edition, January 7, 1997

Anti-Corrosive Paint Finishes	250

The volatile organic compound (VOC) content of interior Clear wood finishes, floor coatings, stains, sealers, and shellacs used in this project shall not exceed the limits defined in Rule 1113 – "Architectural Coatings". Rule in effect January 1, 2004. South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov

Architectural Coatings:

Clear Wood Finish: Varnish	350
Clear Wood Finish: Lacquer	550
Stains	250
Floor Coatings	100
Water Proofing Sealers	250
Sanding Sealers	275
All Other Sealers	200
Shellac: Clear	730
Shellac: Pigmented	550

END OF SECTION

SECTION 018119: CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT

PART 1 - GENERAL

CONSTRUCTION IAQ MANAGEMENT GOALS FOR THE PROJECT

The Owner has established that this Project shall minimize the detrimental impacts on Indoor Air Quality (IAQ) resulting from construction activities. Factors that contaminate indoor air, such as dust entering HVAC systems and ductwork, improper storage of materials on-site, poor housekeeping, shall be minimized.

Summary

This Section includes requirements for the development of a Construction Indoor Air Quality Management Plan (alternately referred to as "the Plan"). Develop the Plan for approval by the Owner and Architect. The Plan shall be implemented throughout the duration of the project construction, and shall be documented as outlined in the Submittal Requirements of Item 1.08 below. The Plan is included as part of the LEED BUILDING requirements for the project.

Related Sections

1. All sections of the Specifications related to interior construction, MEP systems, and items affecting indoor air quality.
2. Division 1, Section 018113 – Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints and Coatings
3. Section 099000 – Painting and Finishing.

PERFORMANCE REQUIREMENTS

LEED BUILDING – GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

   Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

REFERENCES

A. "IAQ Guidelines for Occupied Buildings Under Construction", Second Edition, 2007, The Sheet Metal and Air Conditioner Contractors National Association (SMACNA). (703) 803-2980, www.smacna.org.

B. ANSI/ASHRAE 52.2-1999, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size", www.ashrae.org

DEFINITIONS

1. Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products, including solvents in paints, coatings, adhesives and sealants, wood preservatives; composite wood binder, and foam insulations. Not all VOC's are harmful, but many of those contained within building products contribute to the formation of smog and irritate (at best) building occupants by their smell and/or health impact.
2. Materials that act as "sinks" for VOC contamination: Absorptive materials, typically dry and soft (such as textiles, carpeting, acoustical ceiling tiles and gypsum board) that readily absorb VOC's emitted by "source" materials and release them over a prolonged period of time.
3. Materials that act as "sources" for VOC contamination: Products with high VOC contents that emit VOC's either rapidly during application and curing (typically "wet" products, such as paints, sealants, adhesives, caulks and sealers) or over a prolonged period (typically "dry" products such flooring coverings with plasticizers and engineered wood with formaldehyde).

CONSTRUCTION IAQ MANAGEMENT PLAN

Prepare and submit a Construction IAQ Management Plan to the Owner for approval. The Construction IAQ Management Plan shall meet the following criteria:

1. Construction activities shall be planned to meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) "IAQ Guidelines for Occupied Buildings under Construction", Second Edition, 2007.

2. Absorptive materials shall be protected from moisture damage when stored on-site and after installation.

3. If air handlers are to be used during construction, filtration with a Minimum Efficiency Reporting Value (MERV) of 8 must be at each return air grill, as determined by ASHRAE 52.2-1999.

4. Filtration media shall be replaced immediately prior to occupancy. Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ASHRAE 52.2-1999.

5. A “Sequence of Finish Installation Plan” shall be developed, highlighting measures to reduce the absorption of VOCs by materials that act as “sinks”.

Upon approval of the Plan by the Owner and Architect, it shall be implemented through the duration of the construction process, and documented in accordance with the Submittal Requirements of Item 1.08 below.

Further description of the Construction IAQ Management Plan requirements is as follows:

1. SMACNA Guidelines: Chapter 3 of the referenced “IAQ Guidelines for Occupied Buildings Under Construction”, outline IAQ measures in five categories as listed below. The Construction IAQ Management Plan shall be organized in accordance with the SMACNA format, and shall address measures to be implemented in each of the five categories (including subsections). All subsections shall be listed in the Plan; items that are not applicable for this project should be listed as such.

   HVAC Protection
   - Return Side
   - Central Filtration
   - Supply Side
   - Duct Cleaning

   Source Control
   - Product Substitution
   - Modifying Equipment Operation
   - Changing Work Practices
   - Local Exhaust
   - Air Cleaning
   - Cover or Seal

   Pathway Interruption
   - Depressurize Work Area
   - Pressurize Occupied Space
   - Erect Barriers to Contain Construction Areas
   - Relocate Pollutant Sources
   - Temporarily Seal the Building

   Housekeeping

   Scheduling
   - Protect of Materials from Moisture Damage: As part of the “Housekeeping” section of the Construction IAQ Management Plan, measures to prevent installed materials or material stored on-site from moisture damage shall be described. This section should also describe

measures to be taken if moisture damage does occur to absorptive materials during the course of construction.

- Replacement of Filtration Media: Under the “HVAC Protection” section of the Construction IAQ Management Plan, a description of the filtration media in all ventilation equipment shall be provided. The description shall include replacement criteria for filtration media during construction, and confirmation of filtration media replacement for all equipment immediately prior to occupancy.

- Sequence of Finish Installation for Materials: Where feasible, absorptive materials shall be installed after the installation of materials or finishes which have high short-term emissions of VOC’s, formaldehyde, particulates, or other air-borne compounds. Absorptive materials include, but are not limited to: carpets; acoustical ceiling panels; fabric wall coverings; insulations (exposed to the airstream); upholstered furnishings; and other woven, fibrous or porous materials. Materials with high short-term emissions include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paints, wood preservatives and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation; gypsum board (with associated finish processes and products); and composite or engineered wood products with formaldehyde binders.

  Develop a separate sequencing plan that identifies feasible opportunities to meet the above-stated goals for the project. The plan shall be submitted to the Architect and Owner in accordance with the Submittal Requirements of Item 1.08 of this specification.

- Implementation and Coordination: Implement the Construction IAQ Management Plan, and coordinate the Plan with all affected trades. Designate one individual as the Construction IAQ Representative, who will be responsible for communicating the progress of the Plan with the Owner and Architect on a regular basis, and for assembling the required LEED documentation. Include provisions in the Construction IAQ Management Plan for addressing conditions in the field that do not adhere to the Plan, including provisions to implement a stop work order, or to rectify non-compliant conditions.

1.08 SUBMITTALS

Submit the following LEED-required records and documents:

A. A copy of the Construction IAQ Management Plan as defined in section 1.07 of this specification.

B. Product cut-sheets for all filtration media used during construction and installed immediately prior to occupancy, with MERV values highlighted. Cut sheets shall be submitted with the Contactor’s or Subcontractor’s ‘approved’ stamp as confirmation that the products are the products installed on the

project.

C. Provide the Architect or Owner's Representative with a minimum of 18 photographs comprising of at least six photographs taken on three different occasions during construction. The photographs shall document the implementation of each of the measures followed in the Construction IAQ Management Plan throughout the course of the project construction. Examples include photographs of ductwork sealing and protection, temporary ventilation measures, and conditions of on-site materials storage (to prevent moisture damage). Photographs shall be submitted with brief descriptions of the Construction IAQ Management Plan measure documented, or be referenced to project meeting minutes or similar project documents which reference to the Construction IAQ Management Plan measure documented.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.1 IMPLEMENTATION AND COORDINATION

A. Implement the Construction IAQ Management Plan, and coordinate the Plan with all affected trades. Designate one individual as the Construction IAQ Representative, who will be responsible for communicating the progress of the Plan with the Owner and Consultant on a regular basis, and for assembling the required LEED documentation.The Contractor shall include provisions in the Construction IAQ Management Plan for addressing conditions in the field that do not conform to the Plan, including provisions to implement a stop work order, or to rectify non-compliant conditions.

B. Subcontractors shall be responsible for the implementation of specific control measures, as specified in the Construction IAQ Management Plan. Subcontractors shall coordinate their responsibilities through the Construction Manager and their designated Construction IAQ Representative.

END OF SECTION 018119

SECTION 01 9113 - BUILDING COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. All related Specification sections shall be used in conjunction with this Section.

C. OPR and BoD documentation prepared by the Owner and Architect / Engineer contain requirements that apply to this section.

1.02 SUMMARY

A. This section includes requirements for commissioning during the construction phase, functional testing phase and the building turnover phase. Includes requirements for all specified and associated systems, subsystems and equipment. The intent of this section is to specify the commissioning responsibilities of the Contractor, HVAC Subcontractor, TAB Subcontractor, Automated Temperature Controls Subcontractor, Plumbing Subcontractor, Electrical Subcontractor, Fire Protection Subcontractor and Building Enclosure contractors The Contractor will assure participation and cooperation of his subcontractors as required for the commissioning process. The Commissioning Authority for this project will be hired by the Owner.

B. This project has been designed to meet the requirements of the Connecticut Building Standard Guidelines for High Performance Buildings. This commissioning section includes all requirements to conform to the Mandatory Requirement for Building Commissioning as described in the High Performance Building Guidelines. These requirements shall be adhered to, regardless the number mandatory and optional strategies that are chosen.

1. As an alternative to meeting the Building Standard Options (16a-38k-4) of the Connecticut Building Standard Guidelines for High Performance Buildings, this project has been designed to meet the requirements of the US Green Building Council's Leadership in Energy and Environmental Design New Construction (LEED-NC) guidelines. This commissioning section includes all requirements of the LEED program for EA Prerequisite 1, Fundamental Commissioning of the Building Energy Systems and EA Credit 3, Enhanced Commissioning as described in the Energy and Atmosphere section.

C. The Commissioning Authority is not responsible for construction means, methods, coordination between trades, job safety or any other related management function on the job site.

1.03 DEFINITIONS

A. Architect: Includes Architect identified in the Contract for Construction between Owner and Contractor.

B. Automated temperature controls (ATC): building management system and components providing automated control of related environmental and/or process systems and equipment.

C. Basis of Design (BoD): A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

D. Building Enclosure: The exterior enclosure of the building intended to keep occupants and structure dry and is the separation between interior and exterior spaces. Typical exterior envelope systems include foundation wall waterproofing, under slab waterproofing, exterior wall systems (terra cotta rainscreen), fenestrations (storefronts, curtain walls, punched window openings, doors), joint sealants and roofing and serves to maintain a separation between the interior and exterior environments working in conjunction with the mechanical systems. Refer to individual technical specification sections found in the Contract Documents for actual building enclosure systems that will be commissioned.

E. Building Enclosure Commissioning Authority (referred to herein as the BECxA): The individual or group responsible for executing the commissioning process as it relates to the building envelope. Note that the scope of Building Enclosure Commissioning (BECx) services is defined not by this specification section, but by a separate service contract with the primary CxA and the Owner

F. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

G. Contractor or Construction Manager: The prime manager of construction activities identified in the Contract for Construction between Owner and Contractor.

H. Construction Checkout Documents / Pre-Functional Checklists: The CxA will produce pre-functional checklists that can be used by the Contractor / Subcontractors prior to the start of functional testing. These checklists are tools to help the Construction Manager and Subcontractors verify that the installation complies with the Contract Documents. Any deficiencies that are found can then be corrected early in the process when the Contractors are fully mobilized on the site. The pre-functional checklists will be created for all equipment included in the scope of the commissioning process.

I. Commissioning Authority (referred to herein as the CxA): The individual or group responsible for executing the commissioning process.

J. Engineering Professionals: Includes the Engineers identified in the Contract for Construction between Owner and Contractor, responsible for design of HVAC, plumbing, fire protection, electrical, communications, controls for HVAC systems and other related systems.

K. Leadership in Energy and Environmental Design New Construction (LEED-NC): A rating system provided by the U.S. Green Building Council that rates the environmentally friendly and energy efficient performance of a newly constructed building based on established guidelines.

L. Connecticut Building Standard Guidelines – High Performance Buildings - Schools: A rating system provided by the State of Connecticut that contains guidelines and requirements for meeting both mandatory and optional strategies to ensure compliance with the regulation of setting environmental and energy efficiency standards for state-funded facilities that are newly constructed or are undergoing major renovations. High Performance Building standards require BECx for new buildings that meet requirements set forth in Section 16a-38k-3(a).

M. Mock-up (system or component): A system, or component of a system, that is constructed ahead of other similar pieces of equipment that allows the commissioning agent and the installing contractors the ability to evaluate the installation. It allows early testing of system / equipment applications, user interfaces, component interaction techniques and check out of the building automation logic.

N. Owner's Project Requirements (OPR): A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

O. Subcontractor: Individual contractors responsible to the Construction Manager for installation of specific systems to be commissioned.

P. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

Q. Testing, Adjusting, and Balancing (TAB): Testing, adjusting and balancing of air and water systems, subsystems, equipment and components as required per the contract documents.

1.04 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner or Owner representative:

1. The CxA: Owner or Owner representative has engaged the CxA under a separate contract.
2. The BECx: Owner or Owner representative has engaged the BECxA under a separate contract.
3. Representatives of the Owner or Owner representative including facility users and operation and maintenance personnel.
4. Architect and engineering design professionals.

1.05 OWNER'S or OWNER’S REPRESENTATIVES RESPONSIBILITIES

A. Provide the OPR and BoD documentation for use in developing the commissioning plan, checklists and testing plans, operation and maintenance training plan, and a systems manual.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities, including but not limited to, the following:

1. Coordination and testing meetings.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration of operation of systems, subsystems and equipment.
4. Review system performance and recent building history approximately 10 months into the 12 month warranty period with the CxA.

1.06 COMMISSIONING RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this section. It is noted that the services for the Owners Project Manager, Architect, HVAC mechanical and electrical designers/engineers, and Commissioning Authority are not provided for in this contract. That is, the Construction Manager is not responsible for providing their services. Their responsibilities are listed here to clarify the commissioning process.

B. All Parties:

1. Follow the Commissioning Plan: (The commissioning plan is an informational document that clarifies how the commissioning process shall proceed. This plan is developed by the Commissioning Authority and outlines the responsibilities of the Commissioning Authority, Owner as well as what services will be required of the Design Team, Construction Manager and their subcontractors. This document fully describes the processes that will be used to carry out commissioning.)
2. Attend commissioning scoping meeting and additional meetings, as necessary.

C. Architect / Engineer - Construction and Acceptance Phase:

1. The owner manages the Commissioning Authority contract.
2. Attend the commissioning scoping meeting and selected commissioning team meetings.
3. Perform normal submittal review, construction observation as contracted.
4. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
5. Provide the Commissioning Authority with a copy of all bulletins, sketches, RFI's, addenda and any project document updates to help keep the commissioning plan up to date.

D. Commissioning Authority - Construction and Acceptance Phase:

1. The Commissioning Authority is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The Commissioning Authority may assist with problem solving, non-conformance or deficiencies but, ultimately, that responsibility resides with the general contractor and the A/E. The primary role of the Commissioning Authority is to develop and coordinate the testing plan manual, to observe and document performance – which systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, checkout and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the Commissioning Authority.
2. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
3. Coordinate the commissioning work and, with the Construction Manager, ensure that commissioning activities are being scheduled into the master schedule.
4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.

5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
6. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute pre-functional tests and checklists.
9. The BECxA is responsible for the following scope of services during construction:

   The primary role of the BECxA is to assist in developing and coordinating the execution of a testing plan, observe and document performance – that systems are functioning in accordance with the Contract Documents – to the contractual extent between the BECxA and CxA. The contractors will provide all tools or the use of tools to start, check-out and functionally test building enclosure assemblies or systems.

   Management. The BECxA is hired by the CxA directly. The BECxA directs and coordinates the commissioning activities and the reports to the CxA. All members work together to fulfill their individually contracted responsibilities and meet the objectives of the Contract Documents.

   Scheduling. The BECxA will work with the CxA according to established protocols to schedule the commissioning activities. The CxA will provide sufficient notice to the BECxA for scheduling commissioning activities. The CM/GC will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

   General Services.
   Peer review of contract submittals and shop drawings.
   Review of building envelope mock-up construction(s).Attendance at commissioning kick-off meeting.Construction monitoring to observe exterior envelope work and verify if in compliance with contract documents and/or approved submittals and shop drawings.Note: The BECxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management.
10. Overview the development of an enhanced start-up and initial systems checkout plan with Subs.
11. Perform site visits to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
12. Witnessing the cleaning, flushing and chemical treatment of the hydronic systems prior to balancing.
13. Witnessing any ductwork pressure testing.
14. Verify pre-functional tests and checklist completion by reviewing pre-functional checklist reports and by selected site observation and spot-checking.
15. Verify systems startup by reviewing start-up reports and by selected site observation.

16. Review Testing Adjustment and Balancing execution plan and sample report.
17. Verify air and water systems balancing by reviewing completed reports and by selected site observation.
18. Write the functional performance test procedures for equipment and systems.
19. Coordinate, witness and approve "mock-up" installations of systems and equipment as defined in this division, section 3.03.
20. Analyze any functional performance trend logs and monitoring data to verify performance.
21. Coordinate witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
22. Maintain a master deficiency and resolution log and a separate testing record. Provide the Contractor with written progress reports and test results with recommended actions.
23. Oversee the training of the Owner's operating personnel.
24. Review of equipment warranties.
25. Review and approve the preparation of the O&M manuals (one master set).
26. Development of a systems training manual.
27. Provide a final commissioning report.
28. Organize and perform seasonal or deferred testing of equipment and systems.
29. Organize and perform the 10th month warranty review of systems and equipment.

E. Project Manager – Owner's Representative - Construction and Acceptance Phase:

1. Facilitate the coordination of the commissioning work by the Commissioning Authority, and, with the Contractor to ensure that commissioning activities are being scheduled into the master schedule by the Contractor well in advance.
2. Review the final Commissioning Plan.
3. Attend a commissioning scoping meeting and other commissioning team meetings.
4. Perform the normal review of contractor submittals.
5. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the Commissioning Authority.
6. Review the functional performance test procedures submitted by the Commissioning Authority, prior to testing.
7. When necessary, observe and witness pre-functional checklists, startup and functional testing of selected equipment.
8. Review commissioning progress and deficiency reports (Commissioning Portal) and respond to issues assigned.
9. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
10. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the Commissioning Authority to facilitate the commissioning process.
11. Arrange for facility operating and maintenance personnel to attend various field commissioning activities including equipment & system "mock-ups" and field training sessions.

F. Construction Manager - Construction and Acceptance Phase:

1. Construction Manager shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
    a. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
    b. Provide the CxA with a detailed and accurate construction schedule updated on a monthly basis. Coordinate scheduling of commissioning activities with the CxA and include them in the construction schedule.
    c. Provide a schedule for equipment submittals, installation manual submittals, operation and maintenance data submittals, equipment start-up, and testing to CxA for incorporation into the commissioning plan. Update schedule on a monthly basis throughout the construction period.
    d. Provide CxA with copies of all approved change orders or other modifications impacting construction when approved.
    e. Participate in construction phase coordination meetings.
    f. Participate in commissioning inspections.
    g. Ensure accurate completion of construction checkout documents for all systems to be commissioned prior to verification site visits by the CxA.
    h. Certify readiness of systems to be commissioned prior to functional performance testing.
    i. Participate in functional performance testing of systems to be commissioned.
    j. Resolving issues identified during commissioning and coordinating correction of deficiencies. Ensure responses to open issues within two weeks of being posted via online tracking database (Commissioning Portal).
    k. Participate in operation and maintenance planning and verification.
    l. Assist in coordinating the Subcontractors, as needed, with the scheduling and implementation of the operating personnel maintenance training sessions.
    m. Participate in final review of equipment and systems and participate in final acceptance meeting.
    n. Certify the work is complete and systems are operational according to the contract documents, including calibration of controls and any instrumentation.
    o. Coordinate subcontractor commissioning activities.
    p. Review and approve final commissioning documentation.
    q. Assist in coordinating the Subcontractors, as needed, to perform testing of systems and equipment as it relates to project phasing.
    r. Assist in coordinating the Subcontractors, as needed, to perform deferred or opposite seasonal testing of systems and equipment.
    s. Assist in coordinating the Subcontractors to resolve issues discovered during the system performance review 10 months into the 12 month warranty period.
    t. Assist in coordinating personnel and providing documentation, as needed, to meet the LEED-NC requirements.
    u. Assist in coordinating personnel and providing documentation, as needed, to meet the High Performance Guidelines requirements.
    v. Coordinate and arrange for mock-up systems and equipment as defined in this division, section 3.03.

G. Subcontractors shall assign representatives with the expertise and the authority to act on behalf of the entity responsible for installation of systems to be commissioned who shall participate in and perform commissioning team activities including, but not limited to, the following:

1. Provide a schedule for equipment submittals, installation manual submittals, operation and maintenance data submittals, equipment start-up, and testing to CxA for incorporation into the commissioning plan. Update schedule on a monthly basis throughout the construction period.
2. Participate in construction phase coordination meetings.
3. Provide information to the CxA for developing construction phase commissioning plan including, but not limited to:
4. Schedule as mentioned above.
5. Equipment submittals.
6. Installation manual submittals.
7. Operation and maintenance information submittals.
8. Complete construction checkout documents for all systems to be commissioned.
9. Provide all necessary assistance and work associated with the completeness and installation of "mock-up" equipment as defined in this division, section 3.03.
10. Maintain updated Project Record Documents for periodic review by the CxA and submit final record documents at project completion.
11. Certify readiness of systems to be commissioned prior to functional performance testing.
12. Participate in functional performance testing of systems to be commissioned.
13. Participate in test procedures meeting.
14. Provide technicians who are familiar with the construction and operation of the installed systems, are trained in the use of required testing instruments and procedures to participate in testing of installed systems, subsystems and equipment.
15. Participate in operation and maintenance planning, documentation and verification.
16. Resolving issues identified during commissioning and coordinating correction of deficiencies. Ensure responses to open issues within two weeks of being posted via online tracking database (Commissioning Portal).
17. Participate in training sessions for Owner's operation and maintenance personnel.
18. Participate in final review at acceptance meeting.
19. Participate, as needed, in performing deferred or opposite seasonal testing of systems and equipment.
20. Assist in coordinating personnel and providing documentation, as needed, to meet the LEED-NC requirements.
21. Assist in coordinating personnel and providing documentation, as needed, to meet the High Performance Guidelines requirements.

1.07 COMMISSIONING DOCUMENTATION

A. Commissioning Plan: A document, prepared by the CxA, that outlines the schedule, allocation of resources and documentation requirements of the commissioning process, including but not limited to, the following:

1. Plan for delivery and review of submittals, systems manuals and other documents and reports. Identification of the relationship of these documents to other functions and a description of submittals that are required to support the commissioning processes. Submittal dates include the latest date approved submittals must be received without adversely affecting commissioning.

2. Overview of the organization, layout and content of commissioning documentation and a description of documents to be provided along with identification of responsible parties.
3. Identification of systems and equipment to be commissioned.
4. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
5. Identification of items that must be completed before the next operation can proceed.
6. Description of responsibilities of commissioning team members.
7. Description of observations to be made.
8. Description of requirements for operation and maintenance training, including required training materials.
9. Description of expected performance for systems, subsystems, equipment and controls.
10. Requirements for documenting changes on a continuous basis to appear in the project record documents.
11. Process and schedule for completing construction checklists for systems to be commissioned,
12. Step by step procedures for testing systems, subsystems and equipment with descriptions for methods of verifying relevant data, recording the results obtained and listing parties involved in performing and verifying tests.
13. The BECxA will provide a compilation of written documentation developed during the BECx process and may include site visit reports, peer reviews, submittal and shop drawings reviews and other pertinent correspondence, following the final execution of the Commissioning Plan, including necessary investigation testing.
    i. After each site visit, the BECxA will provide a report to the CxA.
    ii. After the mock-up evaluation performed by the BECxA, they will provide a report to the CxA.

B. Development of Test Procedures: The Architect shall determine which specific test procedures are required to verify and document proper operation of each assembly. Each Sub or vendor responsible to execute a test shall provide submittals about equipment, operation and sequences. Prior to test execution, the BECxA shall be notified of the test procedures.

C. Construction Checkout Documents / Pre-functional Checklists: The CxA shall develop construction checklists for each system to be commissioned including interfaces with the ATC system, safeties, and interlocks. Separate entries will be provided for each item to be checked. Construction checklists will be completed by the installing Subcontractor and verified by the Contractor and CxA. Space will be provided for sign off of installing Subcontractor, Contractor and CxA. Each checklist will include, but not limited to, the following:

1. Name and identification code of each item being checked.
2. Verification of each item including verification of all required data and construction practices listed in the construction checklists. This list outlines all work necessary to be completed prior to the start of functional testing for the particular system, subsystem and equipment.
3. Notation of any equipment or installation that deviates from approved submittals or the construction documents.
4. Name(s) of personnel involved with verification and dates on which verification activities and construction checklists were completed.

D. Witness systems, assemblies, equipment, and component startup.

E. Problem Solving: While on site, the BECxA may recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the CM, Subs and A/E.

F. Hydronic Start-up Documents: Documentation that narrates the flushing, cleaning, chemical treatment, pressure testing and air bleeding of any associated hydronic systems, assemblies, equipment, and component start-up. Documentation should identify individuals present who witnessed said testing.

G. Certificate of Readiness: Certificate of Readiness shall be signed by the Contractor, Subcontractor(s), Installer(s) and CxA certifying that systems, subsystems, equipment, and associated controls are ready for testing and that all relevant information including submittals, installation data and operation and maintenance documentation has been submitted. Completed construction checklists signed by the responsible parties shall accompany this certificate.

H. Functional Performance Testing: CxA shall develop functional performance test documents for each system to be commissioned including interfaces and interlocks. Separate entries will be provided for each item to be tested. CxA shall prepare separate tests for each mode of operation and provide space to indicate whether the mode under test responded as required. All information gathered will be documented by the CxA. Each test will include, but not limited to, the following:

1. Name and identification of each item being checked.
2. Date of test.
3. Indication of whether the record is for a first test or retest following correction of a problem or issue.
4. List of deficiencies.
5. Calibration of sensors and sensor function.
6. Testing conditions under which test was conducted, including (where applicable) ambient conditions, setpoints, override conditions, and status and operating conditions that impact the results of the test.
7. Control sequences for mechanical and electrical systems.
8. Verification of control signals for each setpoint at specified conditions.
9. Responses to control signal at specified conditions.
10. Sequence of responses to control signals at specified conditions.
11. Electrical demand or power input at specified conditions.
12. Expected performance of systems, subsystems and equipment at each step of the tests. Narrative description of observed performance of systems, subsystems and equipment. Notation to indicate whether the observed performance at each step meets the expected results.
13. Interaction of auxiliary equipment.

I. Test and Verification Reports: CxA will create test scenarios, record test data, observations, and measurements on test documents. Photographs, forms and other means appropriate for the application shall be included with test documentation. CxA will compile test and verification reports and verification certificates and include them in the commissioning report.

J. Training Plans: To be prepared by the contractor and submitted to the CxA and the Owner for review and comment prior to finalizing training plans.

K. Corrective Action Documents: CxA will document corrective action taken for systems and equipment that fail tests including required modifications to systems and equipment and revisions to test procedures. Retest and final results will also be documented.

1. Issues Log or Commissioning Notice: CxA prepares and maintains an issues log that describes design, installation and performance issues that are at variance with the OPR, BoD and contract documents. Identification and tracking of issues as they are encountered, documenting the status of unresolved and resolved issues. Issues log is shared with members of the Design/Construction/Commissioning team via an internet portal which is maintained by the CxA.
   a. BVH Commissioning Portal: The CxA Commissioning Portal is an on-line issue tracking database developed by BVH Integrated Services, P.C. The Portal is used by the CxA to track issues and assign responsibility for corrective action. All members of the Commissioning Team will be given access to the Portal to respond to issues and / or deficiencies. Open issues will be sorted by the individual trades. Once the Contractor / Subcontractor(s) have made any necessary corrections they will update their specific issues on line for re-verification by the commissioning provider.

L. Systems Training Manual: CxA shall develop a systems training manual for the operation and maintenance personnel that includes the intended operation of the systems and equipment listed as well as document setpoints and schedules. It should be noted that the Systems Training Manual does not in any way replace the Subcontractor / vendor training nor does it relieve Subcontractor(s) of their responsibilities as outlined in other divisions within the contract documents.

1.08 SUBMITTALS BY CONTRACTOR

A. Information listed below shall be submitted with the product and system product literature and shop drawing submittals for review and approval by the Owner, Architect, Engineering Professionals and the CxA. This information will be used to confirm the product compliance with the Contract Documents and to establish detailed commissioning requirements and procedures. The information shall be specific to each system to be commissioned and shall be inclusive of all related systems, equipment and components.
   1. Manufacturer cut sheets and product literature and shop drawings in accordance with the requirements of other divisions.
   2. Manufacturer's detailed installation and start-up requirements including equipment checklists for each piece of equipment.
   3. Operation instructions.
   4. Manufacturer's recommended maintenance and troubleshooting procedures.
   5. Warranty and owners obligations to maintain warranty.
   6. Detailed product data for each piece of equipment including part load capacities, electrical components and requirements, etc. (As appropriate)
   7. Manufacture's certified test reports on each piece of equipment.
   8. Performance curves for each piece of equipment being submitted. (As appropriate)
   9. Coordination and Record Drawings.
   10. Logic flow diagrams for control systems sequences of operation. Include detailed sections of the Sequence of Operations for related function groups.
   11. Interpret function groups for clarity.
   12. Indicate initial setpoints, reset schedules, sensor locations, etc.

B. Operation and Maintenance Manuals:

1. The Contractor shall develop the Operation and Maintenance manuals in accordance with the requirements indicated in Division 01.
2. All submittal information indicated in item 1.08A above shall be included in the operations and maintenance manual in addition to the information required below.
3. Manufacturer's break-in instructions.
4. Manufacturer suggested service requirements.
5. Spare parts list edited for specific equipment used on the project. Provide names/numbers of local distributors for spare parts.
6. Copy of all equipment specifications.
7. Preventative maintenance instructions.
8. Troubleshooting guide.
9. Plumbing and HVAC piping sanitation certificates.
10. Air and Water Balancing Reports.
11. Warranties and Warranty start dates.
12. Equipment Start-up Reports
13. Roof System Applicator maintenance instructions per warranty requirements.
14. Roof Vegetated System maintenance instructions.
15. Door Hardware maintenance instructions and tools.
16. Curtain wall, Storefronts, Entrances (CWSA) maintenance manuals.
17. Window Hardware and operable unit maintenance instructions.
18. Exterior building sealants removal and installation instructions.
19. Air/Vapor Barrier repair methods.
20. Terra cotta rain screen tile removal and replacement

1.09 QUALITY ASSURANCE

A. Operations and Maintenance Training Instructor Qualifications: Equipment training shall be provided by a factory authorized technical representatives, experienced in training, operation and maintenance procedures for installed systems, subsystems and equipment.

1.10 COORDINATION

A. Coordination Meetings: CxA shall conduct periodic coordination meetings of the commissioning team to review progress on the commissioning plan, to discuss scheduling conflicts and to discuss upcoming commissioning process activities.

B. Pretesting Meetings: CxA shall conduct pretest meetings of the commissioning team to review start-up reports, pretest verification results, testing procedures, testing personnel and instrumentation requirements and manufacturer's authorized service representative services for each system, subsystem, equipment and component to be tested.

C. Testing Coordination: CxA shall coordinate sequence of testing 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 verification.

D. Manufacturer's Field Services: CxA shall coordinate services with the help of the Contractor/Subcontractor of manufacturer's field services.

1.11 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned where applicable in this project. Refer to Contract Documents and individual specification sections for systems to be commissioned.

1. Building Envelope commissioning may include, but is not limited to:
   a. Concrete anchors; include attachment testing of in-situ anchors.
   b. Liquid Applied Roofing; include infrared testing, electronic field vector mapping, flood testing and FM Global wind uplift testing.
   c. Curtain Walls, Storefronts & Entrances – Air and water penetration testing. Structural testing.
   d. Punched Window Openings – Air and water penetration testing.
   e. Masonry – General construction as it relates to air/vapor barrier systems, flashing, veneer construction and anchorage requirements.
   f. Cold Form Framing (and Sheathing) - General construction as it relates to air/vapor barrier systems, flashing, veneer construction and anchorage requirements.
   g. Air/Vapor Barriers – Adhesion tests, field thickness testing (fluid applied), air and water penetration testing.
   h. Flashing Systems – positive slope for drainage, continuity, installation per industry standard and manufacturers requirements.
   i. Slab on Grade with Waterproofing – visual inspection for tears, holes, seals at transitions and taped seams.
   j. Horizontal Waterproofing (above head, tunnel) – flood test.
   k. Foundation Waterproofing – adhesion testing, field thickness testing (fluid applied)
   l. Metal, Terra Cotta and Cast Stone Wall Panel Systems – air and water penetration testing.
   m. Thermal Insulation – conforms to contract documents and manufacturer installation requirements
   n. Building sealants – adhesion testing
   o. Mock-ups (functional testing)
2. Chilled Water System (Campus provided)
3. Steam Service (Campus provided)
4. Air Handling Supply, Return and Exhaust Systems
5. Fume Hood Exhaust System
6. Building Management System
7. Domestic Water Services
8. Fire Protection Services
9. Laboratory Waste System
10. Laboratory Vacuum, Compressed Air and Specialty Gases
11. Natural Gas
12. RODI System
13. Tempered Water System
14. Electrical System

15. Emergency Electrical System

16. Any building system deemed as renewable energy shall be commissioned as required by the High Performance Building Guidelines or LEED

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. All standard testing equipment required to perform start-up and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested.

B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerance specified in this Section. The Contractor(s) instrumentation shall meet the following standards:

1. Be of sufficient quality and accuracy to test and/or measure system performance within the tolerances required to determine adequate performance.
2. Be calibrated on the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument being used.
3. Be maintained in good repair and operating condition throughout the duration of use on this project.
4. Be recalibrated / repaired if dropped and/or damaged in any way since last calibrated.

C. An example for BECx; the window/glazing contractor of Division 8 shall ultimately be responsible for all specified testing and equipment for the window and curtain wall systems specified to be tested in Division 8.

PART 3 EXECUTION

3.01 TESTING PREPARATION

A. Prerequisites for Testing:

1. Certify that systems to be commissioned have been completed, calibrated and manufacturer start-ups (where required) are complete. Verify systems to be commissioned are operating according to the OPR, BoD, and the contract documents and the Certificates of Readiness are signed and submitted.
2. Certify that building instrumentation and automated temperature controls associated with the systems to be commissioned have been completed and calibrated and are operating according to the OPR, BoD, and the contract documents and that preset set points have been recorded.
3. Certify that TAB procedures have been completed and that TAB reports have been submitted, discrepancies corrected and corrective work approved.
4. Test systems and intersystem performance after approval of construction checklists for systems, subsystems, and equipment.
5. Set systems, subsystems, and equipment into operating mode to be tested (i.e. normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power and alarm conditions.)

6. Verify each operating cycle after it has been running for a specified period and is operating in a steady state condition.
7. Inspect and verify the position of each device and interlock identified on checklists. Sign off each item as acceptable or failed. Repeat this test for each operating cycle that applies to system being tested.
8. Check safety cutouts, alarms and interlocks with smoke control and life safety systems during each mode of operation.
9. Update checklists or data sheet after a deficiency is observed and corrected.
10. Verify equipment interface with monitoring and control system and TAB criteria including the following:
    a. Supply and return flow rated for variable flow and constant volume systems in each operational mode, including maximum and minimum flow capacity.
    b. Operation of terminal units in both heating and cooling cycles.
    c. Minimum outdoor air intake in each operational mode and at minimum and maximum airflows.
    d. Building pressurization.
    e. Total exhaust airflows and total outdoor air intake.
    f. Operation of indoor air quality monitoring systems.
11. Verify proper responses of monitoring and control systems controllers and sensors to include the following:
    a. For each controller or sensor, record the indicated monitoring and control system reading and the test instrument reading. If the initial test indicates that the test reading is outside of the control range of the installed device, check calibration of the installed device and adjust as required. Retest malfunctioning devices and record results on checklist or data sheet.
    b. Report deficiencies and prepare an issues log entry.
12. Verify that construction checkout of systems to be commissioned has been completed and approved. CxA shall verify construction checkout and start-up including requirements specified in individual Division Sections and equipment manufacturer's recommendations.

B. Testing Instrumentation: Install measuring instruments and logging devices to record test data for the required test period. Instrumentation shall monitor and record full range of operating conditions and shall allow for calculation of total capacity of system for each mode of operation. Operational modes may include the following:

1. Occupied and unoccupied
2. Full load and minimum flow
3. Maximum flow and minimum flow
4. Warm up and cool down
5. Economizer cycle
6. Emergency power supply
7. Life safety alarm modes
8. Temporary upset of system operation
9. Partial occupancy conditions
10. Special cycles

3.02 START-UP, CONSTRUCTION CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned.

B. General: Each piece of equipment receives full construction checkout. No sampling strategies are used. The construction checkout protocol for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system. Before any system start-ups begin, the Contractor(s) shall conduct a final installation verification audit for their work. The Contractor shall be responsible for completion of all work including change orders and punch list items to the Owner's / CxA satisfaction. This visual check of the various systems to be commissioned shall verify that all components are properly installed. The following items as a minimum shall be observed, but not be limited to, check of:

1. Air Distribution Systems:
   a. Mounting and support of equipment.
   b. Noise, vibration, air and water leaks.
   c. Air filtration, presence and operation of dampers, diffusers, grilles, fire dampers and access doors.
   d. Presence of thermostats and other adjustable temperature control devices.
   e. Presence of smoke sensors and other safety devices.
   f. Instrumentation, gauges, thermometers and flow measuring devices.
   g. Access to equipment and filters.
   h. Insulation of ductwork is complete.
   i. Ductwork is sealed.
   j. Power available to equipment.
   k. Temperature controls are complete.
   l. Air and water balancing is complete and a hand written report available.
2. Heating and Cooling Systems Equipment and Piping:
   a. Service access is acceptable.
   b. Proper cycling.
   c. Excessive noise, vibration or leaks.
   d. Presence of safety devices and controls.
   e. Proper identification of all piping, valves, starters and equipment.
   f. Pressure testing and flushing of systems.
   g. Power available to equipment.
   h. Temperature controls are complete.
   i. Equipment start-up and checkout by the manufacturer's representatives are complete.
   j. Air and water balancing is complete and a hand written report available.
3. Plumbing Systems and Equipment:
   a. Service access is acceptable.
   b. Proper cycling.
   c. Excessive noise, vibration or leaks.
   d. Presence of safety devices and controls.
   e. Proper identification of all piping, valves, starters and equipment.
   f. Pressure testing and flushing of systems.
   g. Power available to equipment.
   h. Equipment start-up and checkout by the manufacturer's representatives are complete.
4. Fire Protection System and Equipment:

a. Service access is acceptable.
b. Proper cycling.
c. Excessive noise, vibration or leaks.
d. Presence of safety devices and controls.
e. Proper identification of all piping, valves, starters and equipment.
f. Pressure testing and flushing of systems.
g. Power available to equipment.
h. Equipment start-up and checkout by the manufacturer's representatives are complete.
i. Emergency power complete and in place.

5. Building Electrical System and Equipment:
   a. Service access is acceptable to all devices.
   b. Presence of safety devices and controls.
   c. Proper identification of all starters, switches and equipment.
   d. Power available to equipment.
   e. Equipment start-up and checkout by the manufacturer's representatives are complete.
6. Building Envelope Systems
   a. Roofing/Waterproofing system is complete with flashing, drains, and sheet metal components. Roof wind uplift testing is completed no less than 30-days after bonding adhesive has been installed.
   b. Wall systems are complete with AVB transitions, interior and exterior sealants, less interior finishes.
   c. Window/Curtain Wall/Storefronts/Entrances and Siding Panel systems are complete with AVB transitions, interior and exterior sealants, less interior finishes.
   d. Building Sealants are installed and have cured for a minimum of seven (7) days.

C. If any work is found incomplete, incorrect, or non-functional, the Contractor shall correct the deficiency before system start-up work proceeds.

D. Contractor shall provide a full start-up plan for each system to be commissioned including all subsystems, equipment and components which shall at a minimum include the following documentation:

1. Construction Check-out Documents
2. Manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
3. Manufacturer's normally used field checkout sheets.

E. Construction Checkout Documents / Pre Functional Checklists

1. Job specific prefunctional checklists will be provided by the CxA along with additional minimum testing and demonstration requirements as set forth by the Owner.

F. Sensor Calibration:

1. Calibration of all sensors shall be included as part of the construction checklists performed by the Contractors.

3.03 FUNCTIONAL PERFORMANCE TESTING

A. This sub section applies to commissioning functional performance testing for all Divisions.

B. Objectives and Scope:

1. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and function of the systems.
2. In general, each system to be commissioned should be operated through all modes of operation where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall be tested.

C. The responsible subcontractor or his/her designee executes the performance of the construction checkout, start-up, and checkout. When checking off construction checklists, signatures may be required of other subcontractors for verification of completion of their work.

D. The CxA shall observe, at minimum, the procedures for each piece of primary equipment.

E. Building Envelope: The following procedures apply to all components to be reviewed for the building envelope.

1. General: Mock-ups are important to ensure that the building envelope construction is per the contract requirements. Those contract requirements are tested to verify they meet the needs of the facility. Assembling a mock-up allows for inspection and verification of materials used, installation techniques and system integrity prior to installing components on the building. The mock-ups must be successfully evaluated and approved prior to components being installed on the building.

F. The subcontractors shall execute start-up and provide the CxA with a signed and dated copy of the completed start-up and construction checklists.

G. Only individuals that have a direct knowledge and witness that a line item task on the construction checklist was actually performed shall initial or check that item off.

H. Test Methods:

1. Mock-Up Systems
   a. "Mock-Up" equipment and systems are to be completed in all respects and readied for functional testing prior to building completion. These systems are as follows:
      1) Typical Air Handling Unit
      2) Typical Air Terminal Boxes (CAVs/VAVs) & reheat coils
      3) At a minimum of two weeks prior to completing the mock-up, the Subs and vendors shall schedule the mock-up evaluation with the CM and BECxA.
      4) The BECxA shall inspect each mock-up and observe any required testing. Testing is performed by the installing contractor.
   b. The BECxA shall document the results of the mock-up inspection and testing (if specified), as well as any deficiencies identified and submit a report of the findings to the CxA.

c. "Mock-Up" equipment and systems are to be completed in all respects and readied for functional testing prior to building completion. These systems are as follows:
   1) Window glazing / curtain wall / storefronts / entrance structures
   2) Any exterior wall structures – masonry, cold form framing systems, siding panels, etc.
   3) Roofing.
   4) Air & Vapor Barrier Systems.
   5) Architecturally Exposed Structural Steel.
d. "Mock-up" equipment is defined as systems and equipment that are in sufficient quantities where early detection of system deficiencies will help to reduce future rejection of equipment. These are permanent installations – not temporary for the sake of demonstration only. The equipment "mock-up" will establish a level of quality of the equipment installation and its operation. This proactive approach will reduce future installation and operational errors of repetitive equipment.
e. "Mock-up" equipment will be reviewed and approved by the Architect, Engineer, CA, and Owner's Representative
f. "Mock-up" equipment will be deemed readied for testing and approval as defined below:
   1) Air Handling Unit
      a) Manufacturer start-up completed and report submitted
      b) Associated Supply and Exhaust Fan VFDs are operational
      c) All ductwork to and from unit is completed, sealed, and insulated
      d) Piping to coils for unit is completed per detail
      e) Piping is insulated
      f) Equipment identification installed
      g) Pipe and Duct identification completed
      h) Valve Tags installed
      i) Final filters installed
      j) All Gages and Thermometers installed
      k) Condensate pans trapped and piped to floor drain
      l) Terminal boxes downstream under control to at least allow BMS command to open.
      m) Automatic Temperature Controls installed, functioning, and reporting to the BAS, including all associated sensors and airflow measuring devices
   2) Air Terminal Boxes (VAV/CAV)
      a) Equipment identification installed
      b) Piping to reheat coil is completed as per detail. Pipe Identification and Valve tagging completed
      c) Piping is insulated
      d) Primary and secondary air ducts are completed, sealed, and insulated
      e) All diffusers served by unit are installed with proper flex runs to limit any air velocity noise.
      f) Unit supports in place.
      g) Automatic Temperature Controls installed, functioning, and reporting to the BAS, including all associated sensing devices.
g. CM is responsible to schedule and provide all necessary time and personnel to achieve the "mock-up" installations. CM will coordinate this effort with the CA and Owners Representative for acceptance.

2. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's graphic trend log capabilities.
3. Tests shall be performed using design conditions whenever possible and where required.
4. Set-up:
    a. Each function and test shall be performed under conditions that simulate actual conditions to the closest practical approximation.
    b. The Contractor executing the test shall provide all necessary materials, system modifications, etc. to produce the flows, pressures, temperatures, etc. necessary to execute the test under specified conditions.
    c. At completion of the test, the Contractor shall return all affected building equipment and systems to their pre-test condition.
    d. Functional performance testing will commence as systems are brought to substantial completion and will be done on a system by system basis. The results of these tests will be documented and submitted to the Owner for final system acceptance. The Commissioning Authority shall attain this objective by developing individual systems testing protocols which, when implemented by the trade Contractor, will allow the Commissioning Authority to observe, evaluate, identify deficiencies, recommend modifications, adjust, and document the systems and systems equipment performance over a range of load and functional levels. Functional performance testing as a minimum will be performed on the following systems:
5. Air Distribution Systems:
    a. The Testing and Balancing Contractor (TAB) shall demonstrate total airflow at each piece of air handling equipment at simulated full cooling, heating and/or max/min or fresh (outside) air.
    b. Spot checks of air outlets shall be made. The Commissioning Authority shall select outlets and the air balancer shall demonstrate a reading of that outlet. Where appropriate, the thermostat shall be adjusted to simulate full cooling, full heating, etc.
    c. The Testing and Balancing Contractor (TAB) shall demonstrate proper room static pressure with respect to the adjacent space(s).
    d. Observe motor HP draw at selected fan motors.
    e. Discrepancies between the balancing report and spot check results shall be dealt with to correct all deficiencies. In the event that significant deficiencies are detected, the entire balancing procedure shall be repeated.
        1) Any noted drafts or noisy air distribution devices shall be evaluated and corrective action taken.
        2) The Testing and Balancing Contractor (TAB) shall verify the proper calibration of temperature, pressure and safety devices as installed on the various pieces of mechanical equipment. The Testing and Balancing Contractor (TAB) shall assist the Commissioning Authority in the proper setting of all temperature, pressure and safety devices.
        3) Any balancing related problems identified during the functional testing procedures shall be addressed and corrected.
6. Hydronic Systems:
    a. The Testing and Balancing Contractor shall demonstrate total water flows at each pump, air handler, chiller and terminal heating equipment.

b. Spot checks of hydronic terminals shall be made. The CxA shall select terminals and the balancer shall demonstrate a reading at the equipment via the flow control device or by using an ultrasonic device.
c. Discrepancies between the balancing report and actual testing results shall be dealt with to correct all deficiencies. In the event that significant deficiencies are detected, the entire balancing procedure shall be repeated.
d. Assist in verifying the calibration and operation of any flow meters and differential pressure sensors.
e. Assist in verifying the calibration and operation of any temperature sensors.
f. Any balancing related problems identified during the functional testing procedures shall be addressed and corrected.

7. Exhaust Systems:
   a. The Testing and Balancing Contractor (TAB) shall demonstrate total airflow at each exhaust fan system.
   b. Spot checks of air outlets shall be made. The Commissioning Authority shall select outlets and the air balancer shall demonstrate a reading of that outlet.
   c. The Testing and Balancing Contractor (TAB) shall demonstrate proper room static pressure with respect to the adjacent space(s).
   d. Observe motor HP draw at selected fan motors.
   e. Discrepancies between the balancing report and spot check results shall be dealt with to correct all deficiencies. In the event that significant deficiencies are detected, the entire balancing procedure shall be repeated.
   f. Any noted drafts or noisy air distribution devices shall be evaluated and corrective action taken.
   g. Any balancing related problems identified during the functional testing procedures shall be addressed and corrected.
8. Automatic Temperature Controls (ATC):
   a. ATC Contractor shall demonstrate the proper operation of the temperature control sequences for each air handling systems, variable air volume boxes, boilers, chillers, pumps, exhaust and terminal heating/cooling equipment as listed in 1.11 of this Section.
   b. ATC Contractor shall demonstrate the proper sequences as they apply to the equipment listed in 1.11 of this Section: This includes but not limited to the following:
      1) Occupied/unoccupied time sequences.
      2) Night setback/night set-up features.
      3) Morning warm-up sequences.
      4) Air-side economizers.
      5) Proper control of steam boilers and associated equipment such as deaerator, boiler feed pumps, condensing economizer system and combustion air.
      6) Proper control of discharge air temperature from air handling equipment including reset temperature sequences.
      7) Heating hot water discharge temperature control to the building systems including hot water reset.
      8) Proper staging and control of the heat exchangers.
      9) Lead/lag operation of the various pumps.
      10) Control of hot water freeze pumps.
      11) Proper control and discharge temperatures from the reheat coils.

12) Operation and control of the fan coils and unit heaters.
13) Proper operation and control of the chillers and cooling towers.
14) Run standby operation of pumps.
15) Proper operation and control of any energy recovery systems.
16) Proper control of the exhaust fans
17) Proper annunciation of building alarms including fail safe controls and proper shut down of equipment.
18) Proper control of all air handling equipment with respect to air volume.
19) Demonstrate any terminal box operation for 30 consecutive days (24 / 7) without a system problem. Shall include temperature and humidity (where applicable) and recording of same.
20) Calibration of all temperature pressure and safety devices.
21) Proper display of all ATC graphics.
22) Control of all automatic control valves and dampers.
23) Assist in calibration of all airflow stations.

9. Plumbing Systems:
   a. Verify proper operation and control of the domestic water heating system.
   b. Proper operation and calibration of the thermostatic mixing valves.
   c. Verify proper operation of the backflow preventer systems.
   d. Verify proper operation of the storm water systems.
   e. Demonstrate proper operation and control of the various pumping systems – (i.e. domestic water booster, sewage ejector, re-circulation pumps)
   f. Demonstrate the ability of the domestic hot water system to maintain the design minimum water temperature at all the faucets serviced by the system for 5 minutes while all faucets are active.
   g. Demonstrate domestic hot water at the faucet within a reasonable amount of time of faucet opening.
10. Electrical Systems:
   a. Demonstrate proper operation of all building lighting, lighting control systems and occupancy sensors.
   b. Demonstrate proper operation of electrical supply and distribution metering system.
   c. Demonstrate proper operation of the emergency generator, transfer switch, emergency power and uninterruptible power supply (UPS) systems.
   d. Verify proper operation of variable frequency drive systems, main electrical gear systems, low and medium voltage systems, and ground systems.
   e. Demonstrate proper operation of elevator systems.
11. Life Safety Systems:
   a. Verify operation of fire pump, fire alarm, egress pressurization, fire suppression and egress lighting.
12. Coordination and Scheduling:
   a. Scheduling is the responsibility of the Contractor. Commissioning activities shall be scheduled through the Contractor. The Contractor shall be responsible for integrating functional performance testing and commissioning requirements into the master activity schedule.
   b. The subcontractors shall provide sufficient notice to the BECxA regarding their completion schedule for the mock-up review of all specified assemblies. The BECxA shall witness and document the mock-up testing. The Subs or their certified testing agency shall execute the tests.

c. The subcontractors shall provide sufficient notice to the CxA regarding their completion schedule for the construction checklists and start-up of all equipment and systems. The CxA shall direct, witness and document the functional testing of all equipment and systems.
d. Subcontractors are responsible for execution of all tests.
e. Functional testing is conducted after construction checklists and start-up has been satisfactorily completed. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems.
f. The Contractor shall verify completeness of the building envelope, perimeter and interior items which affect proper operation and control of HVAC, Plumbing, Fire Protection and electrical equipment and systems.
g. The air and water balancing is completed and debugged before functional testing of air and water related equipment or systems.
h. Testing proceeds from components to subsystems to systems.
i. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

13. Problem Solving:
    a. The CxA will recommend solutions to problems found, however the burden of responsibilities to solve, correct and retest problems rests with the Contractor, Subcontractor, Architect and Engineering Professionals.
14. Trend Logs:
    a. Upon completion of successful functional performance testing, contractor shall submit graphic trend logs to CxA.
    b. Submit graphic trend log for each piece of controlled equipment for each controlled parameter.
    c. Trend logs shall demonstrate successful performance for a seven day period unless the controlled process requires a longer timeline.
    d. Trend log color printouts shall be submitted demonstrating successful seasonal performance.
    e. Trend logs shall be color graphic with legend submitted to the CxA in printout.

3.04 SEASONAL/DEFFERRED TESTING

A. The purpose of (opposite) seasonal functional testing is to evaluate the performance of selected equipment during design weather conditions that may not have been available during the initial functional testing. Ideally cooling equipment needs to be functionally tested under hot, humid summer conditions to ensure proper operation in accordance with design specifications. The same is true for heating hot water and steam systems is which require colder, winter climates.

B. The functional testing performed during seasonal testing will adhere to the guidelines listed above in item 3.3 in this section.

C. Any deficiencies will be documented and submitted to the Contractor and correction of these items will be the responsibility of the respective Subcontractors.

3.05 POST OCCUPANCY/WARRANTY REVIEW

A. The purpose of a post occupancy/warranty review is to review the building systems and equipment prior to warranty expiration. The post occupancy/warranty review will take place approximately 10 months into the 12 month warranty period. The facilities operating staff will be interviewed to discuss any issues discovered during the previous month's operation of the facility (concerning previously commissioned equipment). The building control system and equipment will be inspected to identify any deficiencies.

B. Any warranty related deficiencies will be documented and submitted to the Contractor and correction of these items will be the responsibility of the respective Subcontractors.

3.06 DOCUMENTATION, NON-COMFORMANCE AND APPROVAL OF TESTS

A. Documentation:

1. The CxA will witness and document the results of functional performance tests using the specific procedural forms developed for that purpose.
2. Reports will include measured data, data sheets and a comprehensive summary describing the operation of systems at the time of testing.
3. Data sheets for each controller verifying proper operation of the control system, the system it serves, the service it provides and its location will be provided.

B. Non-Conformance:

1. The CxA will record the results of the functional testing on the procedure or test form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owner.
4. Should a deficiency be identified during checkout, start-up or testing, the CxA will discuss the issue with the responsible subcontractor. When there is no dispute on the deficiency and the subcontractor accepts responsibility to correct it.
   a. The CxA documents the deficiency and the subcontractor's response and intentions and they go on to another test or sequence.
   b. After a system performance testing is complete, the CxA submits the noncompliance issues on the internet portal.
5. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
   a. The deficiency shall be documented on the BVH portal with the subcontractor's response and the item shall be tagged for the Engineer / Architect to review and comment for resolution.
6. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the Owner.
7. The CxA documents the resolution process.

8. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.
9. If it is determined that the system is constructed according to the Contract Documents, Owner will decide whether modifications required to bring the performance of the system to the OPR and BoD documents shall be implemented or if tests will be accepted as submitted. If corrective Work is performed, Owner will decide if tests shall be repeated and a revised report submitted.
10. Cost of Retesting.
    a. The cost for the subcontractor to re-perform a construction check-out or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs proposed shall be negotiated with the appropriate party.
    b. The time for the CxA to direct any retesting required because a specific construction checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be fault, will be negotiated with the appropriate party, who may choose to recover costs from the party responsible for executing the faulty test.
    c. Failure Due to Manufacturer Defect:
        1) If 10% or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CxA. In such case, the subcontractor shall provide the following:
            a) Within one week of notification from the Contractor, the subcontractor or manufacturer's representative shall examine all other identical units making a record of the findings.
            b) The findings shall be provided by the CxA within two weeks of the original notice.
            c) Within two weeks of the original notification, the Contractor, subcontractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals.
        2) The proposed solutions shall significantly exceed the specification requirements of the original installation.
        3) The Owner and Design Team will determine whether a replacement of all identical units or a repair is acceptable.
        4) Two examples of the proposed solution will be installed by the subcontractor and the subcontractor will be allowed to test the installations for up to one week, upon which the Owner and Design Team will decide whether to accept the solution.
        5) Upon Acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

a) Approval: The CxA notes each satisfactorily demonstrated function on the test form. The CxA recommends acceptance of each test using a standard form.
b) Deferred Testing:
   (1) If tests cannot be completed because of a deficiency outside the scope of the subcontractor responsible for installation of the System to be Commissioned, the deficiency shall be documented and reported. Deficiencies shall be resolved and corrected by appropriate parties and test rescheduled.
   (2) If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed, documented, and additional tests scheduled.

3.07 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

A. The Contractor shall be responsible for coordination, scheduling and completing operations and maintenance training for the Owners designated personnel on all Systems to be Commissioned.

1. Training materials shall be submitted for review and approval of the CxA well in advance of training.
2. Trainer qualifications and certifications shall be submitted for review and approval of the CxA well in advance of training.
3. Each subcontractor responsible for training will submit a written training plan to the CxA for review and approval prior to training. The plan will include field orientation during installation, classroom instruction and field training after the completion of installation and cover the following elements:
   a. Equipment (included in training)
   b. Intended audience
   c. Location of training
   d. Objectives
   e. Subjects covered (description, duration of discussion, special methods, etc.)
   f. Duration of training on each subject.
   g. Instructor for each subject
   h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
   i. Instructor and qualifications
4. For the primary equipment, the Controls subcontractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
5. Subcontractors shall provide all qualified personnel, including manufacturer representatives, for equipment and system training.

B. The CxA will verify and approve the content and adequacy of the training of Owner personnel for systems to be commissioned.

1. Training rigor: to be established by Owner & CxA
2. In addition to these general requirements, the specific training requirements for Owner personnel are specified in Division 01.

C. Training Planning Meeting: Before operation and maintenance training, CxA shall convene a training planning meeting to include Owner's operation and maintenance personnel, each Contractor, and subcontractors. In addition to requirements specified in other Divisions, perform the following:

1. Review the OPR and BoD.
    a. Review installed systems, subsystems, and equipment.
    b. Review instructor qualifications
    c. Review instructional methods and procedures.
    d. Review training module outlines and contents.
    e. Review course materials (including operation and maintenance manuals.
    f. Verify and discuss locations and other facilities required for instruction.
    g. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
    h. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

3.08 EXCLUSIONS

A. The Commissioning Authority is not responsible for construction means, methods, coordination between trades, job safety or any other related management function on the job site.

B. The Contractor and Subcontractors will provide all technician services requiring tools or the use of tools to functionally test, adjust or otherwise bring equipment into a fully operational state. It is required by this specification that the person to represent the automated temperature control system shall be the person who wrote the control programming. The CxA shall observe technicians as they complete testing, and may make minor adjustments, but shall not perform construction or technician services.

END OF SECTION

APPLICATION FOR ACCEPTANCE OF ROOFING SYSTEM

CONTACT INFORMATION: **INDEX NUMBER:**

ROOFING CONTRACTOR (NAME & ADDRESS)	TELEPHONE NO.:	**FAX:**
	E-MAIL ADDRESS:	**CONTACT:**
CLIENT (NAME & ADDRESS)	TELEPHONE NO.:	**FAX:**
	E-MAIL ADDRESS:	**CONTACT:**

OVERVIEW OF WORK: *(Submit 1 form per roof area)*

Building Name & Number:		
Building Dimensions: Length: *ft/m;*	Width: *ft/m.;*	Height *ft/m.*
Roof Slope:		
Parapet Height ,max *(in./m)*:	Parapet Height ,min *(in /m):*	
Type of Work: ☐ New Construction ☐ Recover (New roof over existing Roofing System) ☐ Reroof (New cover/remove existing roofing system to deck) ☐ Other		
FM Approved RoofNav Assembly Numbers:		

ROOF SURFACING:

☐ None	
☐ Coating	*(Trade Name/Application Rate)*
☐ Granules	*(Application Rate)*
☐ Gravel/Slag	*(Application Rate)*
☐ Ballast: ☐ Stone Size ☐ Pavers *(Beveled or square edge)*; ☐ Other: Ballast Weight (psf): Field: Perimeter: Corners:	

ROOF COVER/MEMBRANE:

(Please provide ALL applicable details including trade name, type, number of plies, thickness, reinforced, adhesive)

☐ Panel: ☐ Through Fastened Metal ☐ Standing Seam metal ☐ Fiber Reinforced Plastic (FRP) ☐ Other:			
☐ Built Up Roofing (BUR)			
☐ Modified Bitumen			
☐ Single Ply:	☐ Adhered	☐ Fastened	☐Ballasted
☐ Spray Applied			
☐ Other:			

BASE SHEET:

(Please include Trade Name, Type, and Width)

☐ None	
Trade Name:	Width: ☐ 36 In. ☐ 1 meter (39 In.)
☐ Fastened	☐ Adhered
☐ Secured per RoofNav **OR**	☐ Per FM Global Loss Prevention Data Sheet 1-29
Comments:	
☐ Air Retarder	
☐ Vapor Retarder	

INSULATION

Layer	Trade Name	Thickness (In.)	Fastened	Adhered	Tapered
1. Top			☐	☐	☐
2. Next			☐	☐	☐
3. Next			☐	☐	☐
4. Next			☐	☐	☐

☐ Glass Fiber/Mineral Wool/Batt	☐ Facer Type/Vapor Barrier
☐ Thermal Barrier	
☐ Other:	
☐ None	

APPLICATION FOR ACCEPTANCE OF ROOFING SYSTEM

DECK:

(Please include manufacturer, type, yield strength, thickness/gage, etc.)

☐ Steel:	
☐ LWIC (Form Deck):	☐ Cementitious Wood Fiber:
☐ Concrete: ☐ Pre-cast panels or ☐ Cast in Place	
☐ Wood	
☐ Fiber Reinforced Cement	☐ Fiber Reinforced Plastic
☐ Gypsum: ☐ Plank	☐ Poured
☐ Other:	
Comments:	

ROOF STRUCTURE (Include Size, Gage, Etc.):

☐ Purlins ☐ "C" OR ☐ "Z"		
☐ Joists ☐ Wood OR ☐ Steel		
☐ Beams ☐ Wood OR ☐ Steel		
☐ Other:		
Spacing: Field:	Perimeter:	Corners:
Comments:		

FASTENERS USED IN ROOF ASSEMBLY:

Roof Cover Fasteners: Trade Name:	Length:	Diameter:
Stress Plate/Batten:		
Spacing: Field: X	Perimeter: X	Corners: X
Insulation Fasteners: Trade Name:	Type:	
Size:	Stress Plate:	
Spacing: Field:	Perimeter:	Corners:
Deck Or Roof Panels Fasteners: Trade Name:	Type:	
Length:	Size Washer:	
If Weld: Size:	Weld:	Washer:
Deck Side Lap Fasteners: Field: X	Perimeter: X	Corners: X
Spacing: Field: X	Perimeter: X	Corners: X
Base Sheet Fasteners Trade Name:	Type:	
Head Diameter:	Length:	
Spacing: (Attached Sketches as necessary) Spacing Along Laps: Field:	Perimeter:	Corners:
No. Intermediate Rows: Field:	Perimeter:	Corners:
Spacing Along Intermediate Rows: Field:	Perimeter:	Corners:

PERIMETER FLASHING:

(Attach a detailed sketch of metal fascia, gravel stop, nailer, coping, etc.)

☐ FM Approved Flashing	☐ Per FM Global Loss Prevention Data Sheet 1-49
☐ Other:	Comments:

DRAINAGE:

For new construction: Has roof drainage been designed by a Qualified Engineer per FM Global Loss Prevention Data Sheet 1-54 and the local building code? ☐ Yes ☐ No (Attach details)
For re-roofing and recovering: will the roof drainage be changed from the original design (for example: drain inserts, drains covered or removed, new expansion joints, blocked or reduced scupper size? ☐ Yes ☐ No If yes, were the changes reviewed by a Qualified Engineer? ☐ Yes ☐ No (Attach details)
Is secondary (emergency) roof drainage provided per FM Global Data Sheet 1-54? ☐ Yes ☐ No (Attach details)

Signature of Property Owner: _____

Title: _____ Date: _____

Signature of Installing Contractor: _____

Title: _____ Date: _____

APPLICATION FOR ACCEPTANCE OF ROOFING SYSTEM

FM Global OFFICE REVIEW
(Please leave blank for FM Global Office Review)

WIND:

Design Wind Speed: *(mph)*	Ground Terrain: ☐ B ☐ C ☐ D
Uplift Pressure in field: *(psf)*	Uplift Rating Required:
Adequate Uplift Rating Provided:	Adequate? ☐ Yes ☐ No

FIRE:

Internal Assembly Rating:	☐ Class 1	☐ Class 2	☐ Non-Combustible	
External Fire Rating:	☐ Class A	☐ Class B	☐ Class C	☐ None
Concealed Spaces?	☐ Yes	☐ No	Sprinklers below Roof?	☐ Yes ☐ No
Adequate?	☐ Yes	☐ No		

HAIL:

Hail Rating Needed? ☐ SH ☐ MH ☐ None	Hail Rating Provided? ☐ SH ☐ MH ☐ None
Adequate? ☐ Yes ☐ No	

COLLAPSE:

If standing seam, has collapse been reviewed? ☐ Yes ☐ No

COMMENTS:

Reviewed By: _____

Date: _____

FM Global Field Review:
(Leave blank for on-site review by FM Global Loss prevention Consultant):

System installed per reviewed/accepted plans? ☐ Yes ☐ No
If no, explain:

Installation witnessed by FM Global? ☐ Yes ☐ No

Uplift test needed? ☐ Yes ☐ No

(Uplift testing is REQUIRED for applicable new and recover roofs in hurricane, typhoon or tropical cyclone prone regions (see DS 1-29 and 1-52 for more information)

Uplift testing satisfactorily completed ☐Yes ☐ No ☐DNA

If yes, note pressures held for the: Field_____ Perimeter _____ Corners _____
If no, explain and provide required and obtained uplift pressures and other details and attach to this form.

Reviewed By: _____

Date: _____

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. All labor, material and equipment necessary to complete all phases of demolition work as shown on the Drawings, as specified, and as can be reasonably implied from Drawings, Specifications, and field conditions.

B. Filling of depressions resulting from demolition activities.

C. Removal of utilities, drainage structures, drainage piping, pavement, handrails, sidewalks, and curbing.

D. Removal and disposal of resulting demolition materials.

E. Leaving site clean and ready for clearing required to install new construction.

F. Maintaining streets and walks during demolition and the cleaning of them of debris resulting from demolition.

G. Temporary shoring, bracing and framing where necessary for demolition work.

H. Protecting adjoining construction that is to remain.

I. Patching required as a result of demolition.

J. Securing and maintaining in force the required permits and the payment of associated fees.

K. Complying with all regulations for street and walk access and protection and fire access.

1.02 RELATED WORK DESCRIBED ELSEWHERE

A. Section 31 20 00 – Site Earthwork;

B. Section 31 25 00 – Excavated Soil and Material Management;

C. Section 31 25 13 – Erosion and Sedimentation Controls.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. State of Connecticut Basic Building Code;

2. State of Connecticut Department of Health Services;

3. State of Connecticut Department of Environmental Protection;

4. Utility companies having jurisdiction;

Conformed Set - May 29, 2015

5. University of Connecticut Facilities.

1.04 JOB CONDITIONS

A. Traffic:

1. Conduct demolition operations and the removal of debris in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities;

2. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction;

3. Provide alternate, adequately signed, routes around closed or obstructed traffic ways.

4. Ensure the safe passage of persons around the area of demolition;

B. Conduct operations to buildings, to prevent damage or injury to adjacent buildings, structures, other facilities and persons;

C. Provide shoring, underpinning, excavation supports as necessary to protect structures and all adjacent properties;

D. If applicable, provide and maintain fire protection.

E. Promptly repair damages, to adjacent facilities caused by demolition operations. Replace glass breakage immediately.

F. Maintain existing utilities not scheduled to be removed, keep in service, and protect against damage during demolition operations;

1. Repair and, if necessary replace, services damaged as result of demolition;

2. Do not interrupt existing utilities if encountered serving occupied or used facilities, except when authorized in writing by authorities;

3. Provide temporary services during interruptions to existing utilities, as acceptable to the governing authorities;

4. The contractor shall arrange for any utility shut-offs required. The Contractor shall disconnect and seal utilities before starting demolition operations. Construction related work required by the Utility Companies is included in this Contract. Do not start demolition work until utility disconnections have been completed and verified in writing.

B. Protection:

1. Erect barriers, fences, guard rails, enclosures, chutes, and shoring to protect personnel, structures, and utilities remaining intact.

PART 2 – PRODUCTS

2.01 None required by this Section.

PART 3 – EXECUTION

3.01 PREPARATION

A. Review all limits of fencing, sedimentation control and other construction barriers with Owner and Engineer prior to installation.

B. Arrange for, and verify termination of utility services to include removing meters and capping lines, if necessary.

C. Where trafficways will be closed or obstructed the Contractor shall provide alternate routes, including adequate signing and striping.

D. Prior to demolition, removal or abandonment of items within paved areas to remain the Contractor shall sawcut the bituminous concrete pavement.

E. The Contractor shall obtain all necessary permits from agencies having jurisdiction.

3.02 DEMOLITION

A. Use water sprinkling, temporary enclosures, and other suitable methods to limit to the lowest practical level the amount of dust and dirt rising and scattering in the air;

1. Comply with governing regulations pertaining to environmental protection and pollution;

2. Do not use water when it may create hazardous or objectionable conditions, such as ice, flooding, and pollution.

B. Remove below grade construction completely and fill below-grade areas and voids from resulting from demolition of structures and pavements.

1. Use satisfactory materials consisting of stone, gravel, and sand, free from debris, trash, materials, roots, and other organic matter.

C. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen materials, roots and other organic matter.

D. Place fill materials in horizontal layers generally not exceeding 6" in loose depth. Compact each layer at optimum moisture content of fill material to a density equal to original adjacent ground, unless subsequent excavation for new work is required.

1. After fill placement and compaction, grade surface to meet adjacent contours and to provide flow to surface drainage structures.

2. Where indicated on the Drawings demolish and remove foundation walls and retaining walls to an elevation two feet below existing or proposed finish grade, whichever is lower.

3. Filling will be in conformance with the requirements of Section 31 20 00 – Earth Moving.

E. Cap, plug with brick and mortar, or remove, as indicated, pipes and other conduits abandoned due to demolition. Holes left in existing structures left from the removal and/or demolition of piping shall also adequately plugged and capped. Coordinate all utility abandonment with affected utility. Perform utility in accordance with requirements of affected utility. Repair trenches and perform work within R.O.W. in accordance with the Town's and utility company's requirements.

3.03 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from the site debris, rubbish, and other materials resulting from demolition operations;

1. Storing or burning of materials on the site will not be permitted.

B. Transport materials of demolished structures and legally dispose of off-site in conformance with regulations of Department of Environmental Protection, and other regulating agencies as applicable.

C. Remove demolition debris daily.

D. Manner of disposal shall comply with all applicable local, state, and federal regulations.

END OF SECTION

SECTION 02940

STRUCTURAL SOIL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The work of this section consists of all Structural Soil work and related items as indicated on the drawings or as specified herein and includes, but is not limited to, the following:

B. CU-Soil™ is a proprietary material patented by Cornell University (US Patent #5,849,069) and marketed under the registered trademark, CU-Structural Soil®. Only licensed companies are authorized to produce this material, meeting the specifications described in this text. For a list of licensed CU-Soil™ producers, call AMEREQ, INC. at 800-832-8788.

C. 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:
   1. STRUCTURAL SOIL

B. Related Sections include the following:
   1. Division 2 Section "Earthwork" for excavation, filling and backfilling, rough grading, subsurface aggregate drainage and drainage backfill materials..
   2. Division 2 Section “Exterior Plants”
   3. Division 2 Section “Storm Drainage Utilities” for subsurface drainage.
   4. Division 2 Section “Pavement and Joint Sealants” for joint sealants of joints in concrete pavement and at expansion joints of concrete pavement with adjacent construction.
   5. Division 3 Section "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

A. The following references are used herein and shall mean:
   1. ASTM: American Society of Testing Materials
   2. USDA: United States Department of Agriculture
   3. AASHTO: American Association of State Highway and Transportation Officials
   4. Standard Specifications: Regional or Municipal Standard Specifications Documentation for the location of proposed usage
   5. AOAC: Association of Official Agricultural Chemists

1.4 SUBMITTALS

A. At least 30 days prior to ordering materials, the installing contractor shall submit to the engineer representative samples, certificates, manufacturer's literature and test results for materials specified below. No materials shall be ordered until the required samples, certificates, manufacturer's literature, producer's current license and test results have been reviewed and approved by the landscape architect and/or engineer. The engineer reserves the right to reject any material that does not meet CU-Structural Soil® specifications. Delivered materials shall closely match the approved samples.

B. Submit from licensed producer, $^1/_2$ cubic foot representative sample of clay loam, one cubic foot representative sample of crushed stone, and one cubic foot representative sample of CU-Structural Soil® mix for approval. In the event of multiple source fields for clay loam, submit a minimum of one set of samples per source field or stockpile. The samples of all clay loam, crushed stone, and CU-Structural Soil® shall be submitted to the engineer as a record of the soil color and texture.

C. Submit soil test analysis reports for sample of clay loam from an independent soil-testing laboratory. The testing laboratory for particle size and chemical analysis may include a public agricultural extension service agency.

1. Submit a mechanical analysis of the clay loam sample and particle size analysis including the following gradient of mineral content:

USDA Designation	Size in mm.
Gravel	+2 mm
Sand	0.05 – 2 mm
Silt	0.002-0.05 mm
Clay	minus 0.002 mm

Sieve analysis shall be performed and compared to USDA Soil Classification System.

Sieve analysis shall be done by a combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D422 after destruction of organic matter by hydrogen peroxide.

A. Submit a chemical analysis, performed in accordance with current AOAC Standards, including the following:

a. pH and buffer pH.
b. Percent organic matter as determined by the loss of ignition of oven dried samples. Test samples shall be oven dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.
c. Analysis for nutrient levels by parts per million.
d. Soluble salt by electrical conductivity of a 1:2 soil/water sample measured in Millimho per cm.
e. Cation Exchange Capacity (CEC).
f. Carbon/Nitrogen Ratio.

D. Submit one cubic foot sample of crushed stone which will be used in production of CU-Soil™.

1. Provide particle size analysis:

USDA Designation	Size in mm.
3”	+76 mm
$2^1/_2$”	63-76 mm
2”	50-63 mm
$1^1/_2$”	37-50 mm
1”	25-37 mm
¾”	19-25 mm
Fine gravel	2-19 mm

2. Provide the manufacturers analysis of the loose and rodded unit weight
3. Losses from LA Abrasion tests- not to exceed 40%
4. Minimum 90% with 2 or more fractured faces
5. Percent pore space analysis

E. At the engineer’s discretion, the sample of CU-Structural Soil® may be tested for the following:
1. Compaction in accordance with ASTM D698/AASHTO T99
2. California Bearing Ratio in accordance with ASTM D1883- soaked CBR shall equal or exceed a value of 50
3. Measured dry-weight percentage of stone in the mixture

F. The approved CU-Structural Soil® sample shall be the standard.

G. Any deviation from the specified crushed stone and clay loam specifications shall be approved by Amereq, Inc.

1.5 QUALITY ASSURANCE

A. Qualifications of installing contractor: The work of this section should be performed by a contracting firm which has a minimum of five years experience. Proof of this experience shall be submitted as per paragraph, SAMPLES and SUBMITTALS, of this section.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivered CU-Structural Soil® shall be at or near optimum compaction moisture content as determined by AASHTO T 99 (ASTM D 698) and should not be placed in frozen, wet or muddy sites.

B. Protect CU-Structural Soil® from exposure to excess water and from erosion at all times. Do not store CU-Soil™ unprotected. Do not allow excess water to enter site prior to compaction. If water is introduced into the CU-Soil™ after grading, allow water to drain to optimum compaction moisture content.

PART 2 - PRODUCTS

2.1 CLAY LOAM

A. Soil shall be a "loam" with a minimum clay content of 20% or a "clay loam" based on the "USDA classification system" as determined by mechanical analysis (ASTM D-422) and it shall be of uniform composition, without admixture of subsoil. It shall be free of stones, lumps, plants and their roots, debris and other extraneous matter. It shall not contain toxic substances harmful to plant growth. Clay loam shall contain not less than 2% or more than 5% organic matter as determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 230 degrees F., plus or minus 9 degrees.

B. Mechanical analysis for the loam or clay loam shall be as follows:

Textural Class	% of Total Weight
Gravel	less than 5%
Sand	20-45%
Silt	20-50%
Clay	20-40%

C. Chemical analysis: Meet, or be amended to meet the following criteria:

1. pH between 5.5 to 6.5
2. Percent organic matter 2% - 5% by dry weight
3. Adequate nutrient levels
4. Soluble salt less than 1.0 mmho/cm
5. Cation Exchange Capacity (CEC) greater than 10
6. Carbon/Nitrogen ratio less than 33:1

D. Loam or clay loam shall not come from USDA - classified prime farmland.

2.2 FERTILIZER (if needed)

A. Should nutrient analysis suggest that the loam or clay loam need additional nutrients, it shall be amended by Amereq's licensed producer.

2.3 SULFUR (if needed)

A. Sulfur shall be a commercial granular, 96% pure sulfur, with material and analysis appearing on the labeled container.

B. Sulfur used to lower pH shall be a ferrous sulfate formulation.

C. Application rates shall be dependent on soil test results.

2.4 LIME (if needed)

A. Agricultural lime containing a minimum of 85% carbonates.

B. Application rates shall be dependent on soil test results.

2.5 CRUSHED STONE

A. The size of the crushed stone shall be 0.75 inches to 1.5 inches allowing for 5% – 10% being greater than 1.5 inches, and 5% – 10% less than 0.75 inches.

B. Acceptable aggregate dimensions will not exceed 2.5:1.0 for any two dimensions.

C. Minimum 90% with two or more fractured faces.

D. Results of Aggregate Soundness Loss test shall not exceed 18%.

E. Losses from LA Abrasion tests shall not exceed 40%.

2.6 HYDROGEL

A. Hydrogel shall be a coated potassium propenoate-propenamide copolymer (Gelscape® Hydrogel Tackifier) as manufactured by Amereq, Inc. 800-832-8788.

2.7 WATER

A. The installing contractor shall be responsible to furnish his own supply of water (if needed) free of impurities, to the site.

2.8 CU-STRUCTURAL SOIL®

A. A uniformly blended urban tree mixture of crushed stone, clay loam and Gelscape® Hydrogel Tackifier, as produced by an Amereq-licensed company, mixed in the following proportion:

Material	Unit of Weight
specified crushed Stone	100 units dry weight
specified clay loam	20 – 25 units (to achieve minimum CBR of 50)
Gelscape® Hydrogel Tackifier	0.035 units dry weight
moisture	ASMT D698/AASHTO T-99 optimum moisture

PART 3 - EXECUTION

3.1 CU-SOIL™ MIXING AND QUALITY CONTROL TESTING

A. All CU-Structural Soil® mixing shall be performed at the licensed producer's yard using appropriate soil measuring, mixing and shredding equipment of sufficient capacity and capability to assure proper quality control and consistent mix ratios. No mixing of CU-Structural Soil® at the project site shall be permitted.

Maintain adequate moisture content during the mixing process. Soils and mix components shall easily shred and break down without clumping. Soil clods shall easily break down into a fine crumbly texture. Soils shall not be overly wet or dry. The licensed producer shall measure and monitor the amount of soil moisture at the mixing site periodically during the mixing process.

B. Raw materials shall be mixed off-site, only at the licensed producer's facility, on a flat asphalt or concrete paved surface to avoid soil contamination.

C. Should the independent laboratory test results of the clay loam reveal a need to amend it, to meet specifications, the amending materials should be added to the clay loam following the rates and recommendations provided by Amereq.

3.2 UNDERGROUND UTILITIES AND SUBSURFACE CONDITIONS

A. The installing contractor shall notify the engineer of any subsurface conditions which will affect the contractor's ability to install the CU-Soil™.

B. The installing contractor shall locate and confirm the location of all underground utility lines and structures prior to the start of any excavation.

C. The installing contractor shall repair any underground utilities or foundations damaged during the progress of this work.

3.3 SITE PREPARATION

A. Do not proceed with the installation of the CU-Structural Soil® material until all walls, curb footings and utility work in the area have been installed. For site elements dependent on CU-Structural Soil® for foundation support, postpone installation of such elements until immediately after the installation of CU-Structural Soil®.

B. Install subsurface drain lines as shown on the plan drawings prior to installation of CU-Structural Soil® material.

C. Excavate and compact the proposed subgrade to depths, slopes and widths as shown on the drawings. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not over excavate compacted subgrades of adjacent pavement or structures.

D. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.

E. Clear the excavation of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout silts or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the required subgrade compaction.

F. Do not proceed with the installation of CU-Structural Soil® until all utility work in the area has been installed. All subsurface drainage systems shall be operational prior to installation of CU-Structural Soil®.

G. Protect adjacent walls, walks and utilities from damage. Use ½" plywood and/or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
   1. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.
   2. Any damage to the paving or architectural work caused by the installing contractor shall be repaired, as directed by the engineer.

H. Maintain all silt and sediment control devices required by applicable regulations. Provide adequate methods to assure that trucks and other equipment do not track soil from the site onto adjacent property and the public right of way.

3.4 INSTALLATION OF CU-STRUCTURAL SOIL® MATERIAL

A. Install CU-Structural Soil® in 6 inch lifts and compact each lift.

B. Compact all materials to at least 95% Proctor Density from a standard compaction curve AASHTO T 99 (ASTM D 698). No compaction shall occur when moisture content exceeds maximum as listed herein. Delay compaction if moisture content exceeds maximum allowable and protect CU-Structural Soil® during delays in compaction with plastic or plywood as directed by the engineer.

C. Bring CU-Structural Soil® to finished grades as shown on the drawings. Immediately protect the CU-Structural Soil® from contamination by toxic materials, trash, debris, water containing cement, clay, silt or materials that will alter the particle size distribution of the mix with plastic or plywood as directed by the engineer.

D. The engineer may periodically check the material being delivered, prior to installation for color and texture consistency with the approved sample provided by the installing contractor as part of the submittal for CU-Structural Soil®. If the engineer determines that the delivered CU-Soil™ varies significantly from the approved samples, the engineer shall contact the licensed producer.

E. Engineer shall ensure that the delivered structural soil was produced by the approved CU-Soil™ licensee by inspecting weight tickets showing source of material.

F. CU-Soil™ should not be stockpiled long-term. Any CU-Soil™ not installed immediately should be protected by a tarp or other waterproof covering.

3.5 FINE GRADING

A. After the initial placement and rough grading of the CU-Structural Soil® but prior to the start of fine grading, the installing contractor shall request review of the rough grading by the engineer. The installing contractor shall set sufficient grade stakes for checking the finished grades.

B. Adjust the finish grades to meet field conditions as directed.
Provide smooth transitions between slopes of different gradients and direction.
Fill all dips with CU-Soil™ and remove any bumps in the overall plane of the slope.

1. The tolerance for dips and bumps in CU-Structural Soil® areas shall be a 3" deviation from the plane in 10'.

All fine grading shall be inspected and approved by the engineer prior to the installation of other items to be placed on the CU-Structural Soil®.

C. The engineer will inspect the work upon the request of the installing contractor. Request for inspection shall be received by the engineer at least 10 days before the anticipated date of inspection.

3.6 ACCEPTANCE STANDARDS

A. The engineer will inspect the work upon the request of the installing contractor. Request for inspection shall be received by the engineer at least 10 days before the anticipated date of inspection.

3.7 CLEAN-UP

A. Upon completion of the CU-Structural Soil® installation operations, clean areas within the contract limits. Remove all excess fills, soils and mix stockpiles and legally dispose of all waste materials, trash and debris. Remove all tools and equipment and provide a clean, clear site. Sweep, do not wash, all paving and other exposed surfaces of dirt and mud until the paving has been installed over the CU-Structural Soil® material. Do no washing until finished materials covering CU-Structural Soil® material are in place.

END OF SECTION 02940

SECTION 033000 — CAST-IN-PLACE CONCRETE

PART 1 — GENERAL

1.01 GENERAL

A. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. The Owner requires the Contractor to efficiently use resources and energy to the fullest extent possible in the completion of the project. Resource-efficient aspects to be considered in completing this project include use of techniques that minimize waste generation, re-use of materials, on-site where possible, and recycling of waste generated during the construction process.

C. In the selection of the products and materials of this section, preference will be given to those with the following characteristics:

1. Water-based.
2. Water-soluble.
3. Can be cleaned up with water.
4. Non-flammable.
5. Biodegradable.
6. Low or preferably no Volatile Organic Compound (VOC) content.
7. Manufactured without compounds that contribute to ozone depletion in the upper atmosphere.
8. Manufactured without compounds that contribute to smog in the lower atmosphere.
9. Does not contain methylene-chloride.
10. Does not contain chlorinated hydrocarbons.
11. Contains the least possible extent of post-consumer or post-industrial waste.

1.02 DESCRIPTION OF WORK

A. Extent of concrete work shown on drawings. See architectural drawings for extent of concrete work that shall be considered architectural.

B. Related Work Specified in Other Sections:

1. 01 74 19 Construction and Demolition Waste Management
2. 01 81 13 VOC Limits for Adhesives, Sealants, Paints and Coatings
3. 01 81 19 Construction Indoor Air Quality (IAQ) Management
4. Concrete paving and walks are specified in Division 2.
5. Mechanical finishes and concrete floor toppings are specified in other Division-3 sections.
6. Structural Steel and Metal Decking are specified in Division 5.

1.03 DEFINITIONS

A. Supplementary Cementitious Materials: Blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

B. Cementitious Materials: Portland cement alone or in combination with one or more supplementary cementitious materials; subject to compliance with requirements.

1.04 SUBMITTALS

A. Product Data: Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.

B. Shop Drawings:

1. No work may commence until all relevant shop drawings have been reviewed and final “Approval with no exceptions” has been granted by the Architect. The use of the “Request for Information (RFI)” process is strictly a form of communication between the Construction Manager/General Contractor and the Design Team and its sole purpose is to resolve minor issues. The use of this communication vehicle to pre-prepare shop drawings shall not be allowed. Detailed shop drawings shall be submitted for review and approval only after erection shop drawings have been approved without exceptions by the Architect and Engineer. Shop drawings shall be submitted for review and approval at timely intervals. Reviewed and approved piece shop drawings shall be returned at a rate of no more than five drawings per working day.
2. Reinforcement: Submit original shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 “Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures. No erection and concrete placement in the field may proceed without approved reinforcement shop drawings. Submit formwork shop drawings indicating all details and dimensions for architect/engineer review and approval.

C. Samples: Submit samples of materials as requested by Architect, including names, sources and descriptions.

D. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test.

E. Material Certificates: Provide materials certificates in lieu of materials laboratory test reports when permitted by Architect. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item

complies with, or exceeds, specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

F. A completed LEED Concrete Mix Form– Submittal Requirements under the LEED Building Submittal Requirements article of these specifications. LEED concrete mix form is attached at the end of this section. Information to be supplied includes:

1. The weight (lbs/ cubic yard) of all ingredients of the concrete mix such as cement, flyash, blast furnace slag, aggregates and admixtures.
2. Provide material costs of all ingredients in the concrete mix. Material cost does not include costs associated with labor and equipment
3. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
4. The manufacturing location for the product(s); and the location (source) of the raw materials used to manufacture the product(s).

G. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

H. Product Cut Sheets for all materials that meet the LEED Building Performance Requirements this Section.

I. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content).

1.05 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. International Building Code 2003 with State Building Code of Connecticut 2005 Supplement and 2009 Amendment.
2. American Concrete Institute (ACI) 117-90 Standard Specifications for Tolerances for Concrete Construction and Materials.
3. ACI 211.1-91 (Rev. 2009) Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
4. Standard Practice ACI 226.R1, Ground Granulated Blast-Furnace Slag as a Cementitious Constituent in Concrete
5. ACI 301 Specifications for Structural Concrete for Buildings.
6. ACI 302.1R-04 Guide for Concrete Floor and Slab Construction.

7. ACI 305R-99 Hot Weather Concreting.
8. ACI 306R1-90 (Re-approved 2002) Cold Weather Concreting.
9. ACI 308 (Rev. 2008) Standard Practice for Curing Concrete.
10. ACI 315 Details and Detailing of Concrete Reinforcement.
11. ACI 318 Building Code Requirements for Reinforced Concrete.
12. ACI 347 Recommended Practice For Concrete Formwork.
13. ASTM C 260 Standard Specification for Air-Entraining Admixtures for Concrete.
14. ASTM C 311, Standard Methods of Sampling and Testing Fly Ash and Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete.
15. ASTM C 494 Standard Specification for Chemical Admixtures for Concrete.
16. ASTM C 618, Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Uses as a Mineral Admixture in Portland Cement Concrete.
17. ASTM C 989, Ground Granulated Blast-Furnace Slag for Use in Concrete Mortars.
18. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice.

B. Concrete Testing Service: Engage a testing laboratory acceptable to Architect to perform material evaluation tests and to design concrete mixes.

C. Materials and installed work may require testing and retesting at anytime during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

LEED Building Performance Criteria
The following criteria are REQUIRED for the products included in this section:

D. Cast-in-place Concrete shall contain pre-consumer and/or post-consumer recycled content as follows:

1. Flyash: Concrete shall incorporate flyash as a replacement for at least 25% (by weight) of the portland cement.
or
GGBF (Ground Granulated Blast Furnace) Slag: Concrete shall incorporate GGBF Slag as a replacement for at least 45% (by weight) of the portland cement. All design mixes are subject to review and approval by the Structural Engineer.

E. Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this section.

F. Concrete manufactured within 500 miles (by air) of the project site shall be documented in accordance with the LEED Building Submittal Requirements of this section.

G. Adhesives or sealants used for work in this section shall meet the requirements of

Section 018113, “Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings”, where applicable. Certification of these products shall be in accordance with the LEED Building Submittal Requirements of this section.

H. Recycled Steel: Reinforcing bar, steel wire, welded wire fabric, and miscellaneous steel accessories shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Provide products with an average recycled content of steel products such that post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 90 percent

1.06 PROJECT CONDITIONS

A. Before commencing work, the contractor shall examine all adjoining work on which this work is in any way dependent for proper installation and workmanship according to the intent of this specification, and shall report to the Architect/Engineer any condition which prevents this contractor from performing first class work.

B. Protection of Footings Against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.

C. Protect adjacent finish materials against spatter during concrete placement.

D. Provide all barricades and safeguards at all pits, holes, shaft and stairway openings, etc., to prevent injury to workmen and others within and about the premises. Also provide all safeguards as required by the Building Code, OSHA, or any other departments having jurisdiction. Take full responsibility for all safety precautions and methods.

E. Procedure of Work: The contractor shall keep himself constantly informed as to the progress of the work in the field, materials and men ready to start work immediately when conditions of preceding work are available or ready, wholly or in part, so as not to delay the progress of building work or to interfere with the progress of work of other contractors, and in any event he shall, within 24 hours after notice from the Owner, proceed with such work as directed to maintain the uninterrupted progress of the work.

1.07 GUARANTEE

Upon completion of all work to be performed under this contract and acceptance of same by the Owner, the contractor shall execute and deliver in form satisfactory to the Owner, a guarantee that all workmanship and materials used in the performance of the contract shall remain free from defects for a period of one year from the date of the final certificate of occupancy.

1.08 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

B. Recycled Content: Provide products with the highest possible pre-consumer and post-consumer recycled content.

1. Granulated blast furnace slag shall be substituted for at least 45 percent of cement (by weight) or fly ash shall be substituted for 25 percent of cement (by weight) in all concrete.
2. Reinforcing steel products shall contain at least 90 percent recycled material.

C. Formwork: Wood for all non-recycled and non-rented forms and formwork shall be certified in accordance with the Forest Stewardship Council Guidelines.

D. Location of Origin: Where possible, provide products that have been manufactured within 500 miles of the project site.

E. VOC Limits: Field-applied finishes shall conform to the VOC limits listed in Low-Emitting Requirements NC 2.2.

F. See Division 1 for LEED submittal requirements.

PART 2 — PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct of plywood, metal, metal-framed plywood-faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient strength and thickness to withstand pressure of newly-placed concrete without bow or deflection.

1. Use plywood complying with U.S. Product Standard PS-1 "B-B

(Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Form Coatings: Provide VOC-compliant commercial formulation form coating compounds that will not bond with, stain nor adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

D. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide ties which when removed will leave no metal closer than 1 1/2" to concrete surface and which will leave holes no larger than 1" in diameter.

E. Forms for Textured-Finish Concrete: Units of face design, size, arrangement and configuration to match Architect's control sample. Provide solid backing and form supports to ensure stability of textured form liners.

F. Forms for Cylindrical Columns and Supports: Metal, fiberglass-reinforced plastic, paper or fiber tubes. Construct paper or fiber tubes of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation.

2.02 REINFORCING MATERIALS

A. Recycled Content of Steel Products: Reinforcing bar, steel wire, welded wire fabric, and miscellaneous steel accessories shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Provide products with an average recycled content of steel products such that post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 90 percent.

B. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

1. Where indicated on Drawings to be welded, provide reinforcing bars conforming to ASTM A 706, Grade 60, deformed.

C. Steel Wire: ASTM A 82, plain, cold-drawn steel.

D. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

E. Welded Deformed Steel Wire Fabric: ASTM A 497.

F. Synthetic Structural Macro Fibers: ASTM C 1116, minimum of 2 inches (50 mm) length, aspect ratio of 50 to 90, and a UL Rating. The fiber shall have a

minimum dosage of 4 lbs. per cubic yard and a minimum average residual strength (ARS) of 200 psi measured as per ASTM C 1399 “Test Method for Obtaining Average Residual Strength of Fiber-Reinforced Concrete”.

Products: Subject to compliance with requirements, provide one of the following:

“Tuf-Strand SF”	Euclid Chemical Co.
“Strux 90/40”	W. R. Grace

G. Supports for Reinforcement: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
2. For Footings, use bricks made of stone concrete with a minimum compressive strength of 4,000 psi at 28 days.
3. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class I) or stainless steel protected (CRSI, Class 2), at a spacing not to exceed 4'-0" on center in either direction.

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, ASTM C 1157, Type GU or LH. Use one brand of cement throughout project, unless otherwise acceptable to Architect.

B. Ground, Granulated Blast Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Fly Ash: ASTM C 618, Type C or Type F.

D. Silica Fume: ASTM C 1240, amorphous silica.

E. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

1. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to Architect.
2. Combined aggregate gradation for slabs and other designated concrete shall be 8 percent to 18 percent for large top size aggregates (1 1/2 in.) or 8 percent to 22 percent for smaller top size aggregates (1 in. or 3/4 in.) retained on each sieve below the top size and above the No. 100.

F. Lightweight Aggregates: ASTM C 330.

G. Water: Drinkable.

H. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be

compatible with other required admixtures.

Products: Subject to compliance with requirements, provide one of the following:

"Air-Mix" or "AEA 92"	Euclid Chemical Co.
"Sika Aer" or "Sika AEA-15"	Sika Corp.
"MB-VR" or "MB-AE"	BASF
"Darex AEA" or "Daravair"	W.R. Grace.

I. Water-Reducing Admixture: ASTM C 494, Type A, containing not more than 0.05 percent chloride ions.

Products: Subject to compliance with requirements, provide one of the following:

"WRDA Hycol"	W.R. Grace.
"Eucon WR-91"	Euclid Chemical Co.
"Plastol 341"	Euclid Chemical Co.
"Pozzolith 322N"	BASF
"Plastocrete 161"	Sika Corp.

J. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F or Type G, containing not more than 0.05 percent chloride ions.

Products: Subject to compliance with requirements, provide one of the following:

"Eucon 37/1037"	Euclid Chemical Co.
"Plastol Series"	Euclid Chemical Co.
"Daracem" or "ADVA"	W. R. Grace
"Rheobuild 1000"	BASF
"Sikament 300"	Sika Corp.
"Sikament 86"	Sika Corp.

K. Water-Reducing, Non-Corrosive Accelerating Admixture: The admixture shall conform to ASTM C 494, Type C or E, containing not more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least one year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures.

Products: Subject to compliance with requirements, provide one of the following:

"Accelguard 80"	Euclid Chemical Co.
"Polarset"	W. R. Grace
"Plastocrete 161 FL"	Sika Corp.
"Pozzutec 20"	BASF

L. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, containing not more than 0.05 percent chloride ions.

Products: Subject to compliance with requirements, provide one of the following:

"Pozzolith 100XR"	BASF
"Eucon Retarder 75"	Euclid Chemical Co.
"Daratard 17"	W.R. Grace.
"Plastiment"	Sika Co.

M. Corrosion inhibitor: 30 percent calcium nitrite (where called for in the specifications or on the drawings).

Products: Subject to compliance with requirements, provide one of the following:

"Eucon CIA"	Euclid Chemical Co.
"DCI"	W.R. Grace & Co.
"Rheocrete CNI"	BASF

N. Microsilica: Admixture shall be dry densified or slurry formed. Microsilica shall come from the same source throughout the project. If a single source cannot be maintained, laboratory testing of each new source shall be required before acceptance by the Engineer at no cost to the owner.

Products: Subject to compliance with requirements, provide one of the following:

"Force 10,000"	W. R. Grace
"Eucon MSA"	Euclid Chemical Co.
"Emsac F 100"	Elkem Chemical, Inc.
"Sikacrete 950DP"	Sika Corp.
"Rheomac SF 100"	BASF

O. Moisture Vapor Reduction Admixture: ASTM 494, Type S, containing not more than 0.05 percent chloride ions.

Products: Subject to compliance with requirements, provide one of the following:

"Moisture Vapor Reduction Admixture"	Barrier One
"Hycrete V1000"	Hycrete

P. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.

Q. Certification: Written conformance to the above-mentioned requirements and the chloride ion content of admixtures will be required from the admixture manufacturer prior to mix design review by the Engineer.

2.04 RELATED MATERIALS

A. Reglets: Where resilient or elastomeric sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 26 gage galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

B. Waterstops: Provide flat, dumbbell or center-bulb waterstops at construction joints and other joints as indicated sized to suit joints.

1. Rubber waterstops: Corps of Engineers CRD-C 513.

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

The Burke Co.
Progress Unlimited
Williams Products

2. Polyvinyl Chloride Waterstops: Corps of Engineers CRD-C 572.

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

The Burke Co
W.R. Meadows
Progress Unlimited

3. Bentonite Waterstops: Volclay Waterstop RX as manufactured by the American Colloid Co.

C. Granular Base: Evenly graded mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade.

D. Non-Shrink, Non-Metallic Grout: The grout shall be pre-mixed by the factory and shall conform to ASTM C 1107, "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)." In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that when placed at a fluid consistency, the grout shall achieve 95 percent bearing under a 48” x 48” base plate.

Products: Subject to compliance with requirements, provide one of the following:

“Euco-NS”	Euclid Chemical Co.
“Five Star Grout”	U.S. Grout Corp.
“Masterflow 555”	Chemrex
“SikaGrout 212”	Sika Corp.

E. High-Flow Grout: Where high fluidity and/or increased placing time is required,

use high-flow grout. The grout shall be pre-mixed by the factory and shall conform to ASTM C 1107, "Standard Specification for Packages Dry, Hydraulic-Cement Grout (Non-shrink)." In addition, the grout manufacturer shall furnish test data from an independent laboratory indicating that when placed at a fluid consistency, the grout shall achieve 95 percent bearing under an 18" x 36" base plate.

Products: Subject to compliance with requirements, provide one of the following:

"Euco Hi-Flow Grout"	Euclid Chemical Co.
"Masterflow 928"	Chemrex

F. Non-slip Aggregate Finish: Provide fused aluminum oxide grits or crushed emery as abrasive aggregate for non-slip finishes. Emery aggregate shall contain not less than 40 percent aluminum oxide and not less than 25 percent ferric oxide. Use material that is factory-graded, packaged, rust-proof and non-glazing and is unaffected by freezing, moisture and cleaning materials.

G. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd. and shall comply with AASHTO M 182, Class 2.

H. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

I. Clear Curing and Sealing Compound (VOC Compliant): Liquid membrane-forming curing compound, clear styrene acrylate type, complying with ASTM C 1315, Type I, Class A; 25 percent solids content minimum. Moisture loss shall be not more than 0.40 kg/sq. m. when applied at 300 sq. ft./gal. (provide manufacturer's certification).

Products: Subject to compliance with requirements, provide one of the following:

"Super Aqua Cure VOX"	Euclid Chemical Co.
"Super Diamond Clear VOX"	Euclid Chemical Co.
"MasterKure N-Seal-W"	Chemrex

J. Strippable Curing Compound: The compound shall conform to ASTM C 309 (VOC compliant at 350 g/l). All slabs on grade (or as noted on the Drawings) shall be cured using "Kurez RC" and "Kurez RC Off" by The Euclid Chemical Co. Apply in strict accordance with the manufacturer's recommendations and supervision.

K. Crack Sealer: Two-component hybrid urethane repair liquid used to mend cracks in concrete. Sealer shall be an ultra-low viscosity material formulated to penetrate deep into cracks and shall dry to allow foot traffic after 10 minutes and heavy traffic in one hour.

Products: Subject to compliance with requirements, provide the following:

"Euco QWIKstitch"	Euclid Chemical Co.

L. Underlayment Compound: Free flowing, self-leveling, pumpable cementitious base compound.

Products: Subject to compliance with requirements, provide one of the following:

"Flo-Top"	Euclid Chemical Co.
"Super Flo-Top"	Euclid Chemical Co.
"Ardex"	Ardex Co.
"Mastertop 110 Underlayment"	Chemrex

M. Bonding Admixture: Latex non-rewettable type.

Products: Subject to compliance with requirements, provide one of the following:

"Flex-Con"	Euclid Chemical Co.
"Daraweld C"	W.R. Grace
"SBR Latex"	Euclid Chemical Co.
"Sika Latex"	Sika Corp.
"Acryl Set"	Chemrex

N. Anti-Corrosive Epoxy/Cementitious Adhesive: Water-based epoxy/cementitious compound for adhesion and corrosion protection of reinforcing members (20 hour maximum open time).

Products: Subject to compliance with requirements, provide one of the following:

"Duralprep A.C."	Euclid Chemical Co.
"Armatec 110"	Sika Chemical Co.
"Emaco P24"	Chemrex

O. Epoxy Adhesive: Two-component, 100 percent solids, 100 percent reactive compound, complying with ASTM C 881 and suitable for use on dry or damp surfaces.

Products: Subject to compliance with requirements, provide one of the following:

"Sikadur Hi-Mod Series"	Sika Corp.
"Euco Epoxy #452"	Euclid Chemical Co.
"Euco Series Duralcrete Series"	Euclid Chemical Co.

P. High-Strength Flowable Repair Mortar: For forming and pouring structural members or for large horizontal repairs, provide a flowable one-part, high-strength microsilica-modified repair mortar with 3/8" maximum aggregate. The

mortar shall achieve a compressive strength of 9000 psi at 28 days at 9" slump.

Products: Subject to compliance with requirements, provide one of the following:

"Eucocrete"	Euclid Chemical Co.
"Euco Speed MP" (Cold Weather)	Euclid Chemical Co.

Q. Polymer Patching Mortar: Polymer- and microsilica-modified cementitious-based compounds.

Products: Subject to compliance with requirements, provide one of the following:

<u>Horizontal</u>

"Thin Top Supreme"	Euclid Chemical Co.
"Tammspatch II"	Euclid Chemical Co.
"Concrete Top Supreme"	Euclid Chemical Co.
"Sikatop 121" or "Sikatop 122"	Sika Corp.
"Emaco R300 CI"	Chemrex
"Emaco R310 CI"	Chemrex

<u>Vertical/Overhead</u>

"Verticoat"	Euclid Chemical Co.
"Verticoat Supreme"	Euclid Chemical Co.
"Sikatop 123"	Sika Corp.
"Emaco R320 CL"	Chemrex

R. Evaporation Retarder:

Products Subject to compliance with requirements, provide one of the following:

"Eucobar"	Euclid Chemical Co.
"Confilm"	BASF

S. Repair Topping: Self-leveling, polymer-modified high-strength topping. Maximum depth of wear of treated concrete shall be 0.02 mm (0.0079") at 28 days as measured by the Chaplin Abrasion Test in conformance with British Standard 8204.

Products: Subject to compliance with requirements, provide one of the following:

"Thin-Top Supreme"	Euclid Chemical Co.
"Tammspatch II"	Euclid Chemical Co.

2.05 PROPORTIONING AND DESIGN OF MIXES

A. Preparation of Design Mixes:

1. All mix designs shall be proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318-08. Submit mix designs for each class of concrete for review and approval.
2. If mix designs based on field experience are submitted, all materials shall be from the same sources and with the same brand names as the previously utilized mix.
3. If trial batches are used, mix designs shall be prepared by an independent testing laboratory and shall achieve an average compressive strength 1200 psi higher than the specified f'c for strengths up to 5000 psi at 28 days. For higher strengths, the over-design shall be increased to 110 percent of the specified f'c plus 700 psi.
4. The proposed mix designs shall be accompanied by complete standard deviation analysis or trial mixture test data.
5. The testing facility shall not be the same as used for field quality control testing.

B. Supplementary Cementitious Materials:

1. Substitute blast furnace slag for cement by not less than 45 percent of cementitious content by weight.
2. Substitute fly ash for cement by not more than 25 percent of cementitious content by weight.
3. Limit use of microsilica to not exceed 10 percent of cementitious content by weight.
4. The exact percentages used shall be based on a successful test placement on site.

C. Submit written reports to Architect and Structural Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work on the Mix Design Submittal Form included at the end of this specification. Do not begin concrete production until mixes have been reviewed by Architect.

D. Design mixes to provide normal weight concrete with the strengths and properties indicated on the drawings.

E. Lightweight Concrete: Proportion mix as herein specified. Design mix to produce strength and modulus of elasticity as noted on drawings, with a split-cylinder strength factor (Fct) of not less than 5.5 for 4,000 psi concrete and a dry weight of not less than 100 pcf nor more than 115 pcf at 28 days. Limit shrinkage to 0.04 percent at 28 days.

F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results or other circumstances warrant, at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results shall be submitted to and accepted by Architect before using in work.

G. Admixtures: Provide admixtures in concrete mix designs as follows:

1. Water-reducing admixture or high-range water-reducing admixture (superplasticizer) in all concrete as needed for placement and workability.
2. Non-corrosive, non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).
3. High-range water-reducing admixture (superplasticizer) in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, fiber-reinforced slabs, concrete required to be watertight, self-consolidating concrete, concrete with an ultimate strength of 5,000 psi or more and concrete with water/cementitious-material ratios less than 0.50.
4. Air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content as follows with a tolerance of plus-or-minus 1.5 percent:

    a. Concrete structures and slabs exposed to freezing and thawing, de-icing chemicals or subjected to hydraulic pressure:

Maximum Aggregate Size	Moderate Exposure	Severe Exposure
1 1/2”	4.5 percent	5.5 percent
1”	4.5 percent	6.0 percent
3/4”	5.0 percent	6.0 percent
1/2”	5.5 percent	7.0 percent

    b. Other Concrete: (not exposed to freezing and thawing, de-icing chemicals or hydraulic pressure): 2.0 percent to 4.0 percent air.
    c. Troweled interior slabs (except lightweight concrete): 3.0 percent, maximum.

5. Use admixtures for water reduction and set control in strict compliance with manufacturer's directions.
6. Corrosion inhibiting admixture, where indicated on Drawings, at a dosage of 3 gal./cu. yd., unless otherwise noted.

H. Water-Cementitious-Materials (W/C) Ratio: Limit W/C in concrete as follows:

1. Concrete exposed to freezing and thawing: 0.50, maximum.
2. Concrete exposed to de-icing chemicals and/or watertight concrete: 0.40, maximum.
3. Concrete exposed to brackish water, salt spray or de-icing chemical: 0.35, maximum.
4. Troweled interior slabs subject to vehicular traffic: 0.53, maximum.

I. Slump and Sump Flow Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramp slabs and sloping surfaces: Not greater than 3".

2. Reinforced foundation systems: Not less than 1" nor greater than 3".
3. Concrete containing high-range water-reducing admixture (superplasticizer): Not greater than 9", unless otherwise approved by the Architect. All concrete shall arrive at the job site with a slump of 2" to 3" (3" to 4" for lightweight concrete or concrete receiving a "shake-on" hardener). After verification of initial slump, superplasticizer may be added to increase the slump to the approved level.
4. Other concrete: Not less than 1" nor greater than 4".
5. Self-Consolidating Concrete: 20” – 30” (slump flow). The required slump flow shall be based on successful test placement onsite.

J. Chloride Ion Level: Chloride ion content of aggregate shall be tested by the laboratory designing the trial mixes. The total chloride ion content of the mix including all constituents shall not exceed the limitations set forth in Table 4.5.4 of ACI 318-08 for concrete subjected to de-icing chemicals or exposed to chloride in service (0.15 chloride ions by weight of cement).

2.06 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.

B. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity and amount of water introduced.

C. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce maximum mixing and delivery time from 1 1/2 hours to 75 minutes and when air temperature is above 90 deg F (32 deg C), reduce maximum mixing and delivery time to 60 minutes.

D. After mixing, no water shall be added to concrete containing high-range water-reducing admixture (superplasticizer). If loss of slump occurs, superplasticizer may be re-dosed at the site as long as a “flash set” has not occurred. Re-dosage procedures must be discussed and approved by the Engineer and the manufacturer at the Pre-Concrete Conference.

2.07 PRE-CONCRETE CONFERENCE

The Pre-Concrete Conference is mandatory and no concrete work on building structure may commence until all conference criteria have been met to the satisfaction of the Design Team.

A. At least 35 days prior to the start of the concrete construction schedule, the contractor shall conduct a meeting to review the proposed mix designs and to discuss the required methods and procedures to achieve the required concrete construction. The contractor shall send a pre-concrete conference agenda to all attendees at least 20 days prior to the scheduled date of the conference.

B. The contractor shall require responsible representatives of every party who is concerned with the concrete work to attend the conference, including but not limited to the following:

Contractor's superintendent
Laboratory responsible for the concrete design mix
Laboratory responsible for field quality control
Concrete sub-contractor
Concrete supplier
Admixture manufacturer(s)
Concrete-pumping equipment manufacturer

C. Minutes of the conference shall be recorded, typed and printed by the contractor and distributed to all parties concerned within five days of the meeting. One copy of the minutes shall also be transmitted to the following for information purposes:

Owner's representative
Resident or field engineer
Structural engineer of record

D. The minutes shall include a statement by the contractor indicating that the proposed mix design and placing, finishing and curing procedures will produce the concrete quality required by these specifications.

E. The Architect, Structural Engineer of Record and Associate Structural Engineer/Field Engineer will be present at the conference. The Contractor shall notify the Design Team at least 10 working days prior to the scheduled date of the conference.

PART 3 — EXECUTION

3.01 GENERAL

A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

3.02 FORMS

A. Design, erect, support, brace and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position. Maintain formwork construction tolerances complying with ACI 347 and ACI 117. Provide Class A tolerances for concrete exposed to view. Provide Class C tolerances for other concrete surfaces.

B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms to sizes, shapes, lines and dimensions shown and to obtain accurate alignment, location, grades and level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses and the like to prevent swelling and for easy removal.

E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete or cement paste. Locate temporary openings on forms at inconspicuous locations.

F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt and other debris just before concrete is placed. Re-tighten forms and bracing after concrete placement to eliminate leakage and maintain proper alignment.

3.03 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for “Placing Reinforcing Bars”, for details and methods of reinforcement placement and supports and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice and other materials which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork and construction or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.

D. Place reinforcement to obtain minimum coverage for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed

into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.04 JOINTS

A. Construction Joints: Locate and install construction joints as indicated, or if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Architect. Submit proposed joint locations for review and approval.

B. Provide keyways at least 1 1/2" deep in construction joints in walls and slabs and between walls and footings.

1. Accepted bulkheads designed for this purpose may be used for slabs.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise indicated.

D. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions using manufacturer's specified welding irons or other tools.

E. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-ground at points of contact between slabs and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.

1. Joint filler and sealant materials are specified in Division 7 sections of these specifications.

F. Contraction (Control) Joints in Slabs-on-Ground: Maximum joint spacing shall be 36 times the slab thickness unless otherwise noted on the drawings.

1. A dry cut saw shall be used immediately after final finishing and to a depth of 1 1/4".
2. A conventional saw shall be used as soon as possible without dislodging aggregate and to a depth of one quarter of the slab thickness.
3. No sawcutting shall be performed after concrete has set.
4. Joint filler and sealant materials are specified in Division 7.

3.05 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete.

1. Use setting drawings, diagrams, instructions and directions provided by suppliers of embedded items.
2. The most stringent tolerance of suppliers providing embedded items shall govern.

B. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete at exterior walls and where flashing is shown at lintels, relieving angles and other conditions.

C. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting-type screeds.

3.06 PREPARATION OF FORM SURFACES

A. Clean re-used forms of concrete residue and repair and patch as required to return forms to acceptable surface condition.

B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

C. Thin form-coating compounds only with thinning agent of type and amount and under conditions in conformance with form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect forms against rusting. Rust-stained steel formwork is not acceptable and shall not be used.

3.07 CONCRETE PLACEMENT

A. Pre-placement Inspection: Before placing concrete, complete, inspect and survey formwork installation, reinforcing steel and items to be embedded or cast into concrete. Notify other trades to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form-coating compounds are not used.

1. Apply temporary protective covering to lower two feet of finished walls adjacent to concrete floor slabs to be placed and similar conditions and guard against spattering during placement.

B. Comply with ACI 304, “Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete”, and as herein specified.

1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to

cause the formation of seams or planes of weakness.

2. If a section cannot be placed continuously, provide construction joints as herein specified.
3. Deposit concrete as nearly as practicable to its final location to avoid segregation.

C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints. Consolidate placed concrete using mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

D. Use and type of vibrators shall conform to ACI 309, “Recommended Practice for Consolidation of Concrete”. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

F. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

G. Bring slab surfaces to correct level with straightedge and strike-off. Use highway straightedge, bull floats or darbies to create a smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. See also "MONOLITHIC SLAB FINISHES" below.

H. Maintain reinforcement in proper position during concrete placement operations.

I. Submit for review and approval saw-cut plans and/or plans showing the limits of each concrete placement.

J. Cold Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing action or low temperatures, in compliance with ACI 306 and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

4. When needed, use only a non-corrosive, non-chloride accelerator. Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.

K. Hot Weather Placement: When hot weather conditions exist that could seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Mixing water may be chilled; chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is at Contractor's option.
2. Cover reinforcing steel with water-soaked burlap if it becomes too hot so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
3. Fog-spray forms, reinforcing steel and subgrade just before concrete is placed.
4. Use water-reducing retarding admixture (Type D) when needed due to high temperatures, low humidity and/or other adverse placing conditions.

3.08 FINISH OF FORMED SURFACES

A. Rough-Formed Finish: For formed concrete surfaces not exposed to view when the work is complete, unless otherwise indicated. Concrete surface shall have texture imparted by form facing material; tie holes and defective areas shall be repaired and patched and fins and other projections exceeding 1/4" in height shall be rubbed down or chipped off.

B. Smooth-Formed Finish: For formed concrete surfaces exposed to view when the work is complete or that will be covered with a coating material applied directly to concrete, such as waterproofing, damp proofing, painting or other similar system. Concrete surface shall have texture imparted by selected form facing material, arranged orderly and symmetrically with a minimum of seams; tie holes and defective areas shall be repaired and patched and fins and other projections shall be completely removed and smoothed.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets and similar unformed surfaces that are adjacent to formed surfaces, strike off smooth and finish with a texture that matches adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.09 FLOOR FLATNESS/LEVELNESS TOLERANCES

A. Definitions:

1. F_F defines the maximum floor curvature allowed over 24”, computed on the basis of successive 12” (300 mm) elevation differentials; F_F is commonly referred to as the "Flatness F-Number".

2. F_L defines the relative conformity of the floor surface to a horizontal plane as measured over a 10 ft. (3.05 m) distance; F_L is commonly referred to as the "Levelness F-Number".

B. All floors shall be measured in accordance with ASTM E 1155 Standard Test Method for Determining Floor Flatness and Levelness Using the "F Number" System (Inch-Pound Units).

C. All slabs shall achieve the specified overall tolerance. The minimum local tolerance (1/2 bay or as designated by the Architect) shall be 2/3 of the specified tolerances.

D. All slabs on metal deck shall achieve the specified F_L tolerance after the concrete has set.

3.10 MONOLITHIC SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces w are to receive concrete floor toppings or mortar setting beds for tile and other bonded applied cementitious finish flooring materials and as otherwise indicated.

1. After placing slabs, surface shall be leveled to achieve an F_F 17/F_L 15 tolerance.
2. Slope surfaces uniformly to drains where required.
3. After leveling, roughen surface before final set with stiff brushes, brooms or rakes.

B. Float Finish: Apply float finish to monolithic slab surfaces that are to receive Trowel Finish or other finishes hereinafter specified, slab surfaces that are to be covered with membrane or elastic waterproofing or membrane or elastic roofing and as otherwise indicated.

1. After screeding, consolidating and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats or both.
2. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots.
3. Slope surfaces uniformly to drains where required.
4. Immediately after leveling, refloat surface to a uniform, smooth, granular texture. Surface shall achieve an F_F 20/F_L 17 tolerance.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces that will be exposed to view and slab surfaces that are to be covered with resilient flooring, carpet, ceramic or quarry tile, epoxy terrazzo, paint or other thin-film finish coating system and as otherwise indicated.

1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as

trowel is moved over surface.

2. The final troweling operation shall leave the surface free of trowel marks, uniform in texture and appearance and shall achieve an F_F 35/F_L 25 tolerance.
3. Grind smooth any surface defects which would telegraph through applied floor covering system.

3.11 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
3. In order to avoid plastic or drying shrinkage cracks during warm, dry or windy weather, ACI 302 and ACI 308 shall be followed using wind breaks and sun shades when recommended. Evaporation retarder shall be as specified in “RELATED MATERIALS” above.

B. Compatibility: All curing/sealing compounds and curing/sealing methods shall be compatible with the architectural finishes the concrete surfaces are designed to receive and the procedures to attain those architectural finishes.

C. Curing Methods: Perform curing of concrete by one of the methods below or combinations thereof.

1. Moisture Curing: Keep concrete surfaces continuously wet using one of the following:

a. Water.
b. Continuous water-fog spray.
c. Absorptive Cover: Cover concrete surfaces with specified absorptive cover. Thoroughly saturate cover with water and keep continuously wet. Place absorptive cover to provide complete coverage of concrete surfaces and edges with 12" lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete. Place cover in widest practicable widths with sides and ends lapped at least 12" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Mist concrete surfaces with water. Apply clear curing and sealing compound or strippable curing compound uniformly in continuous operation by power spray or roller according to

manufacturer's written instructions. Re-coat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. Use the specified clear curing and sealing compound for all exposed troweled interior slabs not receiving a penetrating liquid densifier or "dry shake" hardener, exterior slabs, sidewalks, curbs and architectural concrete not receiving a penetrating sealer. Maximum coverage shall be 400 sq. ft./gallon on steel troweled surfaces and 300 sq. ft./gallon on floated or broomed surfaces.

b. Use the specified strippable curing compound on surfaces to be covered with finishes or coating material applied directly to the concrete, such as liquid densifier/sealer, waterproofing, dampproofing, membrane roofing, flooring, painting and other similar materials. Apply in accordance with manufacturer's instructions.

D. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

E. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor toppings and other horizontal surfaces by application of the specified curing compound or a continuous moist curing method approved by the Architect.

3.12 REMOVAL OF FORMS

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns and similar parts of the work may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements may not be removed sooner than 14 days after concrete placement and until concrete has attained its specified 28-day compressive strength. Determine potential compressive strength of in-place concrete by testing field-cured specimens that are representative of concrete locations or members.

C. Form-facing material may be removed four days after concrete placement but only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.13 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new

formwork.

B. When forms are intended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance and tighten forms to close joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.14 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to templates at correct elevations and in compliance with certified diagrams or templates of manufacturers furnishing machines and equipment.

D. Base Plates: Grout base plates and foundations as indicated, using specified non-shrink non-metallic grout.

1. Where high fluidity and/or increased placing time is required, use the specified high-flow grout. This grout shall be used for all base plates larger than 6 sq. ft.

E. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Cast in safety inserts and accessories as shown on Drawings. Screed, tamp, and finish concrete surfaces as scheduled.

F. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on Drawings and/or as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.15 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

1. Cut out honeycombs, rock pockets, voids over 1/4" in any dimension and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface.
2. Thoroughly clean, dampen with water, and brush-coat the area to be patched with an approved bonding grout containing the specified

bonding admixture.

3. Place patching mortar while the bonding grout is still tacky.

B. Surfaces Exposed To View:

1. Blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color of surrounding concrete. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching.
2. Compact mortar in place and strike off slightly higher than surrounding surface.

C. Repair of Formed Surfaces:

1. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections and stains and other discolorations that cannot be removed by cleaning.
2. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

D. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

E. Repair of Unformed Surfaces:

1. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness using a template having required slope.
2. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects include crazing, cracks wider than 0.01" or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycombs, rock pockets and other objectionable conditions.
3. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
4. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. The specified underlayment and repair topping may be used when acceptable to the Architect.

F. Repair of Defective Areas:

1. Repair isolated random cracks and single holes not over 1" in diameter by the dry-pack method:

a. Groove top of cracks and cut out holes to sound concrete; clean of dust, dirt and loose particles.
b. Dampen cleaned concrete surfaces and apply bonding compound.
c. Mix dry-pack consisting of two parts Portland cement to five parts fine aggregate passing a No. 16 mesh sieve and using only enough water as needed for handling and placing.
d. Place dry-pack after bonding compound has dried.
e. Compact dry-pack mixture in place and finish to match adjacent concrete.
f. Keep patched area continuously moist for not less than 72 hours.

2. Repair other defective areas by cutting out and replacing with fresh concrete:

a. Remove defective areas to sound concrete with clean, square cuts; expose reinforcing steel with at least 3/4" clearance all around.
b. Dampen concrete surfaces in contact with patching concrete and apply bonding compound.
c. Mix patching concrete of same materials to provide concrete of same type or class as original concrete.
d. Place, compact and finish to blend with adjacent finished concrete.
e. Cure in the same manner as adjacent concrete.

G. Structural Repairs: All structural repairs shall be made with prior approval of the Engineer as to method and procedure using the specified low-shrinkage repair mortar or specified epoxy adhesive. Where epoxy injection procedures must be used, an approved low-viscosity epoxy shall be used.

1. All garage slabs shall be repaired prior to the slab being treated with the specified penetrating anti-spalling sealer. In addition, all cracks shall be filled with the specified crack sealer or other method as approved by the Engineer.

H. Underlayment Application: Leveling of floors for subsequent finishes may be achieved by use of specified underlayment material. Underlayment application shall achieve the tolerances specified in "MONOLITHIC SLAB FINISHES" above.

I. All exposed floors shall be leveled, where required, with the specified self-leveling repair topping.

J. Repair Methods not specified above may be used, subject to acceptance of Architect.

3.16 FOUNDATION WALLS

A. This contractor shall form and leave openings in foundation walls either as

shown on drawings or as directed by the Construction Manager for work of other contractors. These openings shall be temporarily closed and when so directed, this contractor shall point up same in solid and neat manner with waterproofed cement.

3.17 WORK IN CONNECTION WITH OTHER TRADES AND CONTRACTS

A. Install sleeves, pockets, openings, etc., in concrete walls, beams slabs or other concrete elements as needed for mechanical and other trades; these items shall be encased or built into the concrete work and shall be properly placed and secured in position in the forms before concrete is placed.

B. Provide all chases, pipe slots, etc., required for the mechanical trades (see mechanical drawings), constructed as shown on the drawings or as directed by the Construction Manager.

C. Leave temporary access panels, where needed, to install mechanical equipment as required by trade affected. Panels shall be formed with construction joints as specified. Details for such panels shall be submitted to Architect for approval.

3.18 CUTTING AND PATCHING

A. Concrete contractor shall be responsible for all cutting, removing and patching work where concrete surfaces are not installed within the limits shown on the drawings or specified herein. All such work shall meet with the approval of the Architect and Engineer.

B. Where cutting and patching is required to accommodate the work of other contractors, such cutting shall be done at the expense of said contractors but shall be performed by the concrete contractor.

C. The location and extent of cutting in completed concrete work and the patching thereof shall meet with the approval of the Architect and Engineer.

3.19 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The Owner will employ a testing laboratory to perform tests and to submit test reports.

B. Measure F_F /F_L tolerances within 72 hours of placing slabs that receive a trowel finish.

C. Sampling and testing for quality control during placement of concrete may include the following, as directed by Architect:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.

3. Air Content: ASTM C 173, volumetric method, for lightweight or normal weight concrete; ASTM C 231, pressure method, for normal weight concrete; one test for each day's pour of each type of air-entrained concrete.
4. Microwave Test: The water content of freshly mixed concrete will be tested on a random basis during placement using Microwave Drying Oven, in accordance with AASHTO T318, Measurement of Water Content of Fresh Concrete Using the Microwave Oven.
5. Concrete Temperature: Hourly measurements when air temperature is 40 deg F (4 deg C) and below, when air temperature is 80 deg F (27 deg C) and above and each time a set of compression test specimens is made.
6. Compression Test Specimens: ASTM C 31; one set of seven standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
7. Compressive Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. over and above the first 25 cu. yd. of each concrete class placed in any one day. Two specimens will be tested at 7 days, three specimens will be tested at 28 days and two specimens will be retained in reserve for later testing if required.

    a. When frequency of testing will provide less than five strength tests for a given class of concrete, testing will be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
    b. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
    c. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength-test results equal or exceed specified compressive strength and no individual strength-test result falls below specified compressive strength by more than 500 psi.

8. Test results will be reported in writing to Architect, Structural Engineer and Contractor within 24 hours after tests. Reports of compressive strength tests will contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength and type of break for both 7-day tests and 28-day tests.
9. Non-Compliant Test Reports will be e-mailed and/or faxed immediately to all parties on the test report distribution list. Copies will be on different colored paper.
10. Nondestructive Testing: Windsor probes, sonoscope or other non-destructive device may be permitted but will not be used as the sole basis for acceptance or rejection.

11. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

END OF SECTION 033000

SECTION 035416

CEMENT LEVELING COMPOUND

PART 1 GENERAL

1.1 DESCRIPTION

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the cement leveling compound as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Self-leveling cement compound applied over existing concrete substrates, thickness shall be 1/4" minimum.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Concrete work - Section 033000.

1.5 QUALITY ASSURANCE

A. Applicator: Company specializing in performing the work of this Section with a minimum of 3 years' experience and approved by the manufacturer of the product used.

B. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Submit catalog information and product data for material to be used.

B. Submit approval letter as required by Article 3.1, para. B. herein.

C. LEED BUILDING Submittal Requirements: The contractor or subcontractor shall submit the following LEED BUILDING certification items:

1. A completed LEED Concrete Mix Form– Submittal Requirements under the LEED Building Submittal Requirements article of these specifications. LEED concrete mix form is attached at the end of this section. Information to be supplied includes:

   a. The weight (lbs/ cubic yard) of all ingredients of the concrete mix such as cement, flyash, blast furnace slag, aggregates and admixtures.
   b. Provide material costs of all ingredients in the concrete mix. Material cost does not include costs associated with labor and equipment
   c. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   d. The manufacturing location for the product(s); and the location (source) of the raw materials used to manufacture the product(s).

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Building Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content).

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 MOCK-UP

A. Construct a mock-up of underlayment material, 8 feet long by 8 feet wide.

B. Locate where directed by the Architect.

C. Approved mock-up may remain as part of the Work.

1.9 JOB REQUIREMENTS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F. 24 hours before, during, and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture and until underlayment is dry, allow a minimum of seven (7) days.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Subject to the requirements specified herein, provide one of the following products:

1. "K-15" made by Ardex.
2. "Supercap SC500" by Laticrete.
3. Level Set 200" by ProSpec.
4. "DSP-520" made by H.B. Fuller Co.
5. "Super Flo-Top" made by Euclid Chemical Co.
6. "Ultraplan 1 Plus" by the Mapei Corp. (rapid setting).
7. "Novoplan 2" by the Mapei Corp. (standard setting).
8. "Level Quick R/S" or "E/S" by Custom Buiding Products.

2.2 MATERIALS

A. Underlayment: One of the above listed products.

B. Water: Potable and not detrimental to underlayment mix materials.

C. Primer: Manufacturer's recommended type.

D. Joint and Crack Filler: Latex based.

2.3 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Mix to achieve following characteristics:

1. Density: 115 lb./cu. ft. minimum dry density.

2. Compressive Strength: 4,000 psi minimum in accordance with ASTM C 109.

3. Fire Hazard Classification: Flame/Smoke rating of 0/0 in accordance with ASTM E 286.

C. Mix to self-leveling consistency.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where cement leveling compounds are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

B. Manufacturer’s representative must inspect surfaces to receive cement leveling compound and approve those surfaces in writing to the Architect prior to start of application.

3.2 PREPARATION

A. Vacuum clean surfaces; remove any material (curing compounds, film, dirt) that would be detrimental to bond of cement leveling compound.

B. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

C. Close floor openings.

3.3 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Place to minimum 1/4" thickness.

C. Transition to existing floor; use stiff mix to slope to align with existing adjacent floor.

3.4 CURING

A. Air cure in accordance with manufacturer's instructions.

3.5 APPLICATION TOLERANCE

A. Top Surface: Level to 1/8 inch in 10 ft.

3.6 PROTECTION OF FINISHED WORK

A. Do not permit traffic over unprotected floor underlayment surfaces and until underlayment is completely dry.

END OF SECTION

SECTION 042000

UNIT MASONRY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the unit masonry work as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Concrete masonry non-bearing partitions.

2. Stone base in masonry construction.

3. Brick masonry veneer site walls.

4. Metal joint reinforcing, anchors, ties, weeps, closures and related accessories for masonry.

5. Control and expansion joints in masonry, filled with joint fillers.

6. Chases, recesses, pockets and openings in masonry as required for installation of work by others.

7. Building in of items furnished by others into masonry, including access doors, door frames, anchors, sleeves and inserts, and other similar items to be embedded in masonry.

8. Grouting in of metal items built into masonry work.

9. Protection, pointing and cleaning of masonry.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Concrete - Section 033000.

E. Terra cotta assembly - 042800.

~~E.~~**F. Cast stone – Section 047200.**

~~F.~~**G.** Steel lintels - Section 055000.

~~G.~~**H.** Air and vapor barrier membrane - Section 072700.

~~H.~~**I.** Building insulation - Section 072100.

~~I.~~**J.** Metal flashing - Section 076200.

~~J.~~**K.** Firestops and smokeseals - Section 078413.

~~K.~~**L.** Sealant - Section 079200.

~~L.~~**M.** Aluminum curtain wall - Section 084413.

~~M.~~**N.** Tile - Section 093000.

1.5 SUBMITTALS

A. Submit shop drawings for the following:

1. Anchoring details.

2. Control and expansion joint locations and details.

B. Submit samples of the following:

1. Joint reinforcing, each type, width and proposed location (labeled).

2. Anchors, wedges and ties, each type, width and proposed location (labeled).

3. Joint filler, each type.

4. Granite stone.

5. Brick masonry veneer unit.

C. Submit technical and installation information for the following:

1. Mortar materials, each material and mortar type.

2. Certification of mortar mix.

3. Concrete block, joint reinforcing, anchors, ties and joint filler; submit manufacturer's technical and descriptive literature.

4. Block manufacturer shall submit certifications of compliance with ASTM C 90, C 331 and UL 618 prior to any job site delivery. Field sampling of concrete block may be tested by an Independent Testing Laboratory retained by the Owner according to the requirements of ASTM C 140.

D. Construction Procedures: Submit proposed procedures and materials for cleaning masonry work; including certification that cleaner will not adversely affect stone, gaskets, sealants, etc.

E. Provide letter from air/barrier manufacturer confirming thru wall flashing material is compatible with air/barrier.

F. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.6 QUALITY ASSURANCE

A. Conform to the following non-cumulative tolerances (any masonry work not meeting these standards shall be re-built as directed by the Architect).

1. Variation from the plumb:

a. In lines and surfaces of columns, walls and arrises:
1). In 10 feet 1/8"
2). In any story of 25 feet maximum 1/4"
b. For external corners, expansion joints and other conspicuous lines:
1). In any story of 25 feet maximum 1/4"

2. Variation from the level or the grades indicated on the drawings; for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:

a. In any bay or 20 feet maximum 1/4"

3. Variation of the linear building lines from established position in plan related portion of columns and partitions:

a. In any bay or 20 feet maximum 1/4"
b. In 40 feet or more 1/2"

4. Variation in cross-sectional dimensions of columns and in thickness of walls:

a. Minus 1/8"
b. Plus 1/8"

5. Variation in dimensions of masonry openings:

a. Horizontal dimension -0" + 1/16"
b. Vertical dimension +0" - 1/16"

B. Job Mock-Up

1. Prior to installation of masonry work, erect sample wall panel mock-up using materials, bonding patterns and joint tooling required for final work and including cavity wall, masonry sill, typical pier with returns and stone base, window unit and sill, projecting courses, anchors and reinforcement as detailed. Provide special features as directed by the Architect for caulking and contiguous work. Build mock-up at the site, 4' x 4' size as directed by the Architect, indicating the proposed range of colors, textures and workmanship to be expected in the completed work. Reconstruct mock-up if directed by the Architect until it meets with Architect's approval. Obtain Architect's acceptance of visual qualities of the mock-up before start of masonry work. Retain mock-up during construction as a standard for judging completed masonry work. Do not alter, move or destroy mock-up until work is completed and accepted by the Architect. Use sample panels to test proposed cleaning procedures after sample panel meets with Architect's approval.

2. Approved sample panel shall remain on view at the site until completion of face brick work.

3. Architect shall direct distribution of brick color and texture variation within mock-up.

C. Work of this Section shall conform to the requirements of the following:

1. 2011 ACI 530/ASCE 5/TMS 402 Building Code Requirements for Masonry Structures.

2. 2011 ACI 530-1/ASCE 6/TMS 602 Specifications for Masonry Structures.

D. Pre-Construction Conference: Prior to installation of masonry and associated work, Contractor shall arrange a meeting with Masonry Subcontractor, installers of related work, and other entities concerned with masonry wall performance, including the Architect and Owner. Contractor shall record discussions and agreements and furnish copy to each participant. Provide at least seventy-two (72) hours' advance notice to participants prior to convening conference. Review methods and procedures related to masonry work, including, but not limited to, the following:

1. Review masonry requirements (drawings, specifications and other Contract Documents).

2. Review required submittals, both completed and yet to be completed.

3. Review and finalize construction schedule related to masonry work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.

4. Review required inspection, testing, certifying and material usage accounting procedures.

5. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.

E. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.7 PRODUCT HANDLING

A. General: Deliver, store, handle and protect all materials from damage, moisture, dirt and intrusion of foreign matter. Store all masonry units and mortar materials on raised platforms and under ventilated and waterproof cover. Store packaged materials in manufacturer's unopened containers, marked with manufacturer's name and product brand name. Immediately reseal containers after partial use. Remove and replace damaged materials.

B. Masonry Units: Pack, deliver and store to prevent breakage, cracking, chipping, spalling or other damage. Store, protect and ventilate units at project site.

C. Aggregate: Store with provisions for good drainage.

D. Reinforcement and Anchors: Store and protect so that when placed, joint reinforcement and anchors will be free of soil, dirt, ice, loose rust, scale, or other coatings which would destroy or reduce bond with mortar, and will not be disfigured or bent out of shape.

1.8 JOB CONDITIONS

A. In cold weather, when the outside temperature is below forty (40) degrees F., conform to the requirements of "Cold Weather Masonry Construction and Protection Recommendations" publication by Brick Industry Association (BIA). No anti-freeze admixtures are permitted.

B. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg. F. and above.

C. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24" down both sides and hold cover securely in place.

2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24" down face next to unconstructed wythe and hold cover in place.

D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

PART 2 PRODUCTS

2.1 MATERIALS

A. Standard Concrete Block

1. Portland cement, ASTM C 150, Type 1, one source.

2. Aggregates, ASTM C 331, lightweight expanded shale, clay or slate aggregates, manufactured by the rotary kiln process equal to "Solite," "Norlite," or "Haydite."

   a. All block shall be from one aggregate type and from one manufacturer.

3. Concrete Masonry Units: Load bearing lightweight aggregate concrete masonry units conforming to the requirements of ASTM C 90.

   a. Block behind terra cotta stone and block for rated walls shall be 50% maximum solid units.
   b. All other block may be hollow units.

4. The producer of the concrete masonry units shall furnish certification from an independent testing laboratory confirming that all 8" or larger masonry units meet all of the UL 618 requirements for two (2) hours or better (as required), referencing full scale fire test reports (ASTM E 119). All 4" and 6" units shall conform to "National Bureau of Standards" and "National Research Council" full scale fire tests.

5. Sizes and Shapes: Nominal face size 8" x 16" by thickness as indicated on drawings, with stretcher units, jamb units, header units, square corner units (at ends and corners of exposed or painted work), sash units (at control joints within masonry wall), lintel units and other special shapes and sizes required to complete the work.

6. Finish: For exposed or painted block surfaces. In addition to ASTM requirements, block shall have uniformly dense, flat, fine grain texture, with no cracks, chips, spalls, or other defects which would impair appearance. For concealed CMU, surfaces shall be free from deleterious materials that would stain plaster or corrode metal.

7. Curing: All concrete block shall be steam cured, and air dried for not less than thirty (30) days before delivery.

8. Density of concrete block shall not exceed one hundred and five (105) lbs. per cubic foot.

9. Shrinkage: Shrinkage of concrete blocks shall not exceed 0.065% when tested in accordance with ASTM C 426-99.

10. Water Content

    a. At the time of delivery to the job site, concrete masonry units shall have a value, in weight of contained water, of not more than thirty (30) percent of the fully saturated content for the unit tested.
    b. Ship all units from the factory, and store at the job site, with all necessary protection to prevent increase of water content from rain and other sources.

B. Stone: Granite conforming to ASTM C 615, of size and thickness shown on drawings.

1. Finish: Stone shall have thermal finish on all exposed surfaces; concealed surfaces may be sawn. Edges to receive grout or sealant shall be sawn.

2. Type: Jet Mist.

3. Size: Height per elevation drawings; 8" minimum exposed and 8" below grade, typical; 2" thick; joints per elevation drawings.

4. Corner Type: Per detail drawings.

C. Brick Masonry Veneer at Site Walls

1. ~~Size, Color and Texture: As selected by Architect~~ **Machine Molded Flashing Modular Brick "Catawaba" by Glen-Gery Brick, Mid Atlantic Plant (basis of design).**

~~1.~~**2. Modular Brick "Bourbon Street: by Redland brick Inc. Rocky Ridge Plant/ (Acceptable substitution for Basis of Design).**~~.~~

~~2.~~**3.** Acceptable Manufacturers: As selected by Architect.

D. Joint Reinforcing for Masonry Walls

1. For block walls forming part of exterior wall construction behind exterior stone veneer and behind terra cotta rain screens, provide super heavy duty reinforcing fabricated of 3/16" dia. side and cross rods, truss or ladder design, ties, spaced every block course. Provide prefabricated pieces at corners and intersections of walls or partitions.

    a. Reinforcing assembly shall be hot dip galvanized steel finish conforming to ASTM A 153 with zinc coating of 1.5 oz. of zinc per sq. ft., after fabrication.

2. For interior block walls and partitions, provide standard reinforcing fabricated of 9 ga. side and cross rods, truss or ladder design, no ties, spaced every other block course. Provide prefabricated pieces at corners and intersections of walls or partitions. Reinforcing shall be hot dip galvanized steel finish conforming to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft. after fabrication.

3. Wire used in assemblies noted above shall be cold drawn steel wire conforming to ASTM A 82.

4. Approved Joint Reinforcing Manufacturers

a. Hohmann & Barnard
b. Dur-O-Wal
c. Heckmann Building Products
d. National Wire Products Industries, Inc.

E. Anchors and Ties

1. Dovetail Anchor Slots: Hot-dip galvanized steel equal to No. 305 anchor slot made by Hohmann & Barnard, or approved equal by other manufacturers noted above.

2. Flexible Metal Ties for Dovetail Slots: Hot-dip galvanized steel, 16 gauge by 1" wide by Heckmann Building Products Inc., or approved equal.

   a. No. 106 Dovetail Corrugated Anchor.
   b. No. 129 Dovetail Triangle Tie.

3. Wire Mesh: Hot-dip galvanized sixteen (16) gauge steel wire, square mesh, width 3" by length to suit condition; No. 268 by Heckmann Building Products, or approved equal by Hohmann & Barnard.

4. For anchoring CMU wall, at the exterior masonry cavity wall, to the underside of the concrete beam, provide dovetail slot as noted above and the following:

   a. No. 121 galvanized steel dowel anchor and No. 421 tube as manufactured by Heckmann Building Products. Galvanized to conform to ASTM A 153, Class B-2 or
   b. No. PTA-310 galvanized steel dowel anchor and No. NS-TA joint filler as manufactured by Hohmann & Barnard or approved equal. Galvanizing to conform to ASTM A 153, Class B-2.

5. For anchoring masonry to structural steel, provide hot-dip galvanized steel, as listed, or approved equal:

   a. Made by Heckmann Building Products. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.
      1). No. 195 Column Anchors
      2). No. 197 Column Anchors
      3). No. 315 Weld-On Anchor Rods with No. 316 Triangle Ties
      4). No. 315-B Weld-On Anchor Straps with No. 316 Triangle Ties
   b. Made by Hohmann & Barnard or approved equal. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.
      1). No. 355 Column Anchors
      2). No. 356 Column Anchors
      3). No. 357 Beam Anchors
      4). No. 359 F anchor straps with VWT tie.

6. For anchoring CMU interior partitions to underside of steel beams, provide stainless steel tube anchors, No. PTA-420 made by Hohmann & Barnard, or approved equal.

7. For anchoring CMU interior partitions to underside of structural deck, provide 4" x 4" x 1/4" galvanized steel angles (ASTM A 36), 3'-0" long spaced 3'-0" o.c. alternately on each side of partition. Anchor partition securely to structural deck.

F. Reinforcing Bars and Rods: ASTM A 615, Grade 60. See Drawings for size.

G. Control and Expansion Joint Fillers

1. Vertical Installation Within Concrete Masonry Wall: Extruded rubber, cross shape, for use with concrete masonry sash units, which shall provide a force fit in the grooves of the sash block, and shall have 1/2" diameter tubular ends (compressed 25% when installed in 3/8" wide joint). Acceptable product shall be "#RS Series - Rubber Control Joint" as manufactured by Hohmann & Barnard, Inc., or approved equal.

   a. Provide the following sizes:
      1). 2-5/8" wide control joint fillers for 4" block walls.
      2). 4-5/8" wide for 6" block walls.
      3). 6-5/8" wide for 8", 10" and 12" block walls.
   b. Provide backer rod and sealant joint over joint filler as per drawings and Section 07900 of these specifications.

2. Isolation Joint Filler at Abutting Construction and at Intersecting CMU Walls: Compressible and resilient closed cell neoprene gasket with pressure sensitive adhesive backing, thickness 30% greater than thickness of joint. Acceptable joint filler shall be "Everlastic, Type NN-1" by Williams Products, Inc., or approved equal. Recess joint filler and install backer rod and sealant as per drawings and Section 07900 of these specifications.

H. Non-Rated Joint Fillers: Provide closed cell neoprene conforming to ASTM D 1056, Grade 2A1, "#NS Closed-Cell Neoprene Sponge" as manufactured by Hohmann & Barnard, Inc., or approved equal.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type 1, standard color, one source.

B. Hydrated Lime: ASTM C 207, Type S.

C. Sand: Clean, washed, buff colored sand, graded per ASTM C 144.

D. Water: Clean, fresh and suitable for drinking.

2.3 MORTAR MIX

A. Face Brick Construction: Mortar mixes shall meet ASTM C 270, Type N, cement/lime mortar. Colors of mortars shall use coloring agent made by Davis Colors, Lehigh Cement or approved equal. Color of mortar to meet with Architect's approval. The Contractor may use pre-packaged colored mortar equal to "Color Mortar Blend" made by Glen-Gery.

1. **Color of mortar must meet with Architect's approved sample and mock-up panel.**

~~A.~~**B.** Exterior Block Back-Up Construction: Provide Portland cement/lime mortar as noted above conforming to ASTM C 270, Type N.

~~B.~~**C.** Interior Masonry Construction: Provide Portland cement/lime mortar conforming to ASTM C 270, Type N, for load bearing conditions, mortar shall conform to ASTM C 270, Type M.

~~C.~~**D.** Mortar for Cement Cants: One (1) part Portland cement and four (4) parts sand, by volume.

~~D.~~**E.** Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of unit masonry. Use grout of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.

~~E.~~**F.** Mixing

1. General: Add cement just before mixing and mix dry. Use sufficient amount of water as necessary to produce workable mix. Mix in small batches to make plastic mass.

2. Mixing: Machine mix all mortars in approved type mixer with device to accurately and uniformly control water. Add hydrated lime dry. Mix dry materials not less than two (2) minutes. Add water, then mix not less than three (3) minutes. Mix only amount of mortar that can be used before initial set. Do not use mortar which has reached its initial set or two (2) hours after initial mixing, whichever comes earlier. Mortar may not be re-tempered. Clean mixer for each batch, whenever mortar type is changed, and at end of each day's work.

3. Acceleration or other admixtures not permitted.

4. Mortar shall have a flow after suction of not less than seventy-five (75) percent of that immediately after mixing as determined by ASTM C 91.

~~F.~~**G.** Admixtures

1. No air-entraining admixtures or cementitious materials containing air-entraining admixtures shall be used in the mortar.

2. No antifreeze compounds or other substances shall be used in the mortar to lower the freezing point.

3. Calcium chloride or admixtures containing calcium chloride shall not be used in mortar.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that masonry may be completed in accordance with all pertinent codes and regulations, the referenced standards, and the original design.

3. Do not start any work until mock-ups are approved by the Architect.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Architect in writing.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 COORDINATION

A. Carefully coordinate with all other trades to ensure proper and adequate interface of the work of other trades with the work of this Section.

3.3 PREPARATION

A. Concrete Block: Do not wet concrete block units.

3.4 INSTALLATION

A. General

1. Build walls to the full thickness shown. Build single wythe walls to the actual thickness of the masonry units, using units of nominal thickness shown.

2. Build chases and recesses as shown or required for the work of other trades.

3. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

4. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings, movement type joints, returns and off-sets. Avoid the use of less than half size units at corners, jambs, and wherever possible.

5. Lay up walls plumb and true with courses level, accurately spaced, and coordinated with other work.

6. Provide templates made of steel studs for plumbing of two story masonry openings.

7. Pattern Bond: Lay exposed masonry in pattern bond noted in Part 2. Lay concealed concrete block with all units in a wythe bonded by lapping not less than two (2) inches. Bond and interlock each course of each wythe at corners. Do not use units of less than four (4) inches horizontal face dimensions at corners or jambs.

8. Where possible, masonry walls and partitions shall be built after all overhead ducts, pipes and conduits are in place and tested. Masonry shall be neatly built around the items above. Walls and partitions shall be plumb, true to line and free from defects such as open cells, voids, dry joints and other similar defects. In rooms and spaces scheduled to have concrete block finish, all such surfaces including upper wall surfaces up to termination of structural ceiling in spaces without suspended ceilings, shall be made suitable for paint application. Cutting of openings in walls and partitions in place shall be done only with the approval of the Architect.

B. Mortar Bedding and Jointing

1. Lay concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on exterior walls and in all courses of piers, columns and pilasters, where solid CMU is used and where adjacent to cells or cavities to be reinforced or filled with concrete or grout.

2. Lay masonry walls with 3/8" joints unless otherwise shown on drawings.

3. Tool exposed joints slightly concave. Concealed joints shall be struck flush.

4. CMU wall joints scheduled to receive air and vapor barrier specified in Section 072700 shall be struck flush per manufacturer's requirements.

5. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

C. Stopping and Resuming Work: Rake back 1/2 block length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.

D. Built-In Work

1. As the work progresses, build in items specified under this and other Sections of these specifications. Fill in solidly with masonry around built-in items.

2. Mortar in door frames, access doors, louvers and other metal items embedded or built into masonry work solidly with mortar as the masonry units are laid up.

3. Grout under lintels, bearing plates, and steel bearing on masonry with solid bed grout.

4. Sleeves, pipes, ducts and all other items which pass through masonry walls shall be caulked with interior grade sealant meeting requirements of Section 07900, so as to be air tight and prevent air leakage. Refer to Section 07840 for packing of voids in rated masonry walls.

5. Fill vertical cells of masonry units solid with grout which have anchoring, reinforcing rods, supporting or hanging devices embedded in the cell including stone anchors and window or curtain wall anchors.

6. Fill vertical cells of masonry units solid with mortar on each side of door frames to sixteen (16) inches beyond.

7. Unless otherwise noted, fill vertical cells of masonry units solid with grout which are below steel bearing plates, steel beams, and ends of lintels, to eight (8) inches beyond bearing and from floor to bearing.

8. Place wire mesh in horizontal joint below masonry unit cells to be filled with mortar, to prevent mortar from dropping into unfilled cells below.

9. Masonry indicated as being reinforced shall have all voids filled solid with grout. Grout shall be consolidated in place by vibration or other methods which insure complete filling of cells. When the least clear dimension of the grouted cell is less than two (2) inches, the maximum height of grout pour shall not exceed twelve (12) inches. When the least clear dimension is two (2) inches or more, maximum height of grout pour shall not exceed forty-eight (48) inches. When grouting is stopped for one (1) hour or longer, the grout pour shall be stopped 1-1/2" below the top of a masonry unit. Vertical bar reinforcing shall be accurately placed and held in position while being grouted, and shall be in place before grouting starts. All such reinforcing shall have a minimum clear cover of 5/8". Lap all bars a minimum of forty (40) bar diameters and provide steel spacer ties (not to exceed 192 bar diameter) to secure and position all vertical steel and prevent displacement during grouting. Provide continuous horizontal reinforcement embedded in mortar joints every second course.

E. Cutting and Patching

1. All exposed masonry which requires cutting or fitting shall be cut accurately to size with motorized carborundum or diamond saw, producing cut edges.

2. Do not saw cut any masonry openings in face brick construction without Architect's approval and after a procedure has been reviewed and approved.

3. Holes made in exposed masonry units for attachment of handrail brackets and similar items shall be neatly drilled to proper size.

4. All masonry which requires patching in exposed work, if approved by Architect, shall be patched neatly with mortar to match appearance of masonry as closely as possible and to the Architect's satisfaction. Rake back joints and use pointing mortar to match as required.

F. Solid Wall Construction

1. Fill the vertical longitudinal joint between wythes solidly with mortar by parging the in-place wythe and shoving units into the parging.

2. Tie wythes with continuous horizontal reinforcement embedded in mortar joints sixteen (16) inches o.c. vertically.

G. Cavity Walls

1. Where stone veneer is used, per Section 04400, in cavity wall configuration, back-up block shall be reinforced every block course.

2. Refer to Section 072100, "Building Insulation," for material and installation of exterior wall insulation.

H. Interior Block Partitions

1. Build to full height unless otherwise shown on drawings. At non-rated partitions, fill void between CMU and structural deck with continuous neoprene filler conforming to the requirements of Paragraph 2.1, G, herein. At fire rated partitions, fill void with fire stop material meeting the requirements of Section 078413. Fasten to structure at top of partition using Hohmann & Barnard HB Partition Top Anchors or approved equal.

2. Provide continuous horizontal joint reinforcing every other block course, except as otherwise noted. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8". Lap reinforcement a minimum of six (6) inches at ends of units.

3. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

4. Corners

   a. Provide interlocking masonry unit bond in each course at corners.
   b. Provide continuity at corners with prefabricated "L" reinforcement units, in addition to masonry bonding.

5. Intersecting and Abutting Walls

   a. Unless vertical control joints are shown as part of structural frame, provide interlocking masonry bond. Provide starters and special shapes as shown on the drawings to bond these walls.
   b. In addition to masonry bonding, provide horizontal reinforcement using prefabricated "T" units at interior partitions.

I. Ties and Anchors for Masonry Construction

1. Provide ties and anchors as shown or specified, but not less than one metal tie, spaced not to exceed sixteen (16) inches o.c. horizontally and/or vertically.

Provide additional ties within 1'-0" of all openings and spaced not more than 24" apart around perimeter of openings.

2. Where anchoring masonry to structure, provide an open space not less than 1/2" in width between masonry and structural member, unless otherwise shown. Keep open space free of mortar or other rigid materials.

J. Control and Expansion Joints

1. Provide vertical expansion, control and isolation joints in masonry as shown. Build in related items as the masonry work progresses.

2. CMU Control Joint Spacing: If location of control joints is not shown, place vertical joints spaced not to exceed 20'-0" o.c. In addition, locate joints at points of natural weakness in the masonry work, including the following:

a. At structural column or joint between bay.
b. Above control joints in the supporting structure.
c. Above major openings at end of lintels upward and below at ends of sills downward. Place at one side of jamb for openings not less than 7'-0" wide and at both sides for openings over 6'-0" wide.
d. At reduction of wall thickness.
e. Where masonry abuts supporting structure.
f. If additional joints are required, indicate same on approved shop drawings.

K. Lintels

1. Install loose steel lintels furnished by Section 05500, allowing eight (8) inch bearing at ends.

2. For concrete block walls, use specially formed U-shaped concrete block lintel units with reinforcing bars in accordance with the Structural Drawings, filled with grout.

3.5 CANTS

A. Provide specified mortar for cement cants at beams and other projections in elevator shafts, where adjoining wall is of masonry construction. Cants shall slope seventy (70) degrees from the horizontal.

3.6 CLEANING, PROTECTION, ADJUSTMENT

A. Protection

1. The Contractor shall take adequate precautions for the protection of all surfaces against mortar spatter, and shall immediately remove any such spatter should it inadvertently occur, leaving no stain or discoloration.

2. Excess mortar shall be wiped off the masonry surfaces as the work progresses.

3. Wood coverings shall be placed over all such masonry surfaces as are likely to be damaged during the progress of the entire project.

4. Protective measures shall be performed in a manner satisfactory to the Architect.

5. Damaged masonry units shall be replaced to satisfaction of the Architect.

6. Exterior masonry walls shall be draped with waterproof covering until copings are in place, to prevent water penetration in cavity.

B. Cleaning of Masonry: Upon completion, all exposed masonry shall be thoroughly cleaned following recommendations of the IMI Technical Note No. 20. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 4' x 4' in a location approved by the Architect. No further cleaning work may proceed until the sample area has been approved by the Architect, after which time the same cleaning materials and method shall be used on the remaining wall area. If stiff brushes and water do not suffice, the surface shall be thoroughly saturated with clear water and then scrubbed with a solution of an approved detergent masonry cleaner, equal to "Vana Trol" made by ProSoCo Inc. or equal made by Diedrich or approved equal, mixed as per manufacturer's directions, followed immediately by a thorough rinsing with clear water. All lintels and other corrodible parts shall be thoroughly protected during cleaning.

C. Clean polished ground faced units per manufacturer's recommendations. Do not use acids or abrasives on finished walls.

D. Pointing: Point any defective joint with mortar identical with that specified for that joint.

END OF SECTION

SECTION 042800

TERRA COTTA ASSEMBLY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work Included: The Work of this Section shall include but not be limited to the following:

1. Aluminum clip and sub-girts system.

2. Extruded hollow clay tiles panels.

3. Flashing, weather-seals, cover plates and formed metal trim.

4. Miscellaneous anchors, fasteners, adhesives, insulation, vapor barrier, sealants, and related accessories.

5. Aluminum closure pieces at windows, curtain wall and door perimeters, as detailed on the drawings.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Cast in place concrete – Section 033000.

E. Cold formed metal framing – Section 054000.

F. Thermal insulation – Section 072100.

G. Vapor air barrier membrane – Section 072700.

H. Joint sealers – Section 079200.

I. Glazed aluminum assemblies – Section 084413.

1.5 SYSTEM DESCRIPTION

A. A complete, pre-engineered aluminum clip and sub-girt system, with aluminum stud framing, insulation where indicated, closure pieces, trim and flashing. The system is to be composed of clay (terra-cotta) tiles, which can be readily replaced if damaged, tiles hung on aluminum clips, at head grooves and base channels, fastened to aluminum sub-frame. The sub-frame is attached to horizontal aluminum "L" profile which are attached with aluminum clip angles to the structural.

B. Design system to allow for all movements within structure, and to support loads transferred from the adjacent construction and to fit within the space allotted without projections into the finished space as shown on the Drawings.

C. The system is to have between each two tiles a continuous vertical aluminum spacer which will have the following functions:

1. Vertical spacer profile which will keep the uniformed joint dimension and align the tiles vertically.

2. Will prevent the tiles from rattling in the wind and will assure perfectly flat façade.

3. Integral drainage to direct condensation and water infiltration within the wall to weeping points.

D. Design Criteria

1. Strength: Design system to withstand loads as required or Code, whichever is more stringent.

a. Seismic: Conform with Code.

2. Design system to accommodate the following movement and floor slab deflection without failure of any kind:

a. Maximum long-term inter-story column vertical shortening is 1/16" (at Ground Floor).

b. Maximum differential long-term vertical deflection between slab edges of consecutive floors is 1" (in addition to column shortening).

1). Maximum inter-story lateral deflection is limited to story height divided by 400 for wind.

3. Condensation: System shall accommodate positive drainage for moisture entering or condensation occurring within panel system

4. Flatness: System shall be flat with no noticeable warpage, buckling, deflections or other surface irregularities.

5. The drawings indicate sizes, profiles, finishes, and dimensional requirements of the exterior wall system required and are based on specific types and models specified. Exterior wall system components by other manufacturers may be considered, provided deviations in dimensions and profiles are minor and do not change the design concept as solely judged by the Architect.

1.6 PERFORMANCE REQUIREMENTS

A. General: Design, fabricate and install components so that the completed exterior wall system will withstand live loads, the inward and outward pressures specified, and loads stipulated in Section 084413.

1. Deflections within the system are to be limited to L/360 or less when tested in accordance with positive and negative pressures and as required to prevent cracking or damage to tile facing.

2. The exterior wall system shall be designed to meet all specified performance requirements. Where performance requirements result in more than one load or pressure, the load or pressure which produces the greatest stress shall govern.

3. Live Load: Live load is defined as a 7.5 psf force acting normal to wall at mid-height, cumulative to outward force exclusive of loads required by scaffolding equipment.

B. Movement: Design, fabricate and install system to withstand building, seismic and thermal movements including loading deflections, temperature change without buckling, distortion, joint failure, glass breakage, or undue stress on system components, anchors, or permanent deformation of any kind.

1. Provide for thermal movement over an ambient temperature range of 120 deg. F. and a surface temperature range of 180 deg F.

1.7 SUBMITTALS

A. Shop Drawings: Complete shop drawings shall be submitted for approval prior to fabrication, including elevations, and sections of each condition. Such drawings shall also include metal thickness, finish, methods of installation, anchorage and expansion joints, width, bow, camber and squareness tolerances necessary to accommodate thermal movement.

B. Calculations: Submit calculations for the design of the exterior wall system, including deflections, in place stresses, negative pull-off loads and capacity of fasteners. Calculations shall be signed and sealed by a Professional Engineer registered in the State of Connecticut.

C. Product Data: Manufacturer's latest published literature describing each product selection.

D. Samples: Submit 3 sets of the following samples in the selected finishes and color for Architect approval.

1. Each type and composition of tile and for each color and texture required, at least 24 inches square.

2. 12 inch long by full profile sample of each type sheet metal trim and closure pieces.

E. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.8 QUALITY ASSURANCE

A. Performance Test Standards: Provide exterior wall system which has been tested and certified by manufacturer to provide specified resistance to air and water infiltration

when installed as indicated and when tested in accordance with AAMA 501, "Methods of Test for Metal Curtain Walls".

B. Field Test: Provide suitable small sample area for field testing by Owner testing consultant for resistance to air infiltration and water penetration of a small representative sampling of installed clay tile cladding assemblies and adjacent perimeter construction per requirements of AAMA 501.901 Test Method B.

1. Resistance to air infiltration using static air pressure difference: ASTM E 783 Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.

2. Resistance to water penetration using static air pressure difference: ASTM E 1105-field Determination of Water Penetration and Installed Exterior Windows, Curtain Walls and Doors by Uniform and Cyclic Static Air Pressure Difference.

C. Manufacturer's Qualifications: Provide exterior wall system manufactured by a firm experienced in manufacturing systems that are similar to those indicated for this project and have a record of successful in-service performance.

D. Qualifications of Installers

1. The cladding installer shall be approved by the manufacturer of the cladding.

2. The installer will have experience with 100,000 Sq. Ft. of rainscreen installation and 20,000 sq. ft. of terra-cotta rainscreen installation.

3. For actual installation of cladding, use only competent and skilled mechanics completely familiar with the products and the manufacturer's currently recommended methods of installation.

E. Source Responsibility

1. The rainscreen system, including the tiles and the hanging system, will be manufactured by the same company.

2. The entire terracotta rainscreen system, with all its components, will have been used for at least 10 years and in more than 10 projects; submit list of projects for Architect's review.

F. Field Measurements: Prior to fabrication of exterior wall system, take field measurements of structure and substrates to receive wall system.

G. Mock Up: Provide a completely assembled, typical wall areas installed with all related accessories, in composite configurations designed to fulfill the performance criteria, and representative of the design as shown on the Drawings. Include corner condition, base and header conditions.

1. Extent of mockup shall be the same as that which will be provided in the final work.

2. Mock up shall be installed simulating actual construction conditions, including actual structural supports and connections. Use means, methods and techniques proposed for final installation.

3. Locate mock up in location as directed by the Architect.

4. Personnel assembling mock up shall be the same personnel that will perform the actual final units of work at the project site.

5. Mock up shall be subjected to testing criteria specified for final installation.

H. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.9 PRE-INSTALLATION COORDINATION

A. Pre-Installation Conference: Prior to start of cladding work, and at Contractor's direction, meet at site and review installation procedures and coordinate with other work.

1. Meeting shall include Contractor, Architect, major material manufacturers, and subcontractors whose work must be coordinated with cladding work.

B. Installer shall examine parts of supporting structure and conditions under which cladding work is installed.

C. Notify Contractor in writing of conditions detrimental to proper and timely completion of work.

D. Do not proceed until unsatisfactory conditions have been corrected in manner acceptable to Installer.

1.10 SITE CONDITIONS

A. Do not install materials when temperature is below 50 degrees F prior to and during completion of cladding masonry work.

B. During freezing weather, provide adequate equipment or cover to protect clay tile work completed or in progress.

C. At the end of each work day and when weather threatens provide water cut-offs that are proven effective in providing weather-tight seals and in preventing moisture penetration.

1.11 DELIVERY, STORAGE AND HANDLING

A. Deliver exterior wall system components packaged to comply with manufacturer's/fabricator's requirements and adequately protected from damage during shipment.

B. Protect components from adverse job conditions prior to installation.

C. Protect components from other trades after installation.

D. Stack exterior wall system components on platforms or pallets, covered with tarpaulins or other suitable weathertight ventilated covering. Store components so that water accumulations will drain freely.

1. Do not store exterior wall system components in contact with other materials that might cause staining, denting, surface damage, or other deleterious effect.

1.12 SPECIAL WARRANTY

A. Warrant the material of this Section for a period of 10 years from date of Substantial Completion against defects in it.

B. Warrant the workmanship of this Section for a period of 5 years from date of Substantial Completion against defects in workmanship.

C. The warranty shall provide that exterior wall system will remain weathertight during the warranty period and that if any leaks or failures occur, that the system will be structurally sound, repaired or replaced as required to render the system weathertight and sound, at no cost to the Owner. The warranty shall cover labor and materials.

1.13 ATTIC STOCK

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Terra Cotta Tile Units: Full-size units equal to 5% of quantity installed.

PART 2 PRODUCTS

2.1 EXTERIOR WALL SYSTEMS

A. Subject to compliance with requirements, manufacturers of exterior wall systems that may be incorporated in the work include the following:

1. Shildan Moeding.

2. NBK Terrart.

3. Boston Valley Terra Cotta.

2.2 MATERIALS

A. Hollow Clay Tile Units complying with the following requirements:

1. Finish: Standard finish, smooth. Provide deep-groove pattern tiles and baguettes per drawings.

2. Size: See drawings.

3. Basis-of-Design Color: Shildan/Moeding; Blue Grey. Alternate manufacturer color and finish to match that of Shildan/Moeding Blue Grey.

4. The tiles should be in 1.18" (30 mm) thickness **minimum**.

5. Tiles should have deep penetration sealer in order to prevent dirt from staying on them

6. The color shall be inherent in clay tile body and not only on the surface.

B. Fasteners, Clips, and Anchor Channels

1. Supplied in accordance with manufacturer's recommendations to meet load requirements specified.

2. The clips shall receive PPG "Duranar" fluoropolymer finish to match tiles color or approved equal.

C. Vertical Spacers

1. Supplied in accordance with manufacturer's recommendations to maintain a water-tight installation.

2. No sealants, gaskets or other materials which can deteriorate over time or may be flammable may be incorporated in to the system.

3. The spacer shall receive finish as noted above for clips to match tiles color.

D. Accessories: Corrosion resistant type capable of supporting cladding system and superimposed design loads; design to allow adjustments of system prior to being permanently fastened in place.

E. Bituminous Paint: Cold-applied mastic, SSPC Paint 12, compounded for 30 mil thickness per coat.

F. Supporting system; Fastening method: A complete, pre-engineered aluminum clip and sub-girt system, complying with the following requirements:

1. The tiles are fastened at head grooves and base channels using aluminum clips.

2. To ensure proper structural performance, the clips should be located at a point equal to 20% of the length of the tile from the edge of the tile. For example for a tile length of 20" the clip location will be 4" from the edge.

3. To ensure the structural integrity between the tile and the clip, the clip must engage the upper lip of the tile by a minimum width of 0.71" and a minimum vertical dimension of 0.51".

4. The aluminum clips must be fastened to horizontal aluminum sub-frame in order to maintain an accurate horizontal gap.

5. Tiles must be capable of easy and fast assembly

6. The replacement of damaged tiles, particularly in the middle sections, must be possible using simple methods and should not require special tools.

7. The aluminum clips and vertical spacer will be colored to match the tile color.

G. Touch Up Material: As provided by wall manufacturer.

2.3 PRECONSTRUCTION TESTING OF TERRA-COTTA TILES

A. Absorption: Test according to ASTM C 67 using 24 hour submersion and 5 hours boiling (separate sets of specimens, minimum 5 specimens each). Absorption by submersion shall not exceed 5 percent average, 7 percent individual specimen. Absorption by boiling shall not exceed: 8 percent average, 9 percent individual specimen.

B. Freezing and Thawing: Test according to ASTM C 67 for 300 cycles requiring minimum of 150 days (minimum 5 specimens). No specimen shall lose more than 3 percent of its original dry weight. No specimen shall crack, crumble or fracture. Specimens shall conform to approved color range samples before and after testing.

1. Specimen shall have no reduction in breaking load below that required to meet specified criteria.

C. Breaking Load: Test according to modified ASTM C 67 (minimum 5 specimens). Supports shall be actual hardware used for this project. Apply load at mid-span between supports. Report shall include breaking load, calculated section modules at mid-span, calculated breaking stress and show that tiles are sufficient to meet specified load criteria after freeze thaw testing; show safety factor.

D. Separate sets of specimens are required to be tested for each combination of color and texture. For a given color and texture combination, the most common size tile for the project shall be tested, except for breaking load, where tile size corresponding to maximum span shall be tested. If multiple widths occur to maximum span, test width shall be selected by Architect.

PART 3 EXECUTION

3.1 PREPARATION

A. Supply metal anchors to be built in to other trades for placement. Provide insufficient quantity and direct placement.

B. Ensure items built in by other trades for this work are properly located and sized.

C. Establish lines, levels and shims as required. Protect from disturbance.

D. Do no install broken, chipped or cracked units.

3.2 INSTALLATION

A. Install anchor channels and clips as indicated and in accordance with manufacturer's instructions.

B. Install sufficient anchorage devices to securely and rigidly fasten system to building. Fasteners to be concealed.

C. Provide anchors to be installed in other work, and setting details, in time for proper installation by trades concerned; verify correct placement.

D. Lay clay tile units on mounting clips properly jointed with other work.

1. Place clay tile units in accordance with lines and levels indicated, in strict accordance with manufacturer's instructions.

2. Take care to prevent damage to clay tile units.

3. Install system to allow adequate clearances around perimeter and to enable proper installation; allow for thermal movement within cladding assembly.

E. Assemble and anchor various components to allow for expansion and contraction, maintaining watertight condition.

F. Ensure assembly is plumb, level and free of warp or twist; maintain dimensional tolerances and alignment with adjacent work.

G. Allow moisture entering joints and condensation occurring within cavity to drain to exterior.

1. Design drainage system to hold maximum anticipated moisture for 100 year rain cycle without overflowing.

H. Apply coat of bituminous paint on concealed aluminum surfaces to be in contact with steel, cementitious, or dissimilar materials.

I. Set clay tile units in stack bond unless otherwise indicated.

J. Tolerance: Accurately align and locate components to column lines and floor levels; adjust work to conform with following tolerances.

1. Plumb: 1/8" in 10' -0"; 1/4" in 40' -0"; non-cumulative.

2. Level: 1/8" in 20' -0"; 1/4" in 40' -0"; non-cumulative.

3. Alignment: Limit offset to 1/6" where surfaces are flush or less than 1/2" out of flush, and separated by less than 2" (by reveal or protruding work); otherwise limit offsets to 1/8".

4. Location: 3/8" maximum deviation from measured theoretical location (any member, and location).

K. Built-In Work

1. As work progresses, build in anchor bolts, flashing and other items supplied by other trades.

2. Install items plumb and true.

3. Do not build in organic materials subject to rot or deterioration.

4. Remove protective film from finished aluminum surfaces.

L. Cutting: When field cutting is undertaken, care shall be exercised to ensure that cuttings do not remain on exposed surfaces.

3.3 CLEANING

A. Clean soiled surfaces using materials which will not harm clay tile units or adjacent materials.

B. Consult clay tile manufacturer for acceptable cleaners. Use non-metallic tools in cleaning operations.

C. Upon completion of installation, remove protective coatings or coverings and clean aluminum surfaces, exercising care to avoid damage of finish.

D. Remove excess sealant compounds, dirt or other foreign substances.

E. Remove and replace clay tile units that are broken, chipped, cracked, abraded or damaged during construction period. Reinstall in accordance with manufacturer's instructions.

END OF SECTION

SECTION 047200

CAST STONE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the cast stone as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Site wall copings and caps.

2. 3-1/4" thick Cast stone base panels (alternate).

3. Mortar.

4. Anchors and accessories.

5. Joint filler.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Masonry work - Section 042000.

E. Sealant - Section 079200.

1.5 QUALITY ASSURANCE

A. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

B. Qualifications of Workmen

1. For the actual cutting and placing of cast stone units, use only skilled journeyman masons who are thoroughly experienced with the materials and methods specified, and thoroughly familiar with the design requirements.

2. In acceptance or rejection of installed cast stone units, no allowance will be made for lack of skill on the part of workmen.

C. Manufacturer shall have a minimum of ten (10) years' experience in the manufacture of cast stone. Manufacturer's products must have previously been used on the exterior with satisfactory results. Manufacturer must have capability to produce cast stone on schedule and must be a member of the Cast Stone Institute.

D. Casting Tolerances: Maintain casting, bowing, warping and dimension tolerance within the following maximums:

1. Overall Dimension for Height and Width of Units: Plus zero of unit dimension to minus 3/32" for 10'-0" and over.

2. Twist, Bowing or Warping: Do not exceed length/360 or 1/8", whichever is less.

3. Insert Locations: Place within plus or minus 1/8" in each direction.

4. Length of units shall not deviate by more than +/- 1/8" from approved dimensions.

E. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. ASTM C 1364 Standard Specification for Architectural Cast Stone, except where more stringent standards are specified herein.

2. ASTM C 150 Specification for Portland Cement.

3. ASTM C 33 Specification for Concrete Aggregates

4. ASTM C 979 Specification for Coloring Pigments for Integrally Pigmented Concrete.

5. ASTM C 494 Specification for Concrete Admixtures

6. ASTM A 615 Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

7. ASTM C 1194 Test Method for Compressive Strength of Architectural Cast Stone.

8. ASTM C 1195 Test Method for Absorption of Architectural Cast Stone.

9. ASTM C 642 Test Method for Specific Gravity, Absorption, and Voids in Hardened Concrete.

10. ASTM C 39 Test Method for Compressive Strength of Concrete Cylinders.

11. ASTM D 2244 Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

F. Testing: Test three specimens per 500 cubic feet at random from plant production in accordance with referenced standards.

G. Cold weather setting practices shall conform to the requirements specified in Section 042000.

1.6 SUBMITTALS

A. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

B. Submit samples of cast stone with documented independent testing laboratory reports to the Architect for approval.

C. Samples: Before any cast stone materials are delivered to the job site, submit twelve (12) inch long samples of each profile type cast stone unit required.

1. Submit 6" x 6" cast stone samples showing full range of colors and texture available.

D. Shop Drawings: Submit complete shop drawings of all cast stonework showing anchorage, type, location and spacing, joint fillers, mortar, and cast stone profiles, sizes, connections, location, type and size of reinforcing and adjacent construction.

1. The shop drawings shall show the setting mark of each stone and its location on the structure. The stone when delivered shall bear the same corresponding setting mark on an unexposed surface.

2. Shop drawings must show exact profiles for each piece.

E. Certification: Submit certification from an independent testing laboratory certifying to test results required under Article 1.4, Para. F. herein.

F. Provide structural calculations, prepared by a Professional Engineer licensed in Connecticut, prepared in compliance with referenced documents and these specifications. Where specifications and code differ, the more stringent requirement shall govern. Calculations shall be legible and shall incorporate sufficient cross references to shop drawings to make the calculations readily understandable and reviewable. Calculations shall include the following information:

1. Analysis for all applicable loads on substrate.

2. Analysis for all applicable loads on anchors.

1.7 PERFORMANCE REQUIREMENTS

A. Structural Requirements: The work, as erected, shall be designed to withstand a lateral force of 30 psf (or greater if required by Code) applied over field surface normal to face of stone. Deflection under this load shall be limited to L/360 or 3/8" whichever is less.

B. Provision for Thermal Movements

1. The work shall be designed to provide for such expansion and contraction of component material, as will be caused by a surface temperature ranging from -20 deg. F. to +180 deg. F., without causing buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance or other detrimental effects.

2. The amount of such movement that is accommodated in the Contractor's design and method of accommodating it shall be identified on Contractor's submittal drawings, and shall be accompanied by thermal calculations.

1.8 MOCK-UP

A. Provide full size unit(s) for use in construction of wall mock-up specified in Section 042000. The mock-up becomes the standard of workmanship for the project.

1.9 PRODUCT HANDLING

A. Protection: Use all means necessary to protect cast stone and related materials before, during, and after installation, and to protect the installed work and materials of all other trades.

1. Stone shall be stored on skids off the ground and covered with plastic sheeting; all material in contact with stone shall be non-staining.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 CAST STONE COLOR AND FINISH

A. Cast Stone used in this work shall match color and texture of samples approved by the Architect. **Base panels shall match Jet Mist Granite.**

B. Exposed surfaces, unless otherwise specified, shall exhibit a typically fine grained texture similar to natural stone. No bug holes will be permitted and all facing material shall be mixed in a muller mixer.

C. Samples shall be approved by the Architect before the manufacturer shall be required to proceed with the work.

2.2 MANUFACTURER

A. All Cast Stone used in this work shall be manufactured by W.N. Russell and Co., Westmont, NJ, or equal made by Dura Art Stone Co. or Continental Cast Stone Mfg. Inc., and conform to the following properties:

1. Compressive Strength, ASTM C 1194: 6500 psi min. for products at 28 days.

2. Absorption, ASTM C 1195 or ASTM C 642: 6% max. for products at 28 days.

3. Cumulative Percent Weight Loss (CPWL) shall be less than 5% after 300 freeze/thaw cycles when tested in accordance with ASTM C 1364.

4. Air Content: ASTM C 173 or C 231, for wet cast product only shall be 4-8%. Air entrainment is not required for dry cast products.

5. Linear Shrinkage: ASTM C 426; shrinkage shall not exceed 0.065%.

6. Color Variation

   a. Must match color and finish of approved sample when viewed in direct daylight at a 5 foot distance.
   b. ASTM Color Variation Allowed: 2% hue; 6% lightness, chrome and hue combined.

2.3 MATERIALS

A. Cement shall be Portland Type I white, meeting ASTM C 150.

B. Fine aggregate shall be carefully graded and washed natural sands, or manufactured granite, marble, quartz or limestone sands meeting ASTM C 33, except that gradation may vary to achieve desired finish and texture.

C. Coarse aggregate shall be carefully graded and washed natural gravel, or crushed graded stone such as granite, marble quartz, limestone or other durable stone meeting ASTM C 33, except that gradation may vary to achieve desired finish and texture.

D. Coloring: All colors added shall be inorganic (natural or synthetic) iron oxide pigments meeting ASTM C 979 excluding the use of a cement grade of carbon black pigment, and shall be guaranteed by the manufacturer to be light fast and lime proof. The amount of pigment shall not exceed ten (10) percent by weight of the cement used. Colorant shall be manufactured by Davis Colors or approved equal.

E. Cast stone shall be reinforced with new billet steel reinforcing bars meeting ASTM A 615, grade 60, when necessary for safe handling, setting and structural stress, and the size of the reinforcing shall be as shown on approved shop drawings. If the surfaces are to be exposed to the weather, the reinforcement shall be galvanized or epoxy coated when covered with less than two (2) inches of material for bars larger than 5/8 inch and 1-1/2 inches for bars 5/8 inch or smaller. The material covering in all cases shall be at least twice the diameter of the bars. Stone shall be fully reinforced to take all stresses including handling, temperature changes and structural stress.

F. All anchors, dowels and other anchoring devices shall be furnished by the stone setter as shown on approved shop drawings using building stone anchors fabricated of Stainless Steel Type 304.

   1. Anchors shall allow for wracking of the structure (seismic) without stressing the cast stone units.

2.4 FABRICATION

A. Cast stone, after being made, shall be cured as noted below in Article 2.5.

B. Cast stone shall be "dry cast" or "wet cast" (depending upon selected finish) to produce sharp arrises to match profiles on approved shop drawings. Provide stone with sinkages to receive anchors.

C. Cast stone for copings shall be fabricated to largest practical length, as shown on approved shop drawings.

D. Acid etch exposed surfaces as required to remove cement film prior to packaging and shipment. Sandblasting or chemical retardation finishing is not permitted.

2.5 CURING

A. Cure units in a warm curing chamber approximately 100 deg. F. at 95% relative humidity for approximately 12 hours, or cure in a 95% moist environment at a minimum 70 deg. F. for 16 hours after casting. Additional yard curing at 95% relative humidity shall be 350 degree days (i.e. 7 days at 50 deg. F. or 5 days at 70 deg. F. prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.6 ACCESSORIES

A. Mortar for setting of cast stone sections shall conform to ASTM C 270, Type N, with not more than 1/2 part lime per part of white non-staining Portland cement.

B. Joint Filler: Fill all joints with exposed tops with "Emseal" Greyflex Expanding Foam Sealant as manufactured by Emseal, Inc. or approved equal. Material shall be designed for compression in joint twenty-five (25) percent of its original width, depth of filler as per manufacturer's standard. Joint filler shall be recessed 3/4" from finished surface.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where cast stone is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Carefully coordinate with all other trades to ensure proper and adequate interface of the work of other trades with the work of this Section.

3.3 JOINTING

A. Joint Size: 3/8", unless otherwise noted.

B. Joint Material

1. Use a full bed of mortar at all bed joints.

2. Flush vertical joints full with mortar.

3. Leave all joints with exposed tops open for sealant.

C. Location of Joints: As shown on approved shop drawings.

3.4 SETTING

A. All cast stone shall be set by experienced stone masons, accurately and in accordance with the shop and setting drawings. All anchors and dowels shall be firmly placed and all anchor holes and dowel holes and similar holes filled completely with mortar.

B. Setting Tolerances: Plus/minus 1/32" allowable out of plane with adjacent units.

C. When setting with mortar, all stones not thoroughly wet shall be drenched with clear water just prior to setting.

D. All stone shall be protected from splashing mortar or damage by other trades. Any foreign matter splashed on the stone shall be removed immediately.

E. All joints with exposed tops shall be filled with joint filler specified herein recessed 3/4" from stone surface; balance of joint shall be filled with back-up rod and sealant by Section 079200.

3.5 PATCHING

A. The repair of chipped or damaged cast stone shall be done only by mechanics skilled in this class of work, with materials furnished by the manufacturer and according to his direction.

B. Patching will not be permitted on copings and any other piece which can be removed and replaced without undue difficulty. Replace such pieces which are chipped or damaged with identical new pieces. Reseal and/or repoint to remove any evidence of replacement.

C. Cast stone shall show no obvious repairs or imperfections other than minimal color variations when viewed with the unaided eye under good typical lighting at a ten (10) foot distance.

3.6 CLEANING

A. Before pointing, the face of all cast stone shall be scrubbed with a fiber brush, using soap powder and water and shall then be rinsed thoroughly with clean running water. Any mortar on the face of the cast stone shall be removed. No acids or prepared cleaners shall be used without the approval of the cast stone manufacturer.

3.7 POINTING

A. When ready for tuck pointing, the mortar joints shall be dampened and raked back 3/4" for pointing. Pointing shall form a slight concave profile. No pointing shall be done in freezing weather nor in locations exposed to hot sun unless properly protected. Pointing mortar shall be composed of one (1) part non-staining cement (ASTM C 91), one (1) part hydrate lime (ASTM C 207, Type S) and four (4) parts of clean, washed sand (ASTM C 144). Coloring pigments shall be added as specified in Section 042000 for face brick construction. The Architect shall approve color of pointing mortar before proceeding with pointing.

3.8 PROTECTION

A. All projecting cast stone pieces shall be fully protected when installed against damage of any kind. Any piece damaged shall be replaced at no additional cost.

3.9 INSPECTION AND ADJUSTMENT

A. Upon completion of the work, make a thorough inspection of all installed cast stone and verify that all units and joints have been installed in accordance with the provisions of this Section; make all necessary adjustments.

END OF SECTION

SECTION 051200 — STRUCTURAL STEEL

PART 1 — GENERAL

1.01 GENERAL

A. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. The Owner requires the Contractor to efficiently use resources and energy to the fullest extent possible in the completion of the project. Resource-efficient aspects to be considered in completing this project include use of techniques that minimize waste generation, re-use of materials, on-site where possible, and recycling of waste generated during the construction process.

C. In the selection of the products and materials of this section, preference will be given to those with the following characteristics:

1. Water-based.
2. Water-soluble.
3. Can be cleaned up with water.
4. Non-flammable.
5. Biodegradable.
6. Low or preferably no Volatile Organic Compound (VOC) content.
7. Manufactured without compounds that contribute to ozone depletion in the upper atmosphere.
8. Manufactured without compounds that contribute to smog in the lower atmosphere.
9. Does not contain methylene-chloride.
10. Does not contain chlorinated hydrocarbons.
11. Contains the greatest extent possible of post-consumer or post-industrial waste.

1.02 DESCRIPTION OF WORK

A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.

B. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.

C. Related Work Specified in Other Sections:

1. Cast-in-place Concrete is specified in Section 033000.
2. Metal Decking is specified in Section 053000. Refer to this section for installation of shear connectors through deck.

3. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.
4. Refer to Division 3 for anchor bolt installation in concrete; Division 4 for masonry.
5. Refer to Division 5 for "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
6. Refer to Division 9 for Painting and Finishing.

1.03 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System (SLRS): Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

1.04 SUBMITTALS

A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
2. High-strength bolts (each type), including nuts and washers.
3. Direct tension indicators.
4. Shear stud connectors.
5. Shop primers
6. Shrinkage-resistant grout.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

C. Welding Certificates.

D. Source Quality Control Reports.

E. Shop Drawings:

1. No work may commence until all relevant shop drawings have been reviewed and final “Approval with no exceptions” has been granted by the Architect. The use of the “Request for Information (RFI)” process is strictly a form of communication between the Construction Manager/General Contractor and the Design Team and its sole purpose is to resolve minor issues. The use of this communication vehicle to pre-prepare shop drawings shall not be allowed. Detailed shop drawings shall be submitted for review and approval only after erection shop drawings have been approved without exceptions by the Architect and

Engineer. Shop drawings shall be submitted for review and approval at timely intervals. Reviewed and approved piece shop drawings shall be returned at a rate of no more than twenty drawings (or one hundred pieces) per working day.

2. Submit shop drawings prepared under supervision of a registered professional engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams.

    a. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
    b. Include embedment drawings.
    c. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
    d. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pre-tensioned and slip-critical high-strength bolted connections.
    e. Identify members and connections of the seismic-load-resisting system.
    f. Indicate locations and dimensions of protected zones.
    g. Identify demand critical welds.
    h. For structural steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.
    i. Provide setting drawings, templates, and direct installation of anchor bolts, embeds and other anchorages to be installed as work of this section.

F. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and weld connections. Include data on type(s) of tests conducted and test results.

G. Surveys: Submit certified copies of each survey conducted by a licensed Surveyor and showing elevations and locations of base plates, embeds and anchor bolts to receive structural steel and final elevations and locations for major members. Indicate discrepancies between actual installation and contract documents.

LEED Building Submittal Requirements: The contractor or subcontractor shall submit the following LEED Building certification items:

H. A completed LEED Building Materials Certification Form, per Section 013300 – Submittal Requirements under the LEED BUILDING Submittal Requirements article of these specifications. Information to be supplied includes:

    1. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
    2. The manufacturing location for the product(s); and the location (source) of the raw materials used to manufacture the product(s).

3. Provide material costs for the materials included in the contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

I. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

J. Product Cut Sheets for all materials that meet the LEED Building Performance Requirements this Section.

K. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content).

1.05 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:

1. International Building Code 2003 with State Building Code of Connecticut 2005 Supplement and 2009 Amendment.
2. American Institute of Steel Construction (AISC) Code of Standard Practice for Steel Buildings and Bridges. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings".
3. AISC Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings, including the Commentary and Supplements thereto as issued.
4. AISC Specifications for Architecturally Exposed Structural Steel.
5. AISC Specifications for Structural Joints using ASTM A 325 or A 490 Bolts approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
6. American Welding Society (AWS) D1.1 Structural Welding Code - Steel.
7. ASTM A 6 General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use.

B. Qualifications for Welding Work:

1. Qualify welding processes and welding operators in accordance with AWS "Qualification" procedure.
2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests. If recertification of welders is required, retesting will be Contractor's responsibility.

C. Pre-installation Conference: A conference will be conducted at the site or at a location of the Engineer-of-Record's choosing. The Project Architect, the Steel Fabricator, the Steel Erector, the Construction Manager/General Contractor and a representative of the Testing Laboratory will be present.

LEED Building Performance Requirements:

D. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113: "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings", where applicable.

E. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

F. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

G. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration. If bolts and/or nuts become dry or rusty, clean and re-lubricate before use. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

E. Painted members shall be protected to minimize damage by use of nylon slings or other means.

1.07 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.08 LEED REQUIREMENTS

A. LEED Certification: The Owner is targeting a LEED Silver Certification for this project.

B. Recycled Content: Provide products with the highest possible pre-consumer and post-consumer recycled content. Steel products shall contain at least 90 percent recycled material.

C. Location of Origin: Where possible, provide products that have been manufactured within 500 miles of the project site.

D. VOC Limits: Field-applied finishes shall conform to the VOC limits listed in Low-Emitting Requirements NC 2.2.

E. See Division 1 for LEED submittal requirements.

PART 2 — PRODUCTS

2.01 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products such that post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 90 percent.

B. W Shapes: ASTM A 992, ASTM A 572, Grade 50, ASTM A 529, Grade 50 or ASTM A 913, Grade 50.

C. Channels, Angles, M and S shapes: ASTM A 572, Grade 50, ASTM A 529, Grade 50 or ASTM A 913, Grade 50.

D. Plates and Bars: ASTM A 36 (as noted on the drawings) or ASTM A 572, Grade 50.

E. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588, Grade 50.

F. Cold-Formed Hollow Structural Sections (HSS), square and rectangular: ASTM A 500, Grade B, Fy 46, structural tubing.

G. Cold-Formed Hollow Structural Sections (HSS), round: ASTM A 500, Grade B, structural tubing.

H. Corrosion-Resisting Cold-Formed Hollow Structural Sections: ASTM A 847, structural tubing.

I. Steel Pipe: ASTM A 53, Type E or S, Grade B.

1. Finish: Black.

J. Steel Castings: ASTM A 216, Grade WCB with supplementary requirement S11.

K. Steel Forgings: ASTM A 668.

L. Welding Electrodes: Comply with AWS requirements.

2.02 BOLTS, CONNECTORS AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.

C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.
2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with [mechanically deposited zinc coating finish.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

E. Un-headed Anchor Rods: ASTM F 1554, Grade 55.

1. Configuration: Straight with a bottom plate with double-nut and washer assembly.
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.
5. Finish: Plain.

F. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.

1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Plate Washers: ASTM A 36 carbon steel.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Plain.

G. Threaded Rods: A 572, Grade 50.

1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened.
3. Finish: Plain.

H. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

I. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

J. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

K. Electrodes for Welding: Comply with AWS Code.

2.03 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes by plugging with zinc solder and filing off smooth.

2.04 GROUT

A. Metallic Shrinkage Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

Products: Subject to compliance with requirements, provide one of the following:

"Firmix"	Euclid Chemical Co.
"Embeco 153"	Master Builders
"Ferrolith G"	Sonneborn/Contech
"Irontox"	Toch Brothers
"Kemox C"	Sika Chemical
"Vibra-Foil"	W. R. Grace

B. Non-metallic Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

Products: Subject to compliance with requirements, provide one of the following:

"Euco N.S."	Euclid Chemical Co.
"Masterflow 713"	Master Builders
"Five Star Grout"	U.S. Grout Corp.

2.05 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with the AISC "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360 and as indicated on final shop drawings.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements of AWS D1.1/D1.1M.

D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3 – Power Tool Cleaning.

G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end-welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

H. Design of Members and Connections: Details shown are typical; similar details

apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work. Promptly notify Architect whenever design of members and connections for any portion of structure are not clearly indicated.

I. Connections:

1. Weld or bolt shop connections, as indicated.
2. Bolt field connections, except where welded connections or other connections are indicated.
3. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
4. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members (including purlins, girts, and other framing members taking only nominal stresses) and for temporary bracing to facilitate erection.

J. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with Research Council on Structural Connections "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts". Install with Direct Tension Indicators. Unless otherwise noted on the Drawings, all high-strength bolted connections shall be slip critical type.

K. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds and methods used in correcting welding work. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

L. Holes for Other Work:

1. Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.
2. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

M. Expansion Joints: Provide expansion joints in steel shelf angles when part of structural steel frame; locate at vertical expansion joints as indicated on drawings.

2.06 SHOP PAINTING

A. General:

1. Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.

2. Do not paint surfaces which are to be welded or high-strength bolted with friction-type connections, except paint certified for slip critical service.
3. Do not paint surfaces which are scheduled to receive sprayed-on fireproofing.
4. Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) methods as follows:

SP2 – Hand Tool Cleaning: Steel to be fire proofed.
SP3 – Power Tool Cleaning: Interior exposed steel and exterior exposed steel.
SP6 – Commercial Blast Cleaning: Exterior exposed steel and interior steel in aggressive environments (swimming pools, etc.) or architecturally exposed steel.

C. Painting: Within no more than six hours of surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness specified. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

2.07 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Such inspections and tests shall not relieve Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate do not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's “Specification for Structural Joints Using ASTM A 325 or A 490 Bolts”.

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709, performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

3. Radiographic Inspection: ASTM E 94.
4. Ultrasonic Inspection: ASTM E 164.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 — EXECUTION

3.01 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates and other embedded items, with steel erector present, for compliance with requirements.

B. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.02 ERECTION

A. Surveys: Employ a licensed Land Surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces and locations of anchor bolts and similar devices before erection work proceeds and report discrepancies to Architect. Do not proceed with erection until corrections have been made or until compensating adjustments to structural steel work have been agreed upon with Architect.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Setting Bases and Bearing Plates:

1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

2. Set loose and attached base plates and bearing plates for structural members on wedges or other adjustable devices.

E. Anchor Rods:

1. Furnish anchor rods and other connectors required for securing structural steel to foundations and other in-place work.
2. Furnish templates and other devices as necessary for pre-setting rods and other anchors to accurate locations.
3. Refer to Division 3 of these specifications for anchor rod installation requirements in concrete.

F. 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 base or bearing plate prior to packing with grout. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow grout to cure.

G. Field Assembly:

1. Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming a part of a complete frame or structure before permanently fastening.
2. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.
3. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
4. Level and plumb individual members of structure within specified AISC tolerances.
5. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
6. Splice members only where indicated and accepted on shop drawings.

H. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

I. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment and removal of paint on surfaces adjacent to field welds.

J. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

K. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress if acceptable to Architect. Finish gas-cut sections to achieve a sheared appearance when permitted.

3.03 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touch-up Painting: Cleaning and touch-up painting are specified in Division 9.

3.04 QUALITY CONTROL

A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with requirements and will specifically state any deviations therefrom.
2. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
3. Testing agency may inspect structural steel at plant before shipment; however, Architect reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.

B. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work and as may be necessary to show compliance of corrected work.

C. The following inspections and tests will be performed by the testing agency:

1. Direct Tension Indicators: Verification that gaps of installed Direct Tension Indicators are less than gaps specified in ASTM F 959, Table 2.
2. Shop Bolted Connections: Inspection or testing in accordance with AISC specifications.
3. Shop Welding: Inspection and testing during fabrication of structural steel assemblies as follows:

a. Certification of welders and inspection and testing as required; recording of types and locations of defects found in work; recording of work required and performed to correct deficiencies.
b. Visual inspection of all welds.
c. Testing of welds as follows. Inspection procedures listed will be used at testing agency’s option.

c1. Liquid Penetrant Inspection: ASTM E 165.
c2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not acceptable.
c3. Radiographic Inspection: ASTM E 94.
c4. Ultrasonic Inspection: ASTM E 164.

4. Field-Bolted Connections: Inspection in accordance with AISC specifications.
5. Field Welding: Inspection and testing during erection of structural steel as follows:

    a. Certification of welders and inspection and testing as required; recording of types and locations of defects found in work; recording of work required and performed to correct deficiencies.
    b. Visual inspection of all welds.
    c. Testing of welds as follows. Inspection procedures listed will be used at testing agency's option.

        c1. Liquid Penetrant Inspection: ASTM E 165.
        c2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not acceptable.
        c3. Radiographic Inspection: ASTM E 94.
        c4. Ultrasonic Inspection: ASTM E 164.

D. Frequency of testing:

1. High-Strength Bolted Connections:

    a. All high-strength-bolted connections shall be visually inspected to ascertain that proper size of bolts and washers have been used.
    b. A portion of the bolts in slip-critical connections will be tested to verify proper installation and pre-tension as follows:

        b1. Ten percent each from all connections of beams to columns (minimum one bolt per connection).
        b2. Ten percent each from all bracing connections (minimum one bolt per connection).
        b3. Twenty percent each of bolts from all truss connections (minimum two bolts per connection).
        b4. Ten percent each from all hanger connections (minimum one bolt per connection).
        b5. Twenty percent, selected randomly, from all bolts in all lintel connections.

    c. If any bolt in any connection fails, all bolts in that connection will be tested.

2. Welded Connections

    a. All welded connections shall be visually inspected.
    b. A portion of the welded connections will be tested by Ultrasonic method (or other appropriate method) as follows:

        b1. Full length of all complete joint penetration welds.

b2. Full length of all welds subject to tension.
b3. Fifty percent of all butt welds not subject to tension.
b4. Twenty-five percent of all other welds.

c. When defects are revealed, additional inspection by whatever methods the testing agency deems appropriate will be performed to the extent necessary to ensure that the full amount of defect has been located.

END OF SECTION 05l200

SECTION 051250 — ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 of Specification Sections, apply to the section.

1.2 SUMMARY

A. This Section includes requirements regarding the appearance and surface preparation of Architecturally Exposed Structural Steel (AESS).

Refer to Division 5, Section "Structural Steel" for all other requirements regarding steel work not included in this section.

This section applies to any members noted on Architectural or Structural drawings as AESS.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 5 Section "Structural Steel".
2. Division 5 Section "Metal Decking" for erection requirements relating to exposed steel decking and its connections.
3. Division 5 Section "Metal Fabrications" for loose steel-bearing plates and miscellaneous steel framing.
4. Division 9 Section "Special Coatings" for finish coat requirements and coordination with primer and surface preparation specified in this section.
5. Division 9 Section "Painting" for finish coat requirements and coordination with primer and surface preparation specified in this section.

1.3 SUBMITTALS

A. General: Submit each item below according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified.

C. Shop Drawings detailing fabrication of AESS components.

1. Provide erection drawings clearly indicating which members are considered as AESS members.

2. Include details that clearly identify all of the requirements listed in Sections 2.3 “Fabrication” and 3.3 “Erection” of this specification. Provide connections for exposed AESS consistent with concepts shown on the architectural or structural drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined herein.
4. Indicate type, size, finish and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tensioned shear/bearing connections. Indicate to which direction bolt heads shall be oriented.
5. Clearly indicate which surfaces or edges are exposed and what class of surface preparation is being used.
6. Indicate special tolerances and erection requirements as noted on the drawings or defined herein.

D. Qualification data for firms and persons specified in the “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of complete projects names and address, names and addresses of architects and owners, and other information specified.

LEED Building Submittal Requirements: The contractor or subcontractor shall submit the following LEED Building certification items:

E. A completed LEED Building Materials Certification Form, per Section 013300 – Submittal Requirements under the LEED BUILDING Submittal Requirements article of these specifications. Information to be supplied includes:

1. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
2. The manufacturing location for the product(s); and the location (source) of the raw materials used to manufacture the product(s).
3. Provide material costs for the materials included in the contractor’s or subcontractor’s work. Material cost does not include costs associated with labor and equipment.

F. Letters of Certification, provided from the product manufacturer on the manufacturer’s letterhead, to verify the amount of recycled content.

G. Product Cut Sheets for all materials that meet the LEED Building Performance Requirements this Section.

H. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile

Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content).

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: In addition to those qualifications listed in Division 5 Section "Structural Steel", engage a firm experienced in fabricating AESS similar to that indicated for this Project with a record of successful in-service performance, as well as sufficient production capacity to fabricate AESS without delaying the Work.

B. Erector Qualifications: In addition to those qualifications listed in Division 5 Section "Structural Steel", engage an experienced Erector who has completed AESS work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

C. Comply with applicable provisions of the following specifications and documents:

1. *AISC Code of Standard Practice*, latest edition, Section 10 as amended herein.

D. Mockups: At least four weeks prior to fabricating AESS, the Contractor shall construct mock-ups to demonstrate aesthetic effects as well as qualities of materials and execution. A mock-up for each of the following elements shall be constructed:

Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work:

1. Locate mock-ups on-site or in the Fabricator's shop as directed by the Architect. Mock-ups shall be full-size pieces unless the Architect approves smaller models.
2. Notify the Architect one week in advance of the dates and times when mock-ups will be available for review.
3. Demonstrate the proposed range of aesthetic effects regarding each element listed under the fabrication heading below.
4. Mock-up will have finished surface (including surface preparation and paint system).
5. Obtain Architect's approval of mock-ups before starting fabrication of final units.
6. Retain and maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.
7. Approved mock-ups in an undisturbed condition at the time of Substantial completion may become part of the completed work.

E. Pre-Installation Conference: The General Contractor shall schedule and conduct a conference at the Project Site to comply with requirements of Division 1 Section "Project Meetings". As a minimum, the meeting shall include the General Contractor, Fabricator, Erector, the finish-painting subcontractor and the Architect. Coordinate requirements for shipping, special handling, attachment of safety cables and temporary erection bracing, touch-up painting and other requirements for AESS.

F. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113: "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings", where applicable.

G. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

H. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

I. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver AESS to Project Site in such quantities and at such times to ensure continuity of installation.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms or other supports. Protect steel members and packaged materials from erosion and deterioration. Use special care in handling to prevent twisting or warping of AESS members.

C. Erect pre-painted finish pieces using padded slings or other methods such that they are not damaged. Provide padding as required to protect while rigging and aligning member's frames. Weld tabs for temporary bracing and safety cabling only at points concealed from view in the completed structure or where approved by the Architect during the Pre-Installation Meeting. Methods of removing temporary erection devices and finishing the AESS members shall be approved by the Architect prior to erection.

1.6 PROJECT CONDITIONS

A. Field Measurements: Where AESS is indicated to fit against walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.7 COORDINATION

A. Coordinate installation of anchors for AESS members that connect to the work of other trades. Furnish setting drawings, templates, and directions for installing anchors, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to the project site in time for installation. Anchorage concepts shall be as indicated on drawings and approved on final shop drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Meet requirements of Division 5 Section "Structural Steel" as amended below.

B. High-Strength Bolts, Nuts and Washers: Per Section 051200, heavy hex heads and nuts. Provide standard carbon finish.

2.2 FINISHES

A. Compatibility: The General Contractor shall submit all components/procedures of the paint system for AESS as a single coordinated submittal. As a minimum, identify required surface preparation. All of the items shall be coordinated with the finish coat specified in Division 9.

2.3 FABRICATION

A. Fabricate and assemble AESS in the shop to the greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by the Architect. Detail AESS assemblies to minimize field handling and expedite erection.

B. Fabricate AESS with exposed surfaces smooth, square and of surface quality consistent with the approved mock-up. Use special care in handling and shipping of AESS both before and after shop painting.

C. In addition to special care used to handle and fabricate AESS, employ the following fabrication techniques.

1. Fabrication Tolerance: Fabricate steel to one half the normal tolerance as specified in the *Code of Standard Practice*, Section 10.
2. Welds Ground Smooth: Fabricator shall grind welds of AESS smooth. For groove welds, the weld shall be made flush to the surfaces each side and be within +1/16”,-0” of plate thickness.
3. Contouring and Blending of Welds: Where fillet welds are indicated to be ground-contoured, or blended, oversize welds as required and grind to provide a smooth transition and to match profile on approved mock-up.
4. Continuous Welds: Where welding is noted on the drawings, provide continuous welds of a uniform size and profile.
5. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
6. Coping and Blocking Tolerance: Maintain a uniform gap of 1/8” ± 1/32” at all copes and blocks.
7. Joint Gap Tolerance: Maintain a uniform gap of 1/8” ± 1/32”.
8. Piece Marks Hidden: Fabricate such that piece marks are fully hidden in the final structure or made with such media to permit full removal after erection.
9. Mill Mark Removal: Fabricator shall deliver steel with no mill marks (stenciled, stamped, raised, etc.) in exposed locations. Mill marks shall be omitted by cutting of mill material to appropriate lengths where possible. Where not possible, the fabricator can fill and/or grind to a surface finish consistent with the approved mock-up.
10. Grinding of Sheared Edges: Fabricator shall grind all edges of sheared, punched or flame-cut steel to match approved mock-up.
11. Rolled Members: Member specified to be rolled to a final curved shape shall be fully shaped in the shop and tied during shipping to prevent stress relieving. Distortion of the web or stem, and of outstanding flanges or legs of angles shall be visibly acceptable to the Architect from a distance of 20’ under any lighting condition determined by the Architect. Tolerances for the vertical and horizontal walls of rectangular HSS members after rolling shall be the specified dimension ± ½”.
12. Seal weld open ends of round and rectangular hollow structural section with 3/8” closure plates. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AESS is exposed to weather.

2.4 SHOP CONNECTIONS

A. Bolted Connections: Make in accordance with Section 051200. Provide bolt type and finish as noted herein and align bolt heads as indicated on the approved shop erection drawings.

B. Welded Connections: Comply with AWS D1.1 and Section 05120. Appearance and quality of welds shall be consistent with the mock-up. Assemble and weld built-up sections by methods that will maintain alignment of members without warp exceeding the tolerance of this Section.

PART 3 – EXECUTION

3.1 EXAMINATION

A. The erector shall check all AESS members upon delivery for twist, kinks, gouges or other imperfections which might result in rejection of the appearance of the member. Coordinate remedial action with Fabricator prior to erecting steel.

3.2 PREPARATION

A. Provide connections for temporary shoring, bracing and supports only where noted on the approved shop drawings. Temporary connections not shown shall be made at locations not exposed to view in the final structure or as approved by the Architect. Handle, lift and align pieces using padded slings and/or other protection required to maintain the appearance of the AESS through the process of erection.

3.3 ERECTION

A. Set AESS accurately in locations and to elevations indicated, and according to AISC specifications referenced in this Section.

B. In addition to the special care used to handle and erect AESS, employ the following erection techniques.

1. AESS erection tolerances: Erection tolerances shall meet the requirements of Chapter 10 of the *AISC Code of Standard Practice*.
2. Welds ground smooth: Erector shall grind welds smooth in the connection of AESS members. For groove welds, the weld shall be made flush to the surfaces of each side and be within +1/16”,-0” of plate thickness.
3. Contouring and blending of welds: Where fillet welds are indicated to be ground contoured or blended, oversize welds as required; grind to provide a smooth transition and to match profile on approved mock-up.
4. Continuous welds: Where noted on the drawings, provide continuous welds of a uniform size and profile.
5. Minimize weld show-through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
6. Bolt head orientation: All bolt heads shall be oriented as indicated on the contract documents. Where bolt-head alignment is specified, the

orientation shall be noted for each connection on the erection drawings. Where not noted, the bolt heads in a given connection shall be oriented to one side.

7. Removal of field connection aids: Run-out tabs, erection bolts and other steel members added to connections to allow for alignment, fit-up, and welding in the field shall be removed from the structure. Field groove welds shall be selected to eliminate the need for backing bars or to permit their removal after welding. Welds at run-out tabs shall be removed to match adjacent surfaces and ground smooth. Holes for erection bolts shall be plug welded and ground smooth.
8. Filling of weld access holes: Where holes must be cut in the web at the intersection with flanges on W shapes and structural tees to permit field welding of the flanges, they shall be filled. Filling shall be executed with proper procedures to minimize restraint and address thermal stresses in group 4 and 5 shapes.

C. Field welding: Weld profile, quality and finish shall be consistent with mock-ups approved prior to fabrication.

D. Splice members only where indicated.

E. Obtain permission for any torch cutting or field fabrication from the Architect. Finish sections thermally cut during erection to a surface appearance consistent with mock-up.

F. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts. Replace connection plates that are misaligned where holes cannot be aligned with acceptable final appearance.

3.4 FIELD CONNECTIONS

A. Bolted connections: Install bolts of the specified type and finish in accordance with Division 5 section “Structural Steel”.

B. Welded Connections: Comply with AWS D1.1 for procedures, and appearance. Refer to Division 5 section “Structural Steel” for other requirements.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp. Verify that weld sizes, fabrication sequence, and equipment used for AESS will limit distortions to allowable tolerances.
2. Obtain Architect’s approval for appearance of welds in repaired or field modified work.

3.5 FIELD QUALITY CONTROL

A. Structural requirements: The Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports. Refer to Division 5 Section "Structural Steel" for detailed bolt and weld testing requirements.

B. AESS acceptance: The Architect shall observe the AESS steel in place and determine acceptability based on the mock-up. The testing agency shall have no responsibility for enforcing the requirements of this section.

3.6 ADJUSTING AND CLEANING

A. Touch-up Painting: Cleaning and Touch-up painting of field welds, bolted connections, and abraded areas of shop paint shall be completed to blend with the adjacent surfaces of AESS. Such touch up work shall be done in accordance with manufacturer's instructions as specified in Division 9, Section "Painting".

END OF SECTION 051250

SECTION 053000 — METAL DECKING

PART 1 — GENERAL

1.01 GENERAL

A. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. The Owner requires the Contractor to efficiently use resources and energy to the fullest extent possible in the completion of the project. Resource-efficient aspects to be considered in completing this project include use of techniques that minimize waste generation, re-use of materials, on-site where possible, and recycling of waste generated during the construction process.

C. In the selection of the products and materials of this section, preference will be given to those with the following characteristics:

1. Water-based.
2. Water-soluble.
3. Can be cleaned up with water.
4. Non-flammable.
5. Biodegradable.
6. Low or preferably no Volatile Organic Compound (VOC) content.
7. Manufactured without compounds that contribute to ozone depletion in the upper atmosphere.
8. Manufactured without compounds that contribute to smog in the lower atmosphere.
9. Does not contain methylene-chloride.
10. Does not contain chlorinated hydrocarbons.
11. Contains the least possible extent of post-consumer or post-industrial waste.

1.02 DESCRIPTION OF WORK

A. Extent of metal decking is indicated on drawings, including basic layout and type of deck units required.

B. Related Work Specified in Other Sections:

1. Cast-in-place Concrete is specified in Section 033000.
2. Structural Steel is specified in Section 051200.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of decking and accessories. Include manufacturer's certification as

may be required to show compliance with these specifications.

B. Shop Drawings:

1. No work may commence until all relevant shop drawings have been reviewed and final "Approval with no exceptions" has been granted by the Architect. The use of the "Request for Information (RFI)" process is strictly a form of communication between the Construction Manager/General Contractor and the Design Team and its sole purpose is to resolve minor issues. The use of this communication vehicle to pre-prepare shop drawings shall not be allowed. Detailed shop drawings shall be submitted for review and approval only after erection shop drawings have been approved without exceptions by the Architect and Engineer. Shop drawings shall be submitted for review and approval at timely intervals. Reviewed and approved piece shop drawings shall be returned at a rate of no more than five drawings per working day.
2. Submit shop drawings prepared under supervision of a registered professional engineer, including layout and types of deck panels, anchorage details, and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories.

LEED Building Submittal Requirements: The contractor or subcontractor shall submit the following LEED Building certification items:

C. A completed LEED Building Materials Certification Form, per Section 013300 – Submittal Requirements under the LEED BUILDING Submittal Requirements article of these specifications. Information to be supplied includes:

1. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
2. The manufacturing location for the product(s); and the location (source) of the raw materials used to manufacture the product(s).
3. Provide material costs for the materials included in the contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

D. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

E. Product Cut Sheets for all materials that meet the LEED Building Performance Requirements this Section.

F. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content).

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated or specified:

1. International Building Code 2003 with State Building Code of Connecticut 2005 Supplement and 2009 Amendment.
2. American Iron and Steel Institute (AISI) Specification for the Design of Cold-Formed Steel Structural Members.
3. American Welding Society (AWS) D1.3 Structural Welding Code - Sheet Steel.
4. Steel Deck Institute (SDI) Design Manual for Floor Decks and Roof Decks.

B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with Welder Qualification procedures of AWS D1.1.

1. Welded decking in place is subject to inspection and testing. Expense of removing and replacing portions of decking for testing purposes will be borne by Owner if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

C. Underwriters' Laboratories Label: Provide metal floor deck units listed in Underwriters' Laboratories (UL) Fire Resistance Directory, with each deck unit bearing the UL label and marking for specific system detailed.

LEED Building Performance Requirements:

D. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113: “Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings”, where applicable.

E. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

F. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

G. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.05 LEED REQUIREMENTS

A. LEED Certification: The Owner is targeting a LEED Silver Certification for this project.

B. Recycled Content: Provide products with the highest possible pre-consumer and post-consumer recycled content. Steel products shall contain at least 90 percent recycled material.

C. Location of Origin: Where possible, provide products that have been manufactured within 500 miles of the project site.

D. VOC Limits: Field-applied finishes shall conform to the VOC limits listed in Low-Emitting Requirements NC 2.2.

E. See Division 1 for LEED submittal requirements.

PART 2 — PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

Metal Roof Deck Units:

Bowman/E.G. Smith (a division of Cyclops Corp.)
CMC Joist & Deck
Epic Metals Corp.
H. H. Robertson Company
Mac-Fab Products, Inc.
Vulcraft (a division of Nucor)
Wheeling Corrugating Co.

Composite Metal Floor Deck Units:

Bowman/E.G. Smith (a division of Cyclops Corp.)
CMC Joist & Deck
Epic Metals Corp.
Mac-Fab Products, Inc.
H.H. Robertson Co.
Vulcraft (a division of Nucor)
Wheeling Corrugating Co.

2.02 MATERIALS

A. Steel for Painted Metal Deck Units: ASTM A 1008, SS Grade 40.

B. Steel for Galvanized Metal Deck Units: ASTM A 653, SS Grade 40, G60 coating, unless otherwise noted.

C. Miscellaneous Steel Shapes: ASTM A 36.

D. Recycled Content: Provide products with an average recycled content of steel products such that post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 90 percent.

E. Shear Connectors: Headed stud type, ASTM A 108, Grade 1015 or 1020, cold finished carbon steel; dimensions in compliance with AISC specifications.

F. Sheet Metal Accessories: ASTM A 653, SS Grade 40, G60 coating, commercial quality, galvanized.

G. Galvanizing: ASTM A 924, G60.

H. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with Military Specifications MIL-P-21035 (Ships).

I. Flexible Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.

J. Acoustic Sound Barrier Closures: Manufacturer's standard mineral fiber closures.

2.03 PAINT

A. Interior Exposed Galvanized Metal Decking:

1. Surface Preparation:

SSPC-SPI – Solvent Cleaning.

2. Primer:

a. Carboline Carbocrylic 120 @ 1.0-2.0 mils d.f.t.
b. Tnemec 115 Tneme-Deck @ 1.0-2.0 mils d.f.t.
c. Sherwin Williams DTM Primer Finish @ 2.5-3.5 mils d.f.t.

3. Finish:

a. Carboline Carbocrylic 3359 @ 2.0-3.0 mils d.f.t.
b. Tnemec 115 Tneme-Deck @ 2.0-3.0 mils d.f.t.
c. Dupont 25P @ 2.0-3.0 mils d.f.t.
d. Sherwin Williams DTM Primer Finish @ 2.5-3.5 mils d.f.t.

B. Exterior Exposed Galvanized Metal Decking:

1. Surface Preparation:

SSPC-SP1 – Solvent Cleaning (or as required by deck manufacturer).

2. Primer:

a. Carboline Rust Bond @ 1.0-2.0 mils d.f.t.
b. Sherwin Williams Procryl Universal Primer or Macropoly 646 @ 2.0-4.0 mils d.f.t.
c. Tnemec: 66 Epoxoline/161 Tneme-Fascure @ 2-3 mils d.f.t.

3. Finish:

a. Carboline: Carbothane 133/833 @ 3.0-5.0 mils d.f.t.
b. Sherwin Williams Acrolon Multimil or 218 HS Series @ 3.0-5.0 mils d.f.t.
c. Tnemec 73 Endura-Shield at 2-3 mils d.f.t.

C. Unless otherwise noted, provide manufacturer's baked-on, rust-inhibitive paint, for application to metal surfaces which have been chemically cleaned and phosphate chemical treated.

2.04 FABRICATION

A. General: Form deck units in lengths to span three or more supports with flush, telescoped or nested 2" laps at ends and interlocking or nested side laps, unless otherwise indicated.

B. Metal Floor Deck Units:

1. Open-Beam Composite Units: Fabricate deck units with integral embossing or raised pattern to furnish mechanical bond with concrete slabs. Fabricate open-beam deck units with fluted section having interlocking side laps of metal thickness, depth and width as shown.

PART 3 — EXECUTION

3.01 INSTALLATION

A. General: Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein.

1. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
2. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
3. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
4. Do not use floor deck units for storage or working platforms until permanently secured.

B. Fastening Deck Units:

1. Fasten floor deck units to steel supporting members by not less than 3/4"-diameter fusion welds or elongated welds of equal strength, spaced not more than 12" on center with a minimum of two welds per unit at each support. Tack weld or use self-tapping No. 10 or larger machine screws at 48" on center for fastening end closures.
2. Fasten roof deck units to steel supporting members by not less than 1/2"-diameter fusion welds or elongated welds of equal strength, spaced not more than 12" on center at every support, and at closer spacing where required for lateral force resistance. In addition, secure deck to each supporting member in ribs where side laps occur.
3. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds and methods used in correcting welding work. Use welding washers where decking is thinner than 22 gage and as recommended by deck manufacturer.
4. Mechanically fasten side laps of adjacent deck units between supports at intervals not exceeding 36" on center using self-tapping No. 10 or larger machine screws or welding.
5. Keep the interiors of cells that will be used as raceways free of welds having sharp points or edges.

C. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.

D. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.

E. Hanger Slots:

1. Provide UL-approved punched hanger slots between cells or flutes of lower element where floor deck units are to receive hangers for support of ceiling construction, air ducts, diffusers or lighting fixtures.
2. Locate slots at not more than 14" on center in both directions, not more than 9" from walls at ends and not more than 12" from walls at sides, unless otherwise shown.
3. The maximum load supported by each hanger slot shall be 100 pounds.
4. Provide manufacturer's standard hanger attachment devices.

F. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units, except where taped joints are required.

G. Shear Connectors: Weld shear connectors to supports through decking units in accordance with manufacturer’s instructions. Do not weld shear connectors through two layers (lapped ends) of decking units. Weld only on clean, dry deck surfaces.

H. Touch-Up Painting: After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units

and supporting steel members.

1. Touch up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.
2. Touch up painted surfaces with same type of shop paint used on adjacent surfaces.
3. In areas where shop-painted surfaces will be exposed, apply touch-up paint to blend into adjacent surfaces.

3.02 QUALITY CONTROL

A. Owner will engage an independent testing and inspection agency to inspect metal decking and to perform tests and prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with requirements and will specifically state any deviations therefrom.
2. Provide access for testing agency to places where metal decking is being fabricated or produced so that required inspection and testing can be accomplished.
3. Testing agency may inspect metal decking at plant before shipment; however, Architect reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.

B. Correct deficiencies in metal decking which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work and as may be necessary to show compliance of corrected work.

C. The following inspections and tests will be performed by the testing agency:

1. Verification that all metal decking is erected in accordance with approved shop drawings and Contract Documents.
2. Verification that all welding operators have been qualified within the past year.
3. All field welding of metal decking to supporting members will be visually inspected to ascertain that all welds conform to shop drawings and applicable requirements stated in AWS publication, “Welding Inspection; Section 12 – Visual Inspection,” latest edition.
4. When defects are revealed, additional inspection by whatever methods the testing agency deems appropriate will be performed to the extent necessary to ensure that the full amount of defect has been located.

END OF SECTION 053000

SECTION 054000

COLD FORMED METAL FRAMING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the cold formed metal framing as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. "C" shaped steel studs for exterior non-load bearing wall frame construction.

2. "C" shaped steel joists.

3. Anchors and accessories.

4. Gypsum sheathing.

5. Field inspection.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Structural steel - Section 051200.

E. Building insulation - Section 072100.

F. Vapor permeable air barrier - Section 072700.

G. Aluminum composite panels - Section 074213.

H. Interior steel stud construction - Section 092900.

1.5 QUALITY ASSURANCE

A. Component Design: Compute structural properties of studs in accordance with AISI "North American Specification for the Design of Cold Formed Steel Structural Members."

B. Fire-Rated Assemblies: Where framing units are indicated to be components of fire-resistance rated assemblies, provide cold formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction. Products used in the assembly shall carry a classification label from an approved testing and inspection agency.

C. Qualifications

1. Manufacturer's Qualifications: Minimum five years' experience in producing products of the type specified.

2. Installer's Qualifications: Minimum three years' experience in installation of the type of product specified.

3. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M "Structural Welding Code - Steel" and AWS DL3 "Structural Welding Code – Sheet Steel."

D. Pre-Installation Meeting

1. Convene meeting at project site within one week of scheduled start of installation with representatives of the following in attendance: Owner, Architect, General Contractor, and metal framing subcontractor.

2. Review substrate conditions, requirements of related work, installation instructions, storage and handling procedures, and protection measures.

3. Keep minutes of meeting, including responsibilities of various parties and deviations from specifications and installation instructions. Distribute minutes to attendees within 72 hours.

E. Comply with the following standards:

1. American Iron an Steel Institute (AISI):

a. "North American Specification for the Design of Cold-Formed Steel Structural Members," latest edition.
b. "Standard for Cold-Formed Steel Framing General Provisions."

2. American Welding Society (AWS):

a. Structural Welding Code (D1.1).
b. Specifications for Welding Sheet Steel in Structures (E1.3).

3. ASTM:

a. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coted (Galvannealed) by the Hot-Dip Process.
b. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
c. ASTM A 924 - Standard Requirements for Sheet Steel, Metallic-Coated by the Hot-Dipped Process.
d. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Non-Metallic-Coated for Cold-Formed Framing Members.
e. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
f. ASTM C 1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
g. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

F. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Product Data: For information only, submit copies of manufacturer's product information and installation instructions for each item of cold-formed framing and accessories.

B. Shop Drawings

1. Submit shop drawings for special components and installations not fully dimensioned or detailed in manufacturer's product data. Include placing drawings for framing members showing size and gauge designations, number, type, location and spacing. Indicate supplemental bracing, splices, window and door headers accessories and details as may be required for proper installation.

2. If the Contractor elects to prefabricate framing members into panels for erection, he shall submit shop drawings of such panels at suitable scale showing all dimensions, components, and methods of fastening and support.

C. For fasteners, submit product data sheet and samples.

D. Engineering Data

1. Submit Engineering Data drawings to the Architect for review. The Contractor is responsible for the structural design and supports for the cold-formed metal frame, and must show his proposed system and how the Performance Criteria noted below is accommodated on these drawings.

2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of members. Calculations and drawings must be prepared by a Structural Engineer licensed in the State of Connecticut, and shall be signed and sealed by this Engineer.

E. Quality Assurance Submittals: Submit the following:

1. Qualifications: Proof of manufacturer, installer, and welder qualifications.

2. Structural design calculations.

3. Certificates

a. Submit mill certificates signed by framing member/accessory manufacturer certifying compliance with material requirements.
b. Welder certificates.

4. Manufacturer's installation instructions for framing members and framing accessories.

F. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

    a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
    b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
    c. Provide material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PERFORMANCE CRITERIA

A. Cold-formed metal framing system shall be designed, fabricated, and installed to withstand a 30 psf suction and pressure load (or greater if required by Code) with a maximum deflection of L/360 with metal panels.

B. Design system to accommodate vertical deflection of structural building frame, live loading, seasonal and day/night temperature ranges and construction tolerances.

C. Comply with prevailing Code requirements for seismic connections and loads.

1.8 PRODUCT DELIVERY AND STORAGE

A. Protect metal framing units from rusting and damage. Deliver to one project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade. Store off the ground in a dry ventilated space or protect with suitable waterproof coverings. Conform to storage and handling requirements of AISI "Code of standard Practice."

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Provide cold-formed steel framing manufactured by Marino/Ware, Dale/Incor, Superior Steel Studs, Dietrich Metal Framing, Super Stud Building Products or approved equal.

2.2 METAL FRAMING: GENERAL

A. System Components: With each type of metal framing required, provide manufacturer's standard steel runners, (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners and accessories, as recommended by manufacturer for the applications indicated, as needed to provide a complete metal framing system.

2.3 MATERIALS

A. Steel Sheet for Studs and Tracks: ASTM A 1003 Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.

2. Coating: G90 galvanized coating.

B. Steel Sheet for Clips: ASTM A 653, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.

2. Coating G90 galvanized coating.

2.4 FRAMING MEMBERS

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated punched, with stiffened flanges; thickness and grade as required by structural performance.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths compatible with studs un-punched, with un-stiffened flanges; thickness and grade as required by structural performance.

2.5 FRAMING ACCESSORIES

A. Stamp manufacturer's name on each accessory item.

B. Provide screws with accessories designated for screw attachment.

C. Connector Devices

1. Vertical Deflection Clips: VertiClip, including step bushings, as manufactured by The Steel Network Inc. (919) 845-1025 or approved equal. Rigid attachments to structure and screw attachment to stud web using step-bushings to permit

frictionless vertical movement. 68 mils minimum thickness, size as required by structural design calculations.

2. Rigid Clip Angles: StiffClip as manufactured by The Steel Network Inc., or approved equal, size as required by structural design calculations. Rigid attachment to structure and stud web.

D. Bridging

1. Cold Rolled Channel: 1-1/2 by 1/2 inch by 56 mil thick.

a. Bridging Clip: BridgeClip as manufactured by The Steel Network Inc. or approved equal. Provide attachment through stud punch-out clamping onto stud web and wrapping around bridging channel. Provide holes for screw attachment to stud web and channel.

2. Flat Strap: Width and thickness as required by structural design calculations. Rigid attachment to stud flange.

3. Solid Bridging: Channel shaped bridging with lipped flanges and integral formed clips. Screw attachment to stud. 33 mils minimum thickness, size as required by structural design calculations.

4. Bridging and accessories shall be hot dip zinc coated per ASTM A 153.

E. Header for Window and Door Openings: Provide "ICC ESR-1765 Pro X Header System" made by Brady Innovations LLC, or approved equal complete with all accessories including clips and accessories; finish and gauge to match studs.

2.6 FASTENERS

A. Screws: Corrosion resistant coated, self-drilling, pan or hex washer head. Provide screw type and size as required by structural design calculations.

B. Anchor Bolts and Studs: ASTM A 307, Grade A, carbon steel, with hex-head carbon steel nuts and flat steel washers. Hot-dip zinc coated in accordance with ASTM A 153. Provide bolt or stud type and size as required by structural design calculations.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

2.7 GALVANIZING TOUCH-UP

A. For touching up damaged galvanized surfaces after erection, provide "Silver Galv" made by Z.R.C. Worldwide. Apply to a dry film thickness of 1.5 to 3.0 mils.

2.8 GYPSUM SHEATHING AND RELATED ACCESSORIES

A. Gypsum Sheathing: 5/8" thick "Dens-Glass Fireguard," Type X, made by Georgia Pacific, "Securock Glass-Mat Sheathing" made by U.S. Gypsum Co., "Gold Bond EXP Extended Exposure Sheathing" made by National Gypsum Co., "Weather Defense" made by Lafarge/Continental, or approved equal, meeting ASTM C 1177, Type X.

B. Fasteners: 1-1/4" Type S-12 screws "Climaseal" finish.

C. Joint Treatment: Provide a one-part high performance sealant conforming to ASTM C 920, Type S, Grade NS, Class 25 meeting with the approval of the air/vapor barrier manufacturer for compatibility; see Section 072700 for description. Apply a 3/8" bead of sealant to the joint and trowel flat. Apply enough of the same material to each fastener to cover completely when trowelled flat.

2.9 FABRICATION

A. Framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated panels in a manner to prevent damage or distortion in any members in the assembly.

B. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting or screw fasteners, as standard with manufacturer.

C. Wire tying of framing components is not permitted.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where cold-formed metal framing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION: GENERAL

A. Methods of construction shall be piece by piece.

B. Connections shall be accomplished with self-drilling screws or welding so that the connection meets or exceeds the design loads required at that connection.

C. Studs shall be installed seated squarely (within 1/16") against the web portion of the top and bottom tracks. Tracks shall rest on a continuous, uniform bearing surface.

D. Cutting of steel framing members may be accomplished with a saw or shear. Torch cutting of loaded members is not permitted. Cutting of loaded members is not permitted unless under supervision of the project architect or engineer.

E. Temporary bracing shall be provided and left in place until work is permanently stabilized.

F. Bridging shall be of size and type shown on the approved shop drawings and as called for in the engineering calculations.

G. Install headers in all openings that are larger than the stud spacing in that wall. Form headers as shown on the drawings.

H. Insulation meeting the requirements of Section 072100 shall be placed in all jamb and header type conditions that will be inaccessible after their installation into the wall.

I. Provide jack studs to support each end of headers. These studs shall be securely connected to the header and must seat squarely in the lower track of the wall, and be properly attached to it.

J. If by design, a header is low in the wall, the less than full-height studs (cripples) that occur over the header shall be designed to carry all imposed loads.

K. Wall track shall not be used support any load unless specifically designed for that purpose.

L. All axially loaded members shall be aligned vertically, to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections or alternate provisions for load transfer may be made.

M. Holes that are field cut into steel framing members shall be within the limitation of the product and its design. Provide reinforcement where holes are cut through load bearing members in accordance with manufacturer's recommendations and as approved by project architect or engineer.

N. Touch up all steel bared by welding using touch up coating specified herein.

O. Studs shall be spaced to suit the design requirements and limitations of collateral facing materials.

P. Care should be taken to allow for additional studs at intersections, corners, doors, windows, control joints, etc., and as called for in the shop drawings or design calculations.

Q. Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer’s recommendations and industry standards in each case, considering weight or loading resulting from item supported.

R. Provide for structure movement, expansion shall be allowed where indicated and necessary by design or code requirements.

S. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.

T. Install horizontal bridging in stud system, spaced (vertical distance) at not more than 48 inches on center. Fasten at each intersection.

U. Splicing of axially loaded members or floor joists shall not be permitted.

V. Wire tying of members is not permitted.

3.3 INSTALLATION OF GYPSUM SHEATHING

A. Fasten sheathing to exterior of each stud with specified fasteners spaced 3/8" from ends and edges and approx. 8" o.c. at each stud. Install fasteners in accordance with manufacturer's recommendations using 2500-RPM maximum screw gun. Sheathing board shall be installed horizontally. Apply sealant between joints and trowel flush; and apply sealant around sheathing perimeter and at interface with other materials. Cover fastener heads with sealant and trowel flush.

B. Refer to Section 072700 for vapor permeable air barrier description.

END OF SECTION

SECTION 055000

MISCELLANEOUS METALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the miscellaneous metal work as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Rough hardware.

2. Vertical steel ladders.

3. Steel pipe handrails and railings not part of steel pan stair assemblies.

4. Loose steel lintels.

5. Light steel framing and supports, not included as part of work of other trades.

6. Steel gratings and frames.

7. Steel bollards.

8. Miscellaneous steel trim, corner guards, angle guards and channels.

9. Masonry support steel.

10. Sleeves in concrete walls and slabs.

11. Steel framing, bracing, supports, anchors, bolts, shims, fastenings, and all other supplementary parts indicated on drawings or as required to complete each item of work of this Section.

12. Prime painting, touch-up painting, galvanizing and separation of dissimilar metals for work of this Section.

13. Cutting, fitting, drilling and tapping work of this Section to accommodate work of other Sections and of concrete, masonry or other materials as required for attaching and installing work of this Section.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Structural steel - Section 051200.

E. Steel pan stairs - Section 055100.

F. Painting - Section 099000.

1.5 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

C. Reference Standards: The work is subject to requirements of applicable portions of the following standards:

1. "Manual of Steel Construction," American Institute of Steel Construction.

2. AWS D1-1 "Structural Welding Code," American Welding Society.

3. SSPC SP-3 "Surface Preparation Specification No. 3, Power Tool Cleaning," Steel Structures Painting Council.

4. SSPC PA-1 "Painting Application Specification," Steel Structures Painting Council.

5. "Handbook on Bolt, Nut and Rivet Standards," Industrial Fasteners Institute.

D. Steel Materials: For steel to be hot dip-galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: carbon below 0.25 percent, silicon below 0.24 percent, phosphorous below 0.05 percent, and manganese below 1.35 percent. Notify galvanizer if steel does not comply with these requirements to determine suitability for processing.

E. Engage the services of a galvanizer who has demonstrated a minimum of five (5) years' experience in the successful performance of the processes outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coatings within the same facility as outlined herein. The Architect has the right to inspect and approve or reject the galvanizer/galvanizing facility.

F. The galvanizer/galvanizing facility must have an ongoing Quality Control/Quality Assurance program which has been in effect for a minimum of five years and shall provide the Architect with process and final inspection documentation. The galvanizer/galvanizing facility must have an on-premise testing facility capable of measuring the chemical and metallurgical composition of the galvanizing bath and pickling tanks.

G. Inspection and testing of hot-dip galvanized coating shall be done under the guidelines provided in the American Hot-Dip Galvanizers Association (AGA) publication "Inspection of Products Hot-Dip Galvanized After Fabrication."

H. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 PERFORMANCE STANDARDS

A. Railings shall be designed to resist loads per Connecticut State Building Code.

1.7 SUBMITTALS

A. Manufacturer's Literature: Submit manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products.

B. Shop Drawings: Shop drawings for the fabrication and erection of all assemblies of miscellaneous iron work which are not completely shown by manufacturer's data sheets. Include plans and elevations at not less than 1" to 1'-0" scale, and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.

C. Engineering Data

1. Before any ladders and railings are fabricated, submit engineering data drawings to the Architect for review indicating how performance standards specified here shall be met. The Contractor is responsible for the structural design and supports for these systems and must show his proposed systems on these drawings.

2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of members. Calculations and drawings must be prepared by a Structural Engineer licensed in the State of Connecticut and shall be signed and sealed by this Engineer.

D. Welding shall be indicated on shop drawings using AWS symbols and showing length, size and spacing (if not continuous). Auxiliary views shall be shown to clarify all welding. Notes such as 1/4" weld, weld and tack weld are not acceptable.

E. Certification: For items to be hot-dip galvanized, identify each item galvanized and to show compliance of application. The Certificate shall be signed by the galvanizer and shall contain a detailed description of the material processed and the ASTM standard used for the coating and, the weight of the coating. In addition, and as attachment to Certification, submit reports of testing and inspections indicating compliance with the provisions of this Section.

F. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Provide material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recyced content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

PART 2 PRODUCTS

2.1 MATERIALS

A. Metals

1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

2. Steel Plates, Shapes and Bars: ASTM A 36.

3. Steel Bar Grating: ASTM A 1011/A or ASTM A 36.

4. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.

5. Structural Steel Sheet: Hot rolled, ASTM A 570; or cold rolled, ASTM A 611, Class 1; of grade required for design loading.

6. Galvanized Structural Steel Sheet: ASTM A 924, of grade required for design loading. Coating designation G90.

7. Steel Pipe: ASTM A 53, type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.

8. Gray Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.

9. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.

10. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

11. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

B. Grout: Non-shrink, non-metallic grout conforming to the requirements of Section 033000.

C. Fasteners

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

3. Anchor Bolts: ASTM F 1554, Grade 36.

4. Lag Bolts: ASME B18.2.1.

5. Machine Screws: ASME B18.6.3.

6. Plain Washers: Round, carbon steel, ASME B18.22.1.

7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.

8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

9. Lock Washers: Helical spring type carbon steel, ASME B18.21.1.

D. Shop Paint: Shop prime all non-galvanized miscellaneous metal items using Series 88 Azeron Primer made by Tnemec, ICI Devoe "Rust Guard" quick dry alkyd shop coat No. 41403, or "Interlac 393" by International Protection Coatings.

1. If steel is to receive high performance coating as noted in Section 099000, shop prime using primer noted in Section 099000.

E. Bituminous Paint: Cold applied asphalt emulsion complying with ASTM D 1187.

F. Galvanizing Repair Coating: For touching up galvanized surfaces after erection, provide repair coating that is V.O.C. compliant, equal to "Silver Galv" made by Z.R.C. Worldwide or equivalent. Apply to a dry film thickness of 1.5 to 3.0 mils.

2.2 PRIME PAINTING

A. Scope: All ferrous metal (except galvanized steel) shall be cleaned and shop painted with one coat of specified ferrous metal primer. No shop prime paint required on galvanized steel or aluminum work.

B. Cleaning: Conform to Steel Structures Painting Council Surface Preparation Specification SP 3 (latest edition) "Power Tool Cleaning" for cleaning of ferrous metals which are to receive shop prime coat.

1. Steel to get high performance coating as noted in Section 099000 shall be cleaned as per SSPC SP.6 "Commercial Blast Cleaning."

C. Application

1. Apply shop prime coat immediately after cleaning metal. Apply paint in dry weather or under cover. Metal surfaces shall be free from frost or moisture when painted. Paint all metal surfaces including edges, joints, holes, corners, etc.

2. Paint surfaces which will be concealed after shop assembly prior to such assembly. Apply paint in accordance with approved paint manufacturer's printed instructions, and the use of any thinners, adulterants or admixtures shall be only as stated in said instructions.

3. Paint shall uniformly and completely cover the metal surfaces, 2.0 mils minimum dry film thickness. No work shall be shipped until the shop prime coat thereon has dried.

D. Touch-Up: In the shop, after assembly and in the field, after installation of work of this Section, touch-up damaged or abraded portions of shop prime paint with specified ferrous metal primer.

E. Apply one shop coat to fabricated metal items, except apply two (2) coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.3 GALVANIZING

A. Scope: All ferrous metal exposed to the weather, and all ferrous metals indicated on drawings or in specifications to be galvanized, shall be cleaned and then hot-dipped galvanized after fabrication as provided by Duncan Galvanizing or equivalent.

B. Avoid fabrication techniques that could cause distortion or embrittlement of steel items to be hot-dip galvanized. Fabricator shall consult with hot-dip galvanizer regarding potential warpage problems or handling problems during the galvanizing process that may require adjustment of fabrication techniques or design before finalizing shop drawings and beginning of fabrication.

C. Cleaning: Thoroughly clean metal surfaces of all mill scale, rust, dirt, grease, oil, moisture and other contaminants prior to galvanizing.

D. Application: Hot-dip galvanizing shall be applied in accordance with:

1. ASTM A 143: Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel.

2. ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

3. ASTM A 153: Galvanized Coating on Iron and Steel Hardware - Table 1.

4. ASTM A 385: Practice for Providing High Quality Zinc Coatings.

5. ASTM A 924: Galvanized Coating on Steel Sheets.

6. Minimum weight of galvanized coating shall be two (2) oz. per square foot of surface.

E. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

F. All galvanized materials must be inspected for compliance with these specifications and marked with a stamp indicating the name of the galvanizer, the weight of the coating, and the appropriate ASTM number.

G. To minimize surface imperfection (eg: flux inclusions), material to be galvanized shall be dipped into a solution of Zinc Ammonium Chloride (pre-flux) immediately prior to galvanizing. The type of galvanizing process utilizing a flux blanket overlaying the molten zinc will not be permitted.

H. After galvanizing all materials not exposed to view must be chromated by dipping material in a 0.2% chromic acid solution.

I. Galvanized surfaces, where exposed to view, must have a smooth, level surface finish. Where this does not occur, piece shall be rejected and replaced to the acceptance of the Architect.

2.4 PROTECTIVE COATINGS

A. Whenever dissimilar metals will be in contact, separate contact surfaces by coating each contact surface prior to assembly or installation with one coat of specified bituminous paint, which shall be in addition to the specified shop prime paint. Mask off those surfaces not required to receive protective coating.

2.5 WORKMANSHIP

A. General

1. Miscellaneous metal work shall be fabricated by an experienced fabricator or manufacturer and installed by an experienced tradesman.

2. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings and specifications, approved shop drawings, and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected.

3. All work shall be accurately and neatly fabricated, assembled and erected.

B. Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Shop assemble work in largest practical sizes to minimize field work. It is the

responsibility of the miscellaneous metal subcontractor to assure himself that the shop-fabricated miscellaneous metal items will properly fit the field condition. In the event that shop-fabricated miscellaneous metal items do not fit the field condition, the item shall be returned to the shop for correction.

C. Cutting: Cut metal by sawing, shearing, or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp and free of burrs, without deforming adjacent surfaces or metals.

D. Holes: Drill or cleanly punch holes; do not burn.

E. Connections: Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to weather. Locate joints where least conspicuous. Unless indicated otherwise, weld or bolt shop connections; bolt or screw field connections. Provide expansion and contraction joints to allow for thermal movement of metal at locations and by methods approved by Architect.

1. Welding

   a. Shall be in accordance with "Standard Code for Welding in Building Construction" of the American Welding Society, and shall be done with electrodes and/or methods recommended by the manufacturer of the metals being welded.
   b. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces; undercut metal edges where welds are required to be flush.
   c. All welds on or behind surfaces which will be exposed to view shall be done so as to prevent distortion of finished surface. Remove weld spatter and welding oxides from all welded surfaces.

2. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads exposed to view shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts or adjacent metal.

F. Operating Mechanism: Operating devices (i.e. pivots, hinges, etc.) mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.

G. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items specified under this Section of the Specifications to be built into concrete, masonry or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.

H. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.

I. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.

J. Exposed Work

1. In addition to requirements specified herein and shown on drawings, all surfaces exposed to view shall be clean and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs, and other defects which mar appearance of finished work.

2. Metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design.

3. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.

K. Preparation for Hot-Dip Galvanizing: Fabricator shall correctly prepare assemblies for galvanizing in consultation with galvanizer and in accordance with applicable Reference Standards and applicable AGA publications for the "Design of Products to be Hot-Dip galvanized After Fabrication." Preparation shall include but not be limited to the following:

1. Remove welding flux.

2. Drill appropriate vent holes and provide for drainage in inconspicuous locations of hollow sections and semi-enclosed elements. After galvanizing, plug vent holes with shaped lead and grind smooth.

2.6 MISCELLANEOUS METALS ITEMS

A. Rough Hardware

1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.

2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood connections; elsewhere, furnish steel washers.

B. Ladders

1. Vertical steel ladders shall be eighteen (18) inches wide with 3/4" diameter non-slip steel rungs spaced twelve (12) inches o.c. Stringers shall be 3/8" thick by

2-1/2" wide steel bars; rungs welded to bars. Attach ladders to walls six (6) inches from top and bottom and maximum thirty-six (36) inches o.c. from these points.

2. Ladders shall be fabricated to support a live load of one hundred (100) lbs. per square foot and a concentrated load of three hundred (300) lbs. per rung; loads not to act simultaneously.

C. Steel Pipe Handrails

1. Steel pipe of size shown on Drawings, Schedule 40. Fittings shall be flush type, malleable of cast iron. Brackets shall be malleable iron, design as selected by the Architect.

2. Construction: Form direction changes in rails using solid bar stock or elbows. Connections shall be shop welded and ground smooth and flush, except where field connections and expansion joints are required. Field connections may be welded, internal sleeve and plug weld, or internal sleeve and set screw.

3. Secure handrails to walls with wall brackets. Provide brackets of malleable iron castings, with not more than three (3) inches clearance from inside face of handrail to wall surface. Neatly drill wall plate portion of the bracket into concrete or masonry to receive bolts for concealed anchorage. For installation at drywall, Drywall trades shall provide plate to receive wall plate portion of bracket and anchor or bolt wall plate through drywall to supporting steel plate. Locate brackets at not more than 5'-0" o.c. unless otherwise shown.

4. Provide wall return fittings of cast iron, flush type, with the same projection as that specified for wall brackets.

5. Longitudinal members shall be parallel with each other and with floor surface or shape of stair to a tolerance of 1/8" in 10'-0" linear feet. Center line of members within each run of railing shall be in the plane.

6. For steel pipe posts where indicated, anchor posts in concrete by means of pipe sleeves set and anchored into concrete. Provide sleeves of galvanized steel pipe, not less than six (6) inches long and having an inside diameter not less than 1/2" greater than outside diameter of the inserted pipe. Provide steel plate closure secure to bottom of sleeve and of width and length not less than one (1) inch greater than outside diameter of sleeve. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-shrink, non-ferrous grout. Cover anchorage joint with a round steel flange welded to post. Posts shall be set plumb within 1/8" vertical tolerance.

7. Steel pipe handrails shall be capable of resisting a two hundred (200) lb. force applied to rail from any direction and a uniformly distributed load of fifty (50) lbs. per linear foot applied downward or horizontally, loads not to act simultaneously.

D. Loose Steel Lintels: Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a

single unit where indicated. Provide not less than eight (8) inches bearing at each side of openings, unless otherwise indicated.

1. Loose lintels shall conform to the following Schedule:

Opening Width (Maximum)	WALL THICKNESS		
	4 inches	6 inches	8 inches*
2'-0"	3-1/2" x 3-1/2" x 1/4"	6" x 4" x 5/16"	3-1/2" x 3-1/2" x 1/4"
3'-0"	3-1/2" x 3-1/2" x 5/16"	6" x 4" x 5/16"	3-1/2" x 3-1/2" x 5/16"
4'-0"	3-1/2" x 3-1/2" x 5/16"	6" x 4" x 5/16"	3-1/2" x 3-1/2" x 5/16"
5'-0"	4" x 3-1/2" x 3/8"	6" x 4" x 3/8"	4" x 3-1/2" x 5/16"
6'-0"	5" x 3-1/2" x 3/8"	6" x 4" x 3/8"	5" x 3-1/2" x 5/16"
7'-0"	5" x 3-1/2" x 3/8"	5" x 5" x 1/2"	5" x 3-1/2" x 3/8"
8'-0"	5" x 3-1/2" x 3/8"	5" x 5" x 5/8"	5" x 3-1/2" x 3/8"

* Two angles at all openings in eight (8) inch walls.

2. At columns or vertical surfaces where lintels cannot bear on masonry, provide clip angles sized for structural capacity of lintel.

E. Miscellaneous Light Steel Framing

1. Light steel framing, bracing, supports, framing, clip angles, shelf angles, plates, etc., shall be of such shapes and sizes as indicated on the drawings and details or as required to suit the condition and shall be provided with all necessary supports and reinforcing such as hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly support and rigidly fasten and anchor same in place and to steel, concrete, masonry and all other connecting and adjoining work.

2. All light steel framing steel shall be furnished and erected in accordance with the applicable requirements of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" by the American Institute of Steel Construction and as specified herein.

F. Steel Gratings and Frames

1. Provide hot dipped galvanized steel gratings complying with FS RR-G-661 with rectangular cross bars welded to bearing bars. Bars to have plain wearing surface.

2. Manufacturer: Provide gratings manufactured by Reliance, Borden, Irving Subway Grating, or equivalent.

3. Hinged Section: Provide hinged sections in areaway gratings where required by the drawings. Each hinged section up to 4'-0" wide shall be provided with two (2) five knuckle, fast pin, regular weight, plain bearing, wrought bronze butt hinges. Each hinged section over 4'-0" wide shall be provided with three (3) butt hinges. Hinged sections shall have provisions for padlocking on the underside.

4. Furnish grating frames, with corners mitered, welded and ground smooth, and with welded-on straps for secure anchorage into concrete. Frames and anchors to be galvanized.

5. Structural Performance: Provide gratings capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections:

   a. Floors: Capable of withstanding a uniform load of 250 lbf/sq. ft. or a concentrated load of 3000 lbf, whichever produces the greater stress.
   b. Walkways and Elevated Platforms Other Than Exits: Capable of withstanding a uniform load of 60 lbf/sq. ft. Limit deflection to L/360 or 1/4", whichever is less.
   c. Walkways and Elevated Platforms Used as Exits: Capable of withstanding a uniform of 100 lbf/sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. in., whichever produces the greater stress. Limit deflection to L/360 or 1/4", whichever is less.
   d. Sidewalks and Vehicular Driveways: Capable of withstanding a uniform load of 250 lfb/sq. ft. or a concentrated load of 8000 lbf, whichever produces the greater stress.

G. Steel Bollards: Provide six (6) inches O.D. extra strong (Schedule 80) steel pipe, concrete filled, with base of steel plate for mounting to anchor bolts in concrete foundation. Rabbet top of steel pipe and insert 1/4" steel plate cap, flush with top of pipe. Weld top of cap to pipe and grind smooth and flush.

H. Miscellaneous Steel Trim: Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

I. Corner Guards: Provide steel corner guards where shown. Unless otherwise indicated, use 4" x 4" x 1/4" steel angles to a height of four (4) feet above finished floor with 1-1/4" x 8 1/4" bent steel strap anchors welded to backs of angles at each end and approximately sixteen (16) inches o.c. Set and adjust guards to finish flush with adjacent surfaces.

J. Masonry Support Steel

1. Provide galvanized steel, relieving angles, plates, accessories and other steel shapes for masonry support steel; for lintels refer to Para. D. herein.

2. Fabricate masonry support steel to allow final adjustment with the closest tolerances possible. Relieving angles which require cutting to fit masonry flashing shall be straightened without deflections.

3. Coordinate masonry support system with concrete work for locations of wedge inserts.

4. Install to meet requirements of building masonry work, face brick coursing and stone placement. Coordinate final adjustments with masonry work as work progresses.

K. Sleeves in Concrete Walls and Slabs

1. Sleeves through concrete walls shall be of Schedule 40 steel pipe with i.d. two (2) inches larger than o.d. of pipe or conduit (including insulation, if any) to be accommodated. Sleeves shall project one-half (1/2) inch on each side of finished wall. Provide rectangular one-quarter (1/4) inch steel plate collar at center, continuously welded to the perimeter of the sleeve, and six (6) inches wider than the o.d.

2. Slots in slabs shall be 12 gauge steel sheet, galvanized, of dimensions indicated, with strap anchors welded in place not more than twelve (12) inches on centers.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where miscellaneous metal is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 ERECTION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.

C. Fitting Connections: Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot dip galvanized after fabrication, and are intended for bolted or screwed field connections.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance, and quality of welds made, and methods used in correcting welding work.

E. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

F. Field Touch-Up of Galvanized Surfaces: Touch-up shop applied galvanized coatings damaged during handling and installation. Use galvanizing repair coating specified herein for galvanized surfaces.

END OF SECTION

SECTION 055100

STEEL PAN STAIRS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the steel pan stairs as indicated on the drawings and specified herein, including but not limited to, the following:

1. Steel pan stairs, including all clips, hangers, inserts, braces and other supports.

2. Stainless steel handrails, guardrails, and intermediate rails for steel stairs, including supports, brackets, and anchors.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Structural steel - Section 051200.

E. Miscellaneous metals - Section 055000.

F. Installation of inserts in drywall furnished by this Section - Section 092900.

G. Finish painting - Section 099000.

1.5 QUALITY ASSURANCE

A. Qualification of Welders: Use only certified welders and the shielded arc process for all welding performed in connection with the work of this Section. Protect adjacent surfaces when field welding to prevent damage or stain. Welders and welding operators must be qualified by tests as provided by AWS.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with:

1. "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction.

2. "Code for Welding in Building Construction" of the American Welding Society.

3. "Metal Stairs Manual" of the National Association of Architectural Metal Manufacturers.

C. Conflicting Requirements: In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards of these specifications, the provisions of the more stringent shall govern.

D. Field Measurements: If construction process permits, take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress. Allow for trimming and fitting wherever taking field measurements before fabrication might delay work.

E. Tolerances: Allow for construction tolerances as required.

F. Coordination: Coordinate this work with the work of all other trades interfacing with metal pan stairs, such as structural openings, sprinklers and standpipes, and other trades as required.

G. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification

of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 DRAWING SUBMISSION

A. General: It is the intent of the Working Drawings to display the layouts and general design parameters upon which the Shop Drawings shall be developed. Detail development and all connections shall be part of Shop Drawing Development.

B. Shop Drawings

1. Before any steel stairs are fabricated, submit shop drawings to the Architect for approval.

2. Show all locations, markings, quantities, materials, sizes and shapes, and indicate all methods of connecting, anchoring, fastening, bracing, for the stair construction, support and attachment to the work of other trades.

C. Engineering Data

1. Before any metal pan stairs are fabricated, submit engineering data drawings to the Architect for review. The Contractor is responsible for the structural design and supports for the stair system and must show his proposed system on these drawings.

2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of stair members. Calculations and drawings must be prepared by a Structural Engineer licensed in the State of Connecticut and shall be signed and sealed by this Engineer.

1.7 SAMPLES SUBMISSION

A. Submit the following listed samples and other samples as may be requested by the Architect, to show the quality standards:

1. Railing bracket.

2. Exposed weld.

3. Exposed bolted connection.

4. Bent pipe railing.

B. Samples shall be submitted cleaned and shop primed and shall represent standards to which all respective materials used in the Project shall meet.

1.8 LEED SUBMISSION

A. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.9 PERFORMANCE STANDARDS

A. Stairs and railings shall be constructed to conform to the following performance standards, unless greater required by Code:

1. Stairs and platforms shall support a live load of one hundred (100) psf and a concentrated live load of three hundred (300) lbs. and shall have a live load deflection limited to 1/360 of the span. Loads shall not apply simultaneously.

2. Railings shall withstand a two hundred (200) lb. force applied to rail from any direction, and a uniformly distributed load of 50 lbs./lin. ft. applied downward or horizontally, loads not to act simultaneously.

1.10 PRODUCT HANDLING

A. Protection: Use all means necessary to protect steel pan stair before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 MATERIALS

A. Structural Steel: ASTM A 36.

B. Steel Sheets: ASTM A 245, Grade C, minimum ten (10) gauge for platforms, twelve (12) gauge minimum for treads and risers.

C. Stainless Steel Pipe: ASTM A 312, Grade TP 304.

D. Stainless Steel Casings: ASTM A 743, Grade CF 8 or CF 20.

E. Bolts and Nuts: ASTM A 307, Grade A bolts.

F. Machine Screws: Fed Spec. FF-S-92.

G. Expansion Bolts: "Cinch" type, galvanized, of approved manufacture.

H. Threaded End Hanger Rods: Minimum 3/4" diameter, ASTM A 36.

I. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

J. Bituminous Paint: Fed. Spec. TT-C-494.

K. Concrete Fill and Reinforcing Materials

1. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 3000 psi.

2. Nonslip-Aggregate Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

3. Welded Wire Fabric: ASTM A 185, 6 by 6 inches – W1.4 by W1.4, unless otherwise indicated.

2.2 FABRICATION

A. General

1. Steel pan stair work shall be fabricated by an experienced manufacturer in accordance with approved shop drawings and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand strains and stresses to which material will be subjected.

2. Fabricate shop assemblies in largest practical sizes to minimize field work. All exposed surfaces shall be clean and free from all dirt, stains, grease marks, scratches, waves, dents, buckles, tool marks, rattles, and other objectionable defects which mar appearance or use of finished work.

3. Cutting: Cut materials by sawing, shearing, or blanking. Flame cutting will be permitted when ground back to clean edges. Cuts shall be made accurately, clean, sharp and free of burrs, without deforming adjacent metals.

4. Connections: Make connections with tight joints, capable of developing full strength of the members, flush. Locate joints where least conspicuous. Use concealed fasteners where possible. Weld or rivet shop connections; bolt, screw or weld field connections.

   a. Welding: Welds shall be continuous, except where spot welding is specifically permitted. Welding shall conform to the Standard Code of the American Welding Society. Exposed welds are required to be ground flush.
   b. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts, or upset thread ends. Exposed bolts and screw head shall be flat and countersunk, unless otherwise indicated on drawings. Remove projecting ends of bolts and screws. Punch or drill holes; do not burn.

B. Stairs and Platforms

1. Provide stringers, risers, sub-treads and platforms matching profiles as shown. Form tread pan and riser in a continuous piece to receive the finished tread; tread shall be a minimum of twelve (12) gauge. Weld risers and treads to carrier angles which shall be welded to the structural steel stringers. Fasten countersunk bolts or stud welded clips through mesh for cement fill. Provide welded-on clips for the support of gypsum drywall soffits.

2. On intermediate platforms, provide metal bases formed of stringers. Miter and weld and grind smooth internal and external corners of metal bases. Form platform runs of minimum ten (10) gauge steel.

3. Countersink bolt heads and screws on finished surfaces or cut off flush with such surfaces.

4. Properly fit and securely fasten together all parts making exposed joints close fitting. Cut, drill, punch and tap as required for installation.

5. Make joints as strong and rigid as adjoining sections. Weld continuously along entire line of contact except where spot welding is indicated.

6. Give ferrous metal surfaces a shop coat of primer. Before painting, thoroughly clean surfaces with wire brushes or other proper and effective means of removing loose scale, filings or other objectionable materials.

7. Remove grease prior to painting. Separate dissimilar metals in or adjacent to work of this Section with a coat of bituminous paint on each surface prior to installation.

8. Closure and Filler Plates: Where indicated on drawings or as required, at least twelve (12) gauge sheet steel, securely fastened to top and bottom of stringer and adjacent wall, by welding or screws.

9. Struts, Hangers, Platform Headers and Subframing

   a. Provide supports as detailed and required, including all struts, clip angles, angles or hangers which are required and necessary for support of stair construction.
   b. Supports shall be of size suitable for the support load, as required. Struts, angles and hangers shall be supported by and directly connected to the structural framing. Struts and hangers, with their connections, shall be concealed.
   c. Provide other inserts, anchors and/or other subframing as may be required to complete the stair construction and properly support it on the structural framing.

C. Handrails, Railings, Posts and Brackets

1. Provide stainless steel pipe of size shown on drawings. Reinforce pipes internally as required to meet performance standards given in paragraph 1.7 herein. Fittings shall be flush type, stainless steel. Wall brackets shall be stainless steel design as detailed.

2. Provide satin, directional polish, No. 6, for stainless steel.

3. Handrail, post and railing spacing shall meet Code requirements.

4. Construction: Form direction changes in rails using solid bar stock or elbows. Connections shall be shop welded, except where expansion joints are required. Field connections shall be welded for continuity. All exposed welds shall be ground smooth and flush.

   a. If elbows are not available for angles shown, bends shall maintain full diameter of pipe, use mandrel, no kinks, ripples, flats are acceptable.

5. Anchor posts to steel with steel flanges, angle type or floor type as required by conditions, welded to posts and bolted to the steel supporting members.

6. Secure handrails to walls with wall brackets. Provide brackets as shown on drawings. For installation in drywall, furnish Drywall Section steel plate to receive wall plate portion of bracket and anchor or bolt wall plate through drywall to supporting steel plate. Locate brackets at not more than 5'-0" o.c. unless otherwise shown.

7. Anchor rail ends into adjacent walls with steel flanges welded to rail ends and anchored into the wall construction as described above.

8. Shop prime as specified above for stairs and platforms.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where steel pan stairs are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Work in the field shall comply with the same requirements as specified for shop work above.

B. Except where otherwise shown or specified for a particular item of work or for built-in work, fasten metal work to solid masonry with expansion bolts. Fastenings to wood plugs in masonry will not be accepted. Drill holes to the exact diameter of the bolts using a rotary drill for concrete and a percussion drill for other masonry. Thread screws full length to the head of the screw.

C. Provide connecting members needed for properly securing the work to masonry, drywall and structural framing, including bolts, machine screws, rods, hangers, inserts, sleeves, plates, anchors, expansion bolts, washers and other items as required. Furnish built-in items to drywall trades as required for proper anchorage.

D. Leave work exposed to view, including stair soffits, clean, smooth and neatly finished. All exposed welds shall be dressed smooth.

E. Include supplementary parts necessary to complete each item even though such work is not definitively shown or specified.

F. Coordinate and schedule the work of this Section with the work of other trades. Furnish anchors, sockets, fastenings and other miscellaneous items to be embedded in concrete or masonry, or required for securing metal work to other construction so as not to delay job progress.

G. Attach wall railings to the wall construction, using appropriate bolts and anchors to meet performance standards.

H. Install work plumb and true to the exact lines and levels, in the correct location and in proper relation to adjoining work.

I. Touch up marred and abraded shop paint of exposed surfaces after erection in the field.

J. Posts shall be set plumb within 1/8" vertical tolerance. Longitudinal members shall be parallel with each other and with floor surface or slope of stair to a tolerance of 1/8" in ten (10) linear feet. Center lines of members within each run of railing shall lie in the same vertical plane. Field joints of connecting sections shall be hairline.

3.3 TOUCH-UP PAINTING

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop coat, and paint exposed steel areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

END OF SECTION

SECTION 055117 ALUMINUM SLOTTED FRAMING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Non-ferrous metal fabrications and manufactured items not shown or specified under work of other Sections, including, but not limited to, the following.

1. Suspended aluminum slotted framing system at laboratory ceilings for support of service fixtures, equipment, etc.

2. Hardware, fittings, clamps, hangers, supports, accessories and fasteners required to complete the installation.

B. Related Sections:

1. Mechanical: Division 23.

3. Electrical: Division 26.

1.02 REFERENCES

A. The following standards are cited in, or may be relevant to this Section. The latest edition of each standard shall govern the Work of this Section only to the extent specified in each citation.

B. Aluminum Association (AA):

1. SAS-30 Specifications for Aluminum Structures.

2. WA-20 Welding Aluminum.

C. American Society for Testing and Materials (ASTM):

1. A36/A36M Specification for Structural Steel.

2. A570 (Grade 33) Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.

3. A575 Specification for Steel Bars, Carbon, Merchant Quality, M-Grade.

4. A576 (Grade 1015) Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.

5. A635 Specification for Steel, Sheet and Strip,, Heavy-Thickness Coils, Carbon, Hot-rolled.

6. B117 Method of Salt Spray (fog) Testing.

7. B209 Specification for Aluminum and Aluminum Alloy Sheet and Plate.

8. B221 Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes, and Tubes.

9. B308 Specification for Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.

C. American Iron and Steel Institute (AISI) Specification for the Design of Cold-Formed Steel Structural Members.

D. Federal Specifications (FS): FF-S-325 Shield, Expansion, and Nail, Drive Screw (Devices, Anchoring, Masonry).

1.03 STRUCTURAL REQUIREMENTS

A. Aluminum Slotted Framing: Comply with the following:

1. Work shall remain rigid and free of vibration, sway, or excessive deflection under anticipated loads.

2. Work shall safely support anticipated loads consisting of piping, service fixtures, and equipment (approximately 20 lbs./square foot).

B. Anchoring Devices: Support dead load of framing system plus specified live loads with a safety factor of 2.5. Contractor shall be responsible for design of anchorage of Aluminum Slotted Framing System to existing concrete-filled metal deck and to partitions.

1.04 SUBMITTALS

A. Comply with Section 013300 requirements.

B. Shop Drawings/Product Data:

1. Aluminum Slotted Framing System member size, weight/wall thickness, shape; kinds and locations of shop and field connections; fittings and accessories; support and anchorage; relation to building frame, floors, and walls; and other data necessary to fabricate, erect and coordinate work of affected trades.

2. Anchorage to existing construction: Contractor shall design and submit proposed anchorage of Aluminum Slotted Framing System to existing concrete-filled metal deck and to partitions.

C. Structural calculations signed and sealed by a structural engineer licensed in the State of Connecticut. Calculations may include, but are not limited to:

1. Description of design criteria.

2. Stress and deflection analysis.

3. Loads of Aluminum Slotted Framing System, including anticipated live loads described above, on existing building structure.

4 Anchorage of Aluminum Slotted Framing System to concrete-filled metal deck and partitions.

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Work shall be done by a manufacturer regularly engaged in producing assemblies of the required kind and quality. He shall have the equipment, skilled workers, and capacity to accomplish the work and meet the Construction Schedule. He shall employ the services of a Professional Engineer, registered in the State of Connecticut, to design work to meet specified structural requirements.

2. The manufacturer shall certify in writing that all components supplied have been produced in accordance with an established quality assurance program.

.

B. Installer's Qualifications:

1. Installer shall be authorized by framing system manufacturer with not less than 5 years experience in the installation of systems of this size and complexity.

2. All system components shall be supplied by a single manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 016000 requirements.

B. All material is to be delivered to the work site in original factory packaging.

1.07 PROJECT CONDITIONS

A. Field Measurements: Fabricate work to field dimensions where possible. Where field measurements cannot be made without delaying work, make proper allowances for trimming and fitting. This provision does not relieve the Contractor of his responsibility for accurately fabricating and installing his work and fitting it to adjoining work.

B. Confirmation of Adjacent Construction: Contractor shall field verify site conditions and adjacent construction to which Aluminum Slotted Framing System will be anchored.

1.08 SEQUENCING/SCHEDULING

A. Coordinate delivery and installation of items required for support of other trades.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. All Aluminum Slotted Framing System components shall be manufactured by a single manufacturer: 1.5 Series by Bosch Rexroth (www.boschrexroth-us.com), or Aluminum Fractional T-Slotted Framing System, 80/20 Inc. Columbia City, IN 46725 (260-248-8030), or approved equal.

2.02 MATERIALS

A. Standard 4-slot (one per side) extrusions of 6105-T5 aluminum, 1-1/2" x 1-1/2", 1-1/2" x 3", and of other sizes as shown on drawings, or as needed to satisfy performance criteria, with a system of connectors, black polystyrene end-caps, black polystyrene slot covers, and zinc/steel fasteners. See drawings for size of assemblies, and lengths of extrusions required.

B. Slotted Framing supports square clear anodized aluminum welded wire mesh panels, attached with mesh panel retainers (47065T198).

C. Wire Mesh: 1" x 1" wire mesh, square welded, by McNichols, New Brunswick, NJ (877-884-4653), or approved equal.

D. Anchors:

1. Expansion Shields: Fed. Spec. FF-S-325, Group I, Type I, Class 2, head-out multiple unit bolt expansion shield.

2. Self-Threading Concrete Anchors: Buildex Tapcon Concrete Anchors or Ackerman Johnson Mascrus or approved equal, proof load 4x design load, suitable for driving into 4,000 psi concrete without concrete or anchor failure.

2.03 GENERAL FABRICATION REQUIREMENTS

A. Make work neat, accurate, and free from defects that impair strength, function or appearance.

B. Shear and punch work cleanly and accurately. Remove burrs. Ease sharp exposed edges.

C. Make straight sections free of bow or camber. Make bends to constant radii.

D. Make flush, tight, butt joints where not otherwise shown/specified. Locate joints where least conspicuous.

E. Fit and trial assemble work in the shop. Permanently shop-assemble work into the largest section that meet shipping and field conditions. Use connections that maintain structural value of joined pieces.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Comply with Section 016000 requirements.

3.02 INSTALLATION REQUIREMENTS

A. Install work per approved shop drawings; square, level, plumb, and true; free from distortion; and in proper relation to adjoining work. Provide all anchoring devices necessary to secure work to building structure.

B. Carefully fit and true work before joining and anchoring it. Make field joints and connections to standards specified for fabrication.

C. Anchorage: Where not otherwise specified, anchor work as follows:

1. To Structural Steel: Clamp, bolt or weld.

2. To Hardened Concrete: Use expansion bolts. Shim and grout base plates.

3. To Masonry: Use expansion shields and bolts or self-threading concrete anchors into solid masonry units/mortar filled cores and solid mortar joints, as required to carry loads.

5. To Drywall Construction: Use flat-head toggle bolts into steel framing and steel anchor plates. Do not anchor work to unreinforced gypsum board.

3.05 ADJUSTING, CLEANING, AND PROTECTION

A. Correct nonconforming and damaged work. Replace work that cannot be repaired at the Project.

B. Hand tool-clean field connections and coating abrasions per SSPC SP2.

C. Protect work from damage and abuse.

END OF SECTION

SECTION 055200

DECORATIVE RAIL SYSTEMS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the decorative metal handrails and railings as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Stainless steel rail systems.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

1.5 QUALITY ASSURANCE

A. The contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work. Such prior projects must have involved facilities determined by the Architect to be of landmark quality and/or historical significance. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices and erection shall be in accordance with drawings, specifications, and approved shop drawings, and be of

highest quality practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected. All work shall be accurately and neatly fabricated, assembled, and erected.

1.6 SUBMITTALS

A. Shop Drawings: Submit for all items of work, at full scale as far as practical, showing metal thicknesses, arrangement of components, of joining, of jointing, details of all field connections and anchorages, diagrams and details explaining provisions for thermal movement, fastening and sealing methods, and support methods, metal finishes and all other pertinent information.

B. Samples for Verification: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the work.

1. 6" long sections of each different linear railing member, including handrails, top rails and posts.

2. Fittings and brackets.

3. Welded connections.

4. Assembled samples of railings, made from full size components, including top rail, post and handrail. Show method of finishing members at intersections. Samples need not be full height.

C. Provide signed and sealed calculations by a Professional Engineer licensed in the State of Connecticut, demonstrating compliance with structural performance per State of Connecticut Code.

D. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

1.7 PRODUCT HANDLING

A. Finished Materials: Protect finishes against soiling, staining or damage from scratches and abrasion. Maintain protection during construction until project completion or as otherwise directed by Architect.

1. Provide wrappings, strippable coatings or other means approved by Architect.

2. During construction, remove protection for visual observation of finish as directed by Architect and replace to maintain protection.

1.8 PERFORMANCE STANDARDS

A. Structural Performance of Handrails and Railings: Provide handrails and railings complying with requirements per Connecticut Code and ADA requirements.

B. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in engineering, fabricating, and installing handrails and railing systems to prevent buckling, opening of joints, overstressing of components and connections, damage to adjoining construction, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 deg F ambient, 180 deg F material surfaces.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stainless Steel

1. Comply with the following standards for the forms and types of stainless steel for the required items of work.

a. Pipe: ASTM A 3116, Grade 2205
b. Sheet, Strip, Flat Bar and Plate: ASTM A 666, Grade 316.
c. Tubing: ASTM A 554, Grade 316.
d. Castings: ASTM A 743A, Grade 316.
e. Bars and Shapes: ASTM A 276, Grade 316.

B. Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

C. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of the metal to be welded, and as required for color match, strength and compatibility in the fabricated items.

D. Fasteners for Interconnecting Handrails and Railing Components: Furnish of basic metal and alloy, matching finished color and texture as the metal being fastened, unless

otherwise indicated. Unless otherwise shown, provide Phillips flat-head screws for exposed fasteners.

E. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads. Fasteners shall be fabricated from Type 316 stainless steel.

F. Erosion-Resistant Anchoring Cement: Factory packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.2 FABRICATION

A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than those required to support structural loads.

B. Assemble handrails and railings in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

C. Form changes in direction of members as detailed or, if not detailed, by either of the following methods:

1. By radius bends of radius indicated.

2. By flush radius bends.

3. By bending.

4. By insertion of prefabricated flush elbow fittings.

D. Welded Connections: Fabricate stainless steel handrails and railing systems for connection of members by welding, except as otherwise indicated. Limit non-welded connections to connections that cannot be made in the factory due to size or handling limitations and similar considerations. For connections made during fabrication, weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe or tube to which end is joined, and weld all around.

5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

E. Brackets, Flanges, Fittings and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing system members to other construction.

F. Provide inserts and other anchorage devices to connect handrails and railing systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.

G. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

H. Ease exposed edges to a radius of approximately 1/32", unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.

I. Cut, reinforce, drill and tap components, as indicated, to receive finish hardware, screws, and similar items.

J. Provide weepholes, or another means to evacuate entrapped water, in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources.

K. Fabricate joints that will be exposed to weather in a manner to exclude water.

L. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

M. Close exposed ends of pipe by welding 3/16" thick stainless steel plate in place or with prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4" or less.

N. Fillers: Provide stainless steel sheet or plate fillers, of thickness and size indicated or required to support structural loads of handrails, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses to produce adequate bearing to prevent bracket rotation and overstressing substrate.

2.3 FINISHES

A. Stainless Steel

1. Remove or blend tool and die marks and stretch lines into finish.

2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

3. Finish: Non-directional

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions and directions for installing anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16" in 3 feet.

3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4" in 12 feet.

C. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2" beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6" of post.

3.4 ANCHORING POSTS

A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:

B. Form or core-drill holes not less than 5" deep and 3/4" larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular

space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:

1. Non-shrink, non-metallic grout or anchoring cement.

C. Cover anchorage joint with flange of same metal as post, attached to post as follows:

1. Welded to post after placing anchoring material.

D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

3.5 ANCHORING RAILING ENDS

A. Anchor railing ends into concrete and masonry with round flanges connected to railing ends and anchored into wall construction with post installed anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.

1. Weld flanges to railing ends.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2" clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.

2. For hollow masonry anchorage, use toggle bolts.

3. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.

3.7 PROTECTION

A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 057000

ORNAMENTAL METALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the ornamental metals, including heavy gauge stainless steel and non-ferrous metal products which are used in building construction for functional, architectural, and decorative effects, and which are not a part of other metal systems specified in other Sections. The extent of these items is indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Decorative railings and handrails.

2. Stainless steel plate formed angles and tees for support of decorative glass panel walls.

3. Stainless steel plate formed custom corner guards and decorative frames.

4. Type 316 stainless steel fabrications at Water Lab.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Miscellaneous metals - Section 055000.

1.5 QUALITY ASSURANCE

A. General: Work of this section shall be fabricated and installed by an experienced fabricator or manufacturer who has been engaged in work of equivalent scope and fabrication standards for at least five (5) years. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings, specifications, and approved shop drawings, and be of highest quality practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected. All work shall be accurately and neatly fabricated, assembled, and erected.

B. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. However, do not delay job progress; allow for adjustments and fitting where taking of field measurements before fabrication might delay the work.

C. Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Work that cannot be permanently shop assembled, shall be completely assembled, marked and disassembled in shop before shipment to insure proper assembly in field. Shop assemble work in largest practical sizes to minimize field work. It is the responsibility of the Contractor for this work to assure himself that the shop fabricated items will properly fit the field condition. In the event that shop fabricated items do not fit the field condition, the item shall be returned to the shop for correction.

D. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Shop Drawings: Submit for all items of work of this Section, as enumerated under paragraph 1.2, showing locations, layouts, materials, thicknesses, finishes, dimensions, construction, relation to adjoining construction, erection details, profiles, jointing and all other details to fully illustrate the work of this Section.

B. Samples: Submit fabricated samples (of sufficient size to fully show construction, materials and finishes) of all items of work as enumerated under paragraph 1.2 herein.

C. Product Data: Submit manufacturer's, fabricator's and finisher's specifications and installation instructions for products used in ornamental metal work, including finishing materials and methods.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide materials which have been selected for their surface flatness, smoothness and freedom from surface blemishes where exposed to view in the finished unit. Exposed to view surfaces which exhibit pitting, seam marks, roller marks, "oil-canning," stains, discolorations, or other imperfections on the finished units will not be acceptable.

B. Stainless Steel: Comply with the following standards for the forms and types of stainless steel for the required items of work.

1. Pipe: ASTM A 312, Grade TP 304 or Grade TP 316.

2. Sheet, Strip, Flat Bar and Plate: ASTM A 666, Type 304 or Type 316.

3. Tubing: ASTM A 554, Grade MT 304 or Grade MT 316.

4. Castings: ASTM A 743A

a. Type 304: Grade CF 8 or CF 20.
b. Type 316: Grade CF 8M or CF 3M.

5. Bars and Shapes: ASTM A 276, Type 304 or Type 316.

6. Guardrail Infill: Ornamental Mesh by Carl Stahl.

C. Steel (Carbon) for Concealed Supports Only

1. Structural Shapes: ASTM A 36.

2. Plates (for forming or bending cold): ASTM A 283, Grade C.

3. Steel Sheets: ASTM A 366, Grade 1.

4. Shop prime with rust inhibitive primer equal to Series 88 Azeron made by Tnemec, or approved equal made by Benjamin Moore or Sherwin Williams.

D. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of the metal to be welded, and as required for color match, strength and compatibility in the fabricated items.

E. Fasteners: Furnish basic metal and alloy, matching finished color and texture as the metal being fastened, unless otherwise indicated. Provide Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

F. Anchors and Inserts: Either furnish inserts to be set in concrete or masonry work, or provide other anchoring devices as required for the installation of ornamental metal items. Provide toothed steel or lead shield expansion bolt devices for drilled-in-place anchors. Provide galvanized or cadmium-coated anchors and inserts for exterior installations.

1. Provide units with exposed surfaces matching the texture and finish of the metal item anchored.

G. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

H. Cast-in-Place and Preinstalled Anchors: Anchors fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete.

I. Wire-Rope Fittings: Connectors fabricated from stainless steel, and with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

2.2 FABRICATION

A. Cutting: Cut metal by sawing, shearing or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp, square and free of burrs, without deforming adjacent surfaces or metals.

B. Holes: Drill or cleanly punch holes (do not burn), so that holes will be accurate, clean, neat and sharp without deforming adjacent surfaces or metals.

C. Connections

1. Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to water. Locate joints where indicated on drawings. Provide connections to allow for thermal movement of metal at locations and by methods approved by Architect. For work exposed to view, use concealed fasteners (unless welded or other connections indicated) with joints accurately fitted, flush and rigidly secured with hairline contacts.

2. Welding: Welding shall be in accordance with recommendations of the American Welding Society and shall be done with electrodes and/or methods recommended by the manufacturers of the metals being welded. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces so that joint will not be visible; undercut metal edges where welds are required to be ground flush and dressed smooth. All welds on or behind surfaces which will be exposed to view shall be done so that finished surface will be free of imperfections such as pits, runs, splatter, cracks, warping, dimpling, depressions or other forms of distortion or discoloration. Remove weld splatter and welding oxides from all welded surfaces.

3. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads, where shown to be exposed to view, shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts of adjacent metal.

D. Operating Mechanism: Operating devices, mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.

E. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items for architectural metal work to be built into concrete, masonry, or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.

F. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.

G. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.

H. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.

I. Exposed Work: In addition to requirements specified herein or shown on drawings, all surfaces exposed to view shall be clean, and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs and other defects which mar appearance of finished work. Ornamental metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.

J. Materials used shall be of such strength, thickness and alloy that they are capable of meeting all standards and descriptions specified herein and as detailed on drawings.

2.3 SHOP FINISHING

A. General

1. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated.

2. Provide colors or color matches as indicated on selected samples.

3. Protect mechanical finishes on exposed surfaces from damage by application of strippable temporary protective covering prior to shipment.

4. Corrosion Protection: Coat concealed surfaces which will be in contact with concrete, masonry, wood or dissimilar metals, in exterior work and work to be

built into exterior and below grade walls and decks, with a heavy coat of bituminous paint. Do not extend coating onto exposed surfaces.

B. Stainless Steel

1. Remove or blend tool and die marks and stretch lines into finish.

2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

3. Bright, Directional Polish: No. 4 finish.

4. Satin, Directional Polish: No. 6 finish.

5. Satin Reflective, Directional Polish: No. 7 finish.

6. Mirror-Like Reflective, Non-Directional Polish: No. 8 finish.

7. When polishing is complete, passivate and rinse surfaces. Remove foreign matter and leave surface chemically dry.

2.4 PROTECTION

A. Provide necessary protection to all exposed surfaces of architectural metal work, so as to prevent damage, staining, discoloration, abrasion, etc., to these surfaces from time of shipment from factory to acceptance of work of this project. Protection shall be provided by wrappings, strippable coatings, or other means. After installation, remove protective paper or strippable coating and clean exposed surfaces, and then provide additional temporary protection to protect architectural metal work from damage during subsequent construction activities. Surfaces which are damaged, stained, discolored, abraded etc., shall be rejected and replaced with new materials, at no cost to the Owner.

2.5 STEEL FRAMING, BRACING, SUPPORTS AND REINFORCEMENTS

A. Steel framing, plate reinforcing, supplementary steel framing or reinforcing, bracket assemblies, and the like required for the support, framing, reinforcing, bracing, etc., of work of this Section shall be of such sizes and shapes as indicated on the drawings, or as required to suit the conditions, and shall be provided with all necessary supports and accessory items such as inserts, hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly and rigidly fasten, anchor or attach work of this Section in place and to the concrete, masonry and other connecting and adjoining work.

2.6 ORNAMENTAL HANDRAILS AND RAILINGS

A. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove flux immediately.

4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

5. Form changes in direction of railing members by radius bends.

6. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, or otherwise deforming exposed surfaces of handrail and railing components.

7. Provide wall returns at ends of wall-mounted handrails, close ends of returns.

8. Close exposed ends of handrail and railing members with prefabricated end fittings.

9. Brackets, Flanges, Fittings, and Anchors: Provide brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

   a. Furnish inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
   b. For railing posts set in concrete, provide preset sleeves of steel, not less than 6 inches long and inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

2.7 STAINLESS STEEL FRAMING

A. Fabricate frames from stainless steel plate formed angles and tees to the sizes and shapes indicated. Miter and weld frame members at corners. Secure wall panels in frames as detailed on the drawings; all welds shall be ground smooth and flush.

B. Refer to Section 033500 for concrete fabrications.

2.8 CORNER GUARDS

A. Surface-Mounted, Stainless Steel Corner Guards: Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.

   1. Material: Stainless steel sheet, Type 304, minimum 0.050" thick, with No 4 directional satin finish.

2.9 FRAMED OPENINGS

A. Stainless steel custom frames for drywall openings, formed from stainless steel plate, Type 304 with No. 4 directional finish. Concealed attachment.

2.10 STRUCTURE FOR SUPPORT OF DECORATIVE GLASS PANELS

A. Rectangular, ornamental stainless steel tubing, with laser fused 90 degree corners, in size as shown on the architectural drawings; Type 304 stainless steel with No. 4 directional satin finish.

B. Internal stainless steel sleeve with welded bottom plate as a concealed base for all decorative tubes.

C. Tubing will have conduit for AV, Data and Electrical wiring incorporated inside of tube. Provide necessary finished openings for wiring with flush cover plates, held with flush, stainless steel tamper-proof snake-eye screws.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where ornamental metal work is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. General: Install work of this Section square, plumb, straight, true to line or radius, accurately fitted and located, with flush, tight hairline joints (except as otherwise indicated or to allow for thermal movement), with provisions for other trades, with provisions to allow for thermal movement, with provisions to exclude water where exposed to weather, and with attachment devices as required for secure and rigid installation. It is the responsibility of the Contractor to assure himself that shop fabricated architectural metal items will properly fit the field condition. In cases where the shop fabricated architectural metal items do not fit the field condition, the item shall be returned to the shop for correction.

B. Attachments

1. Unless otherwise indicated, work to be built into concrete or masonry shall be anchored with shop welded on galvanized steel strap anchors; work to be attached to concrete or masonry shall be anchored by bolts into embedded inserts or expansion shields; work attached to structural steel shall be anchored by welds or bolts; work attached to metals other than structural steel shall be anchored by bolts or screws. Power actuated fasteners not permitted unless approved by Architect. Provide all supplementary parts necessary to complete each item of work of this Section.

2. All attachment devices shall be of type, size and spacing to suit condition and as approved by Architect. Provide shims, slotted holes, or other means necessary for leveling, plumbing and other required adjustments. Attachment devices for work exposed to view shall be concealed, unless indicated otherwise. Where bolts or screws are permitted in work exposed to view, they shall be oval head and counter sunk, unless otherwise noted, with projecting end cut off flush with nuts or adjacent material, and shall match adjacent surfaces.

3. Do all necessary drilling, tapping, cutting or other preparations of surrounding construction in the field accurately, neatly and as necessary for the attachment and support of work of this Section, but obtain Architect's approval prior to such preparation to work of others.

C. Tolerances: All work of this Section shall be plumb, square, level, true to radius and correctly aligned within the following limitations:

1. Offset from true horizontal, vertical and design location shall not exceed 1/16" per ten (10) feet of length for any component, not cumulative.

2. Maximum offset from true alignment between abutting components shall not exceed 1/32".

D. All railings shall be installed to withstand loads as required by prevailing Building Code.

E. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units at Contractor's option.

F. Install concealed gaskets and joint fillers as the work progresses, so as to make the work soundproof or lightproof as required.

G. Restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.

H. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.

I. Field Welding: Comply with AWS Code for the procedures of manual shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

3.3 CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

3.4 PROTECTION

A. Protect finishes of ornamental metal from damage during construction period with temporary protective coverings approved by ornamental metal fabricator. Remove protective covering at the time of Substantial Completion.

B. Restore finishes damaged during construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 057100

ORNAMENTAL METAL STAIRS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the architectural stairs as indicated on the drawings and specified herein, including, but not limited to, the following:

1. Steel stair with terrazzo treads, including all clips, hangers, inserts, braces, and other supports.

2. See Section 057000 for guard and handrail.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Structural Steel - Section 051200.

E. Ornamental Metals - Section 057000.

1.5 QUALITY ASSURANCE

A. General: Work of this section shall be fabricated and installed by an experienced fabricator or manufacturer who has been engaged in work of equivalent scope and fabrication standards for at least five (5) years. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings, specifications, and approved shop drawings, and be of highest quality practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected. All work shall be accurately and neatly fabricated, assembled, and erected.

B. Qualification of Welders: Use only certified welders and the shielded arc process for all welding performed in connection with the work of this Section. Protect adjacent surfaces when field welding to prevent damage or stain. Welders and welding operators must be qualified by tests as provided by AWS.

C. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with:

1. "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction.

2. "Code for Welding in Building Construction" of the American Welding Society.

3. "Metal Stairs Manual" of the National Association of Architectural Metal Manufacturers.

D. Conflicting Requirements: In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards of these specifications, the provisions of the more stringent shall govern.

E. Field Measurements: If construction process permits, take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress. Allow for trimming and fitting wherever taking field measurements before fabrication might delay work.

F. Tolerances: Allow for construction tolerances as required.

G. Coordination: Coordinate this work with the work of all other trades interfacing with architectural stairs, such as structural and other trades as required.

H. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall

be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

1.6 DRAWING SUBMISSION

A. General: It is the intent of the Working Drawings to display the layouts and general design parameters upon which the Shop Drawings shall be developed. Detail development and all connections shall be part of Shop Drawing Development. Show metal thicknesses, arrangement and joining of components, and details indicating provisions for thermal movement and fastening.

B. Shop Drawings

1. Before any steel stairs are fabricated, submit shop drawings to the Architect for approval.

2. Show all locations, markings, quantities, materials, sizes and shapes, and indicate all methods of connecting, anchoring, fastening, bracing, for the stair construction, support and attachment to the work of other trades.

C. Engineering Data Drawings

1. Before any architectural stairs are fabricated, submit engineering data drawings to the Architect and Structural Engineer for review. The Contractor is responsible for the structural design and supports for the stair system and must show his proposed system on these drawings.

2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of stair members. Calculations and drawings must be prepared by a Structural Engineer licensed in the State of Connecticut and shall be signed and sealed by this Engineer.

1.7 SAMPLES SUBMISSION

A. Submit the following listed samples and other samples as may be requested by the Architect, to show the quality standards:

1. Exposed weld.

2. Exposed bolted connection.

3. Tread and riser combination.

B. Samples shall be submitted cleaned and shop primed and shall represent standards to which all respective materials used in the Project shall meet.

1.8 LEED SUBMISSION

A. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.9 PERFORMANCE STANDARDS

A. Stairs and railings shall be constructed to conform to the following performance standards, unless greater required by Code:

1. Stairs and platforms shall support a live load of one hundred (100) psf and a concentrated live load of three hundred (300) lbs. and shall have a live load deflection limited to 1/360 of the span. Loads shall not apply simultaneously.

2. Railings shall withstand a two hundred (200) lb. force applied to rail from any direction, and a uniformly distributed load of 50 lbs./lin. ft. applied downward or horizontally, loads not to act simultaneously.

1.10 PRODUCT HANDLING

A. Protection: Use all means necessary to protect architectural stair before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel and Iron: Comply with the following standards for the forms and types of steel for the required items of work.

1. Steel Plates, Shapes and Bars: ASTM A 36.

2. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.

3. Structural Steel Sheet: Hot rolled, ASTM A 570; or cold rolled, ASTM A 611, Class 1; of grade required for design loading.

4. Galvanized Structural Steel Sheet: ASTM A 924, of grade required for design loading. Coating designation G90.

5. Steel Pipe: ASTM A 53, type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.

6. Gray Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.

7. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.

8. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

9. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

   a. Inserts shall be forwarded to the precast manufacturer in order to be cast into the precast elements.

10. Bolts and nuts for stair assembly shall be high strength bolts, ASTM A 325 SC, with hardened washers.

B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Bituminous Paint: Cold-applied asphalt mastic, ASTM D 1187.

D. Ornamental Guardrails and Handrails: Provide railings fabricated on stainless steel tubes conforming to ASTM A 554, with #4 polished finish. Welds shall be flush and inconspicuous. Infill material shall be stainless steel flexible mesh fabricated of Type 316 stainless steel wire rope joined with Type 316 stainless steel ferrules. Mesh direction shall be horizontal for rectangular frame shapes and diagonal for staircases.

E. Precast Terrazzo Treads

1. Provide precast terrazzo stair treads as detailed on drawings with 3" abrasive nosings consisting of aluminum oxide or silicone carbide; color as selected by the Architect.

2. Comply with NTMA specifications and recommendations for fabrication of precast terrazzo. Reinforce all precast terrazzo units.

3. Match color and pattern of precast work with color and pattern of cast in place work, unless different color and pattern required.

4. Furnish all inserts, anchors and accessories required for complete installation.

2.2 FABRICATION

A. General

1. Architectural steel stair work shall be fabricated by an experienced manufacturer in accordance with approved shop drawings and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand strains and stresses to which material will be subjected.

2. Fabricate shop assemblies in largest practical sizes to minimize field work. All exposed surfaces shall be clean and free from all dirt, stains, grease marks, scratches, waves, dents, buckles, tool marks, rattles, and other objectionable defects which mar appearance or use of finished work.

3. Cutting: Cut materials by sawing, shearing, or blanking. Flame cutting will be permitted when ground back to clean edges. Cuts shall be made accurately, clean, sharp and free of burrs, without deforming adjacent metals.

4. Connections: Make connections with tight joints, capable of developing full strength of the members, flush. Locate joints where least conspicuous. Use concealed fasteners where possible. Weld or rivet shop connections; bolt, screw or weld field connections.

a. Welding: Welds shall be continuous, except where spot welding is specifically permitted. Welding shall conform to the Standard Code of the American Welding Society. Exposed welds are required to be ground flush and smooth.
b. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts, or upset thread ends. Exposed bolts and screw head shall be flat and countersunk, unless otherwise indicated on drawings.

Remove projecting ends of bolts and screws. Punch or drill holes; do not burn.

B. Stairs and Platforms

1. Provide stringers and supports for risers, treads and platforms matching profiles as shown. Form tread support in a continuous piece to receive the finished tread. Weld carrier angles to the structural steel stringers.

2. On intermediate platforms, provide metal bases formed of stringers. Miter and weld and grind smooth internal and external corners of metal bases. Form platform runs of minimum ten (10) gauge steel.

3. Properly fit and securely fasten together all parts making exposed joints close fitting. Cut, drill, punch and tap as required for installation.

4. Make joints as strong and rigid as adjoining sections. Weld continuously along entire line of contact except where spot welding is indicated.

5. Give ferrous metal surfaces a shop coat of primer. Before painting, thoroughly clean surfaces with wire brushes or other proper and effective means of removing loose scale, filings or other objectionable materials.

6. Remove grease prior to painting. Separate dissimilar metals in or adjacent to work of this Section with a coat of bituminous paint on each surface prior to installation.

7. Struts, Hangers, Platform Headers and Subframing

   a. Provide supports as detailed and required, including all struts, clip angles, angles or hangers which are required and necessary for support of stair construction.
   b. Supports shall be of size suitable for the support load, as required. Struts, angles and hangers shall be supported by and directly connected to the structural framing. Struts and hangers, with their connections, shall be concealed.
   c. Provide other inserts, anchors and/or other subframing as may be required to complete the stair construction and properly support it on the structural framing.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where architectural stairs are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Work in the field shall comply with the same requirements as specified for shop work above.

B. Provide connecting members needed for properly securing the work to drywall and structural framing, including bolts, machine screws, rods, hangers, inserts, sleeves, plates, anchors, expansion bolts, washers and other items as required. Furnish built-in items to drywall trades as required for proper anchorage.

C. Leave work exposed to view clean, smooth and neatly finished. All exposed welds shall be dressed smooth.

D. Include supplementary parts necessary to complete each item even though such work is not definitively shown or specified.

E. Coordinate and schedule the work of this Section with the work of other trades. Furnish anchors, sockets, fastenings and other miscellaneous items to be embedded in concrete or masonry, or required for securing metal work to other construction so as not to delay job progress.

F. Install work plumb and true to the exact lines and levels, in the correct location and in proper relation to adjoining work.

G. Touch up marred and abraded shop paint of exposed surfaces after erection in the field.

3.3 TOUCH-UP PAINTING

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop coat, and paint exposed areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

END OF SECTION

SECTION 057700

STRUCTURAL GLASS CANOPY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the structural glass canopy as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Engineering and design of structural glass canopy.

2. Stainless steel canopy frame.

3. Fabrication, packaging and delivery.

4. Erection by an installer approved by the wall manufacturer or under the direction of a technical advisor of the manufacturer.

5. Provision and installation of glass and glazing accessories, and associated fittings as part of glass canopy assemblies.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Ornamental metals - Section 057000.

E. Glass and glazing - Section 088000.

1.5 PLANS AND SPECIFICATIONS

A. The drawings (building elevations, floor plans and design details) and specifications are an outline of the criteria and performance requirements of the work. The requirements shown by the details are intended to establish basic dimensions of the module and the site lines, jointing and profiles of members. Within these parameters, the Contractor is responsible for the design and engineering of the entire system, including whatever modifications or additions may be required to meet the specified requirements and maintain the visual design concept for the entire project.

B. It is recognized that the design details do not cover some conditions, or modifications which may be required. It is, however, intended that conditions not detailed shall be developed through Contractor's shop drawings to the same level of aesthetics and in compliance with performance criteria, as indicated for detailed areas and stipulated in these specifications. The Contractor, by accepting a contract for the work, acknowledges this and agrees that the Architect shall have the final say as to all matters whether detailed or not on the design details.

1.6 QUALITY ASSURANCE

A. The work of this Section shall be performed by a Contractor approved by the manufacturer and who is regularly engaged in the engineering, manufacture, fabrication, finishing, installation, glazing, and sealing of similar work. The Contractor shall demonstrate to the satisfaction of the Architect that he has successfully performed this type of work on comparable projects over the past five years. The subcontracting of any work included hereunder is specifically prohibited except for that which may be approved by the Architect in writing prior to award of this Contract.

B. The Architect reserves the right to visit the fabricating facilities of the Contractor, and any of its approved Sub-Contractor at any time when the work is in progress. All shop and field materials and workmanship shall be subject to inspection by the Architect and his representatives at all times. Such inspections do not relieve the Contractor from obligations to provide materials conforming to all requirements of the Contract Documents.

C. Pre-Installation Meeting: Meet at the project site with the representatives of the glass and glazing materials manufacturers, architectural exposed structural steel fabricator and erector, sealant manufacturer, the glazing installer, Architect’s representative and Owner’s representative. Review the glazing procedure and schedule, including the method of delivering and handling glass, and installing glazing materials. The chemical compatibility of all glazing materials and framing sealants with each other and with like materials used in glass fabrication shall be established.

D. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic

Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

1.7 PERFORMANCE REQUIREMENTS

A. Structural Members: Comply with ASCE-7 whichever is more stringent.

B. The deflection of a glass framing member in a direction normal to the plane of glass when subjected to a uniform load deflection test in accordance with ASTM E 330, and per the above specified loads, shall not exceed 1/175 nor one (1) inch of its clear span for spans less than twenty (20) feet or 1/240 of clear spans greater than twenty (20) feet.

C. The deflection of a glass framing member in a direction parallel to the place of the glass, when carrying its full dead load, shall not exceed an amount which will reduce the glass or panel bite below seventy-five (75) percent of the design dimension and the member shall have a 1/8" minimum clearance between itself and the edge of the fixed panel, glass, or component immediately adjacent, nor shall it impair the function of or damage any joint seals.

D. Water Penetration: No water penetration shall occur when system is tested in accordance with AAMA 501.2. "Hose Test." Water penetration is defined as the appearance of uncontrolled water on the interior surface of any part of the canopy.

E. Thermal Movement: Provide for such expansion and contraction of component materials to one-hundred-eighty (180) degrees F. without causing buckling, stresses on glass, failure of seals, undue stress on structural elements, reduction of performance or other detrimental effects.

F. Where permitted by code, a 1/3 increase in allowable stress for wind or seismic load shall be acceptable, but not in combination with any reduction applied to combined loads. In no case shall allowable values exceed the yield stress.

G. Compression flanges of flexural members may be assumed to receive effective lateral bracing only from anchors to the building structure and, horizontal glazing bars or interior trim which are in contact with fifty (50) percent of the member's total depth.

1.8 SUBMITTALS

A. Structural Calculations: Prior to fabrication of the structural glass wall system and canopy assembly submit design calculations prepared by a PE licensed in the State of Connecticut in accordance with current design rules of the AISC and applicable codes. Include analysis for all pertinent load cases live, dead, wind, thermal, seismic, etc.

1. Supply reactions at supports for review by project engineer and maximum frame deflections.

2. Supply calculations for supports and other details as necessary.

3. Existing test reports will not be acceptable in lieu of calculations.

4. All data must be sealed by PE noted above.

B. Shop Drawings: Submit complete shop drawings including details. Show dimensioned layout of suspended glass curtain wall and glass vestibule in relation to adjacent work such as walls, columns, beams and slabs, etc., coordination of built-in concealed gutter and leader system, and all other details to fully illustrate the work of this Section.

1. Include details of all supports and data to show provisions for vertical and horizontal expansion/contraction of curtain wall as necessary.

2. Identify all materials and all attachment devices and accessories.

3. Include coordination details and drawings for related and adjoining work, and erection diagrams.

4. Submit drawings at full scale as far as practical, showing metal and glass thicknesses, arrangement of components, of joining, details of all field connections and anchorage, field measurements, diagrams and details explaining provisions for thermal movement, waterproofing, fastening and sealing methods, glazing methods, and all other pertinent information.

C. Samples

1. Glass: 12" x 12" samples of each glass type.

2. Anchors, gaskets, full size.

3. Spring plate assembly with glass, bolt and accessories.

4. Stainless steel framing member, 12" long.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.

b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.9 GUARANTEE

A. Guarantee shall state that all work is in accord with drawings and specifications as amended by any changes thereto authorized by the Architect, free from defects in materials and workmanship and weathertight for a period of twelve (12) years from the date of acceptance of the work by the Owner. Contractor shall agree to repair or replace defective materials and workmanship during the guarantee period at no additional cost to the Owner.

B. Defective materials and workmanship is hereby defined to include evidence of abnormal deterioration, aging or weathering of the work, significant leakage of water or air, structural failure of components (including glass breakage) resulting from exposure to specified loads, failure of operating parts to function normally, sealant failures, deterioration or discoloration of finishes in excess of normal weathering and aging, and failure to fulfill other specified performance requirements.

C. Guarantee shall further state that glass shall be guaranteed against breakage due to defects in glass materials, and/or installation for a period of 5 years after acceptance of the work by the Owner.

D. Contractor shall be responsible for damage to the building and furnishings occasioned by defective materials or workmanship or damaged as part of repairs to the wall.

E. This guarantee, the enforcement or lack of enforcement thereof, shall not deprive the Owner of other actions, rights or remedies available to him. Guarantee shall be in a form acceptable to the Owner.

1.10 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Factory finished components shall be stored, handled and shipped in a manner that will provide unscratched and undamaged units delivered to the site. Time delivery of material to the site to insure uninterrupted progress of the work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Glass

1. Glass shall be as manufactured by Pilkington, 20 mm clear laminated, made up of a 12 mm heat strengthened outerlite, 1.56 mm SGP (designed for UV exposure) with transparent spacers, and a 6 mm clear heat strengthened inner layer. (Interlayers not designed for UV exposure are not acceptable; PVB interlayers are not acceptable.)

   a. Provide ceramic frit pattern within interlayer. Pattern as indicated on drawings.
   b. Glass thickness shall be increased as need to meet design loads.

2. All tempered glass must be heat soak tested to convert nickel sulfide inclusions from the alpha phase to the beta phase so that the glass will fracture in the test. Manufacturer must show by statistical analysis of test data that the probability of failure is not greater than 1 in 54,000 sq. ft. of tempered glass.

3. Written warranties against nickel sulfide inclusions in lieu of heat soaking will not be accepted.

4. All edges shall be ground flat with a frosted appearance unless otherwise noted.

5. All edgework, holes and notches in the tempered glass panels will be completed before tempering and shall comply with the requirements of Pilkington glass limited as stated below:

   a. Dimensional tolerance on panel size will be +/- 1 mm of the theoretical dimension required.
   b. Squareness of each panel will be within 3 mm.
   c. Bow allowance is 0.1%.
   d. The positional tolerances on all holes will be +/- 1 mm from a single datum point.

6. Pre-stress glass around holes to a level which is compatible with the design and use of the fittings. Check by differential surface refractometer on stress level.

B. Fittings

1. Planar fittings shall be manufactured from stainless steel Grade 316. Type of fitting shall be Spider fitting.

2. The Contractor shall demonstrate to the Architect's satisfaction that the stresses induced in the glass by these fittings are compatible with the strength of the glass and the needs of the performance section of this specification.

3. The finish of all fittings will be No. 4 brush.

4. Spring plates shall be designed to the Architect's specification. The design shall be shown by the Contractor to be compatible with the performance specification in all respects.

5. Spring plates shall provide a tolerance capability which will cope with the full range of movements shown below

   a. Thermal movements occurring as a result of differential coefficients of thermal expansion within the range specified. The components used within the system shall withstand noiselessly all thermal movements without any buckling, distortion, cracking, failure of joint seals or undue stress on the glass or fixing assemblies.
   b. Maximum side sway of structure due to wind load to the magnitude specified or seismic movement to the degree specified.
   c. Deflection due to self weight of the Planar system.
   d. Inward and outwards movements due to the design wind loads specified.

6. Articulated bolts will be bright machine finished, socket head bolt diameter 1-1/8" with hexagonal shank, stainless steel Type 316.

7. No exterior plates, caps, disks or buttons will be permitted.

8. Bushings will be Nylatron Polyamide, clear in color.

9. Gaskets will be fully vulcanized fiber, neoprene or precured silicone.

C. Stainless Steel

1. Comply with the following standards for the forms and types of stainless steel for the required items of work.

   a. Pipe: ASTM A 312, Grade TP 316.
   b. Sheet, Strip, Flat Bar and Plate: ASTM A 666, Type 316.
   c. Tubing: ASTM A 554, Grade MT 316.
   d. Castings: ASTM A 743A, Grade CF 8M or CF 3M.
   e. Bars and Shapes: ASTM A 276, Type 316.

2. Finish: AISI No. 4.

D. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of the metal to be welded, and as required for color match, strength and compatibility in the fabricated items.

E. Fasteners: Furnish basic metal and alloy, matching finished color and texture as the metal being fastened, unless otherwise indicated. Provide Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

F. Anchors and Inserts: Either furnish inserts to be set in concrete or masonry work, or provide other anchoring devices as required for the installation of ornamental metal items. Provide toothed steel or lead shield expansion bolt devices for drilled-in-place anchors. Provide galvanized or cadmium-coated anchors and inserts for exterior installations.

1. Provide units with exposed surfaces matching the texture and finish of the metal item anchored.

2.2 FABRICATION - GENERAL

A. Cutting: Cut metal by sawing, shearing or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp, square and free of burrs, without deforming adjacent surfaces or metals.

B. Holes: Drill or cleanly punch holes (do not burn), so that holes will be accurate, clean, neat and sharp without deforming adjacent surfaces or metals.

C. Connections

1. Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to water. Locate joints where indicated on drawings. Provide connections to allow for thermal movement of metal at locations and by methods approved by Architect. For work exposed to view, use concealed fasteners (unless welded or other connections indicated) with joints accurately fitted, flush and rigidly secured with hairline contacts.

2. Welding: Welding shall be in accordance with recommendations of the American Welding Society and shall be done with electrodes and/or methods recommended by the manufacturers of the metals being welded. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces so that joint will not be visible; undercut metal edges where welds are required to be ground flush and dressed smooth. All welds on or behind surfaces which will be exposed to view shall be done so that finished surface will be free of imperfections such as pits, runs, splatter, cracks, warping, dimpling, depressions or other forms of distortion or discoloration. Remove weld splatter and welding oxides from all welded surfaces.

3. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads, where shown to be exposed to view, shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts or adjacent metal.

D. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items for architectural metal work to be built into concrete, masonry, or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.

E. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.

F. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.

G. Exposed Work: In addition to requirements specified herein or shown on drawings, all surfaces exposed to view shall be clean, and free from dirt, stains, grease, scratches,

distortions, waves, dents, buckles, tool marks, burrs and other defects which mar appearance of finished work. Metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.

H. Materials used shall be of such strength, thickness and alloy that they are capable of meeting all standards and descriptions specified herein and as detailed on drawings.

I. Where flashing is penetrated by anchors or fasteners provide waterproof washers or mastic as approved by the Architect to insure watertight assembly.

2.3 STAINLESS STEEL FRAMING, BRACING, SUPPORTS AND REINFORCEMENTS

A. Stainless steel framing, plate reinforcing, supplementary stainless steel framing or reinforcing, bracket assemblies, and the like required for the support, framing, reinforcing, bracing, etc., of work of this Section shall be of such sizes and shapes as indicated on the drawings, or as required to suit the conditions, and shall be provided with all necessary supports and accessory items such as inserts, hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly and rigidly fasten, anchor or attach work of this Section in place and to the concrete, masonry and other connecting and adjoining work.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where the structural glass canopy is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

3.2 INSTALLATION: GENERAL OF FRAMING

A. Install work of this Section square, plumb, straight, true to line, accurately fitted and located, with flush, tight hairline joints (except as otherwise indicated or to allow for thermal movement), with provisions for other trades, with provisions to allow for thermal movement, with provisions to exclude water and with attachment devices as required for secure and rigid installation. It is the responsibility of the Contractor to assure himself that shop fabricated items will properly fit the field condition. In cases where the shop fabricated items do not fit the field condition, the item shall be returned to the shop for correction.

B. Attachments

1. Unless otherwise indicated, work to be built into concrete or masonry shall be anchored with shop welded galvanized steel strap anchors; work to be attached to concrete or masonry shall be anchored by bolts into embedded inserts or expansion shields; work attached to structural steel shall be anchored by welds or bolts; work

attached to metals other than structural steel shall be anchored by bolts or screws. Power actuated fasteners not permitted unless approved by Architect. Provide all supplementary parts necessary to complete each item of work of this Section.

2. All attachment devices shall be of type, size and spacing to suit condition and as approved by Architect. Provide shims, slotted holes, or other means necessary for leveling, plumbing and other required adjustments. Attachment devices for work exposed to view shall be concealed, unless indicated otherwise. Where bolts or screws are permitted in work exposed to view, they shall be flat head and counter sunk, unless otherwise noted, with projecting end cut off flush with nuts or adjacent material, and shall match adjacent surfaces.

3. Do all necessary drilling, tapping, cutting or other preparations of surrounding construction in the field accurately, neatly and as necessary for the attachment and support of work of this Section, but obtain Architect's approval prior to such preparation to work of others.

C. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing or provide new units at Contractor's option.

D. Install concealed gaskets and joint fillers as the work progresses, so as to make the work weathertight.

E. Restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.

F. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.

G. Field Welding: Comply with AWS Code for the procedures of manual shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

3.3 INSTALLATION

A. The glass system shall be installed in strict compliance with current published literature and the instructions of manufacturer

B. The Contractor shall have a calibrated torque wrench on site and shall apply the torques recommended by manufacturer to all fasteners. The use of manual wrenches will not be acceptable.

C. Plate to plate joints of glass are sealed with field applied silicone sealant. Joint dimensions shall be designed to be compatible with sealant properties and live load movement of the structure. Each face of joint shall be tooled to a uniform concave profile.

D. Bolt Torque: Torque bolts to torques specified on shop drawings using calibrated tool. Lock torqued bolts into position to prevent back off. Reset calibrations regularly to ensure accurate torquing.

E. Maintain a minimum temperature of 40 deg. F. during glazing unless the manufacturer of the glazing material specifically agrees to application of this material at lower temperature. If job progresses or other conditions require glazing work when temperature is below 40 deg. F. (or below the minimum temperature recommended by the manufacturer), consult the manufacturer and establish the minimum provisions required to ensure satisfactory work.

F. Clean glazing connectors receiving glazing materials of deleterious substances which might impair the work. Remove protective coatings which might fail in adhesion or interfere with bond of sealants. Comply with manufacturer's instructions for final wiping of surfaces immediately before application of primer and glazing sealants. Wipe metal surfaces with Xylol or Toluol.

G. Inspect each unit of glass immediately before installation. Glass which has significant impact damage at edges, scratches or abrasion of faces, or any other evidence of damage shall not be installed.

H. Sealants: Prime surfaces to receive glazing sealants in accordance with manufacturer's recommendations, using recommended primers.

I. Locate setting blocks, if required by the shop drawings, at the quarter points of sill, but no closer than 6" to corners of glass. Use blocks of proper sizes to support the glass in accordance with manufacturer's recommendations.

J. Provide spacers to separate glass from spring plates.

K. Set glass in a manner which produces greatest possible degree of uniformity in appearance. Face all glass, which has dissimilar faces, with matching faces in the same direction.

L. Use masking tape or other suitable protection to limit coverage of glazing materials to the surfaces intended for sealants.

M. Tool exposed surfaces of glazing materials.

N. Clean excess sealant from glass and support members immediately after application, using solvents or cleaners recommended by the manufacturers.

3.4 CLEAN UP

A. Removal of Debris: All debris caused by or incidental to the installation work shall be promptly removed from the job site as the work progresses.

B. Protection and Cleaning: Contractor shall remove from the installed work all mastic smears or other unsightly marks caused by his workmen, that would not be readily removed by normal final cleaning by others with mild soap and water and shall be responsible for any damage or disfigurement of the work caused at any time by his own men.

END OF SECTION

SECTION 062000

CARPENTRY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the carpentry work as shown on the drawings and/or specified herein, including but not limited to, the following:

1. Blocking and miscellaneous wood.

2. Plywood at electrcal rooms.

3. Rough hardware.

4. Installation only of finish hardware.

5. Installation only of doors and hollow metal frames.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Architectural woodwork - Section 064023.

E. Roofing - Section 075200.

F. Steel doors and frames - Section 081113.

G. Wood doors - Section 081416.

H. Finish hardware - Section 087100.

1.5 QUALITY ASSURANCE

A. Lumber Standard: Comply with PS 20.

B. Plywood Standard: Comply with PS 1 and American Plywood Assoc. (APA).

C. Shop fabricate carpentry work to the extent feasible and where shop fabrication will result in better workmanship than feasible for on-site fabrication.

D. Grade Marks: Identify lumber and plywood by official grade mark.

1. Lumber: Grade stamp to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number or name, grade of lumber, species grouping or combination designation, rules under which graded where applicable, and condition of seasoning at time of manufacture.

a. S-Dry: Maximum nineteen (19) percent moisture content as per ASTM D 2016.

E. Installation of doors, frames and hardware shall conform to the minimum standards of "Installation Guides for Doors and Hardware" of the Door and Hardware Institute.

F. LEED Building Performance Requirements

1. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

2. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

3. Engineered wood, not including salvaged wood, shall contain a minimum of 10% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, medium density fiberboard) to be permanently installed on the interior of project shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI). Certification of these products shall be in accordance with the LEED Building Submittal Requirements of this Section.

5. Adhesives used for work in this section, including plastic laminating adhesives, shall contain no added Urea Formaldehyde.

6. Wood Materials manufactured, fabricated, and/or harvested within 500 miles (by air) of the project site shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

7. Solid wood materials shall be FSC-certified by the Forest Stewardship Council as sustainably harvested. Documentation of FSC certification shall be in accordance with the LEED Building Submittal requirements of this Section.

8. Adhesives, sealants, paints and coatings used for work in this section shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable. VOC Limits include, but are not limited to the following:

Clear Wood Varnish	350 g/l
Clear Wood Lacquer	550 g/
Wood Stains	250 g/l
Sanding Sealers	275 g/l
Clear Shellac	730 g/l
Pigmented Shellac	550 g/l

1.6 SUBMITTALS

A. Pressure Treatment: Include certification by treating plant stating chemicals and process used, net amount of salts retained and conformance with applicable standards.

B. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with governing ordinances and that treatment will not bleed through finished surfaces.

C. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify that no added urea formaldehyde is present in any composite wood materials, agrifiber material, or adhesive.

4. Documentation for all new wood products, including FSC Certified. Provide vendor invoices for all permanently installed wood products, FSC Certified or not. Each wood product must be identified on a line-item basis. FSC products must be identified as such on a line item basis. The dollar value of each line item must be shown. The vendor's Chain-of-Custody certificate number must be shown on any invoice that includes FSC products.

5. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

6. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING

A. Deliver carpentry materials to the site ready to use with each piece of lumber clearly marked as to grade, type and mill, and place in an area protected from the elements.

B. Deliver rough hardware in sealed kegs and/or other containers which shall bear labels as to type and kind.

C. Pile lumber for rough usage, when delivered to the site in stacks to insure drainage and with a minimum clearance of six (6) inches above grade. Cover stacks with tarpaulins or other watertight coverings. Store grounds and similar small sized lumber inside the building as soon as possible after delivery.

D. Do not store seasoned lumber in wet or damp portions of the building.

E. Protect fire retardant treated materials against high humidity and moisture during storage and erection.

F. Remove delivered materials which do not conform to specified grading rules or are otherwise not suitable for installation from the job site and replace with acceptable materials.

G. All items specified in Section 087100 of this specification entitled "Finish Hardware" shall be received, accounted for, stored and applied under this Section.

H. Hardware shall be sorted and stored in space assigned by Contractor and shall be kept at all times under lock and key. The safety and preservation of all items delivered will be the responsibility of the Contractor.

1.8 JOB CONDITIONS

A. Installer must examine the substrates and supporting structure and the conditions under which the carpentry work is to be installed, and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer and the Architect.

B. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

PART 2 PRODUCTS

2.1 WOOD MATERIAL

A. General

1. All wood shall be sound, flat, straight, well seasoned, thoroughly dry and free from all defects. Warped or twisted wood shall not be used.

2. For miscellaneous wood blocking, grounds, furring as required, use Utility Grade Coastal Douglas Fir or Southern Pine, free from knots, shakes, rot or other defects, straight, square edges and straight grain, air seasoned with maximum moisture content of nineteen (19) percent. Wood shall be S4S, S-Dry, complying with PS-20.

3. For closet shelving, provide 3/4" thick A-A INT-APA plywood with 1/4" thick hardwood edges, fire retardant treated as specified herein.

4. Plywood and rough carpentry for telephone and electric closets, provide 3/4" thick C-D EXT-APA plywood, fire retardant treated as specified herein.

B. Wood Treatment

1. All interior wood material specified herein shall be fire retardant treated to comply with the AWPA standards (C20 for lumber, C27 for plywood) for pressure impregnation with fire retardant chemical to achieve a flame spread rating of not more than 25 (UL Class "FR-S") when tested in accordance with UL Test 723 or ASTM E 84. The fire retardant chemicals used to treat the lumber must comply with FR-1 of AWPA Standard P17 and be free of halogens, sulfates and ammonium phosphate.

    a. After treatment, kiln dry to a moisture content of fifteen (15) percent; if wood is to be painted or finished, kiln dry to a moisture content of twelve (12) percent. Treatment shall be equal to "Dricon" made by Arch Wood Protection Inc. or approved equal. Provide UL approved identification on treated materials.

2. For exterior blocking, roofing and sheet metal, pressure treat wood with copper azole, Type A (CBA-A); ammoniacal copper quat (ACQ) or similar preservative product that contains no arsenic or chromium. Preservative shall comply with AWPA Standard C-2 for lumber and C-9 for plywood, (.25 lbs./cubic foot of chemical in wood).

    a. After treatment, kiln dry to a maximum moisture content of fifteen (15) percent. Treatment shall be equal to "Wolmanized Natural Select" made by Arch Wood Protection Inc. or approved equal.

3. Treated wood which is cut or otherwise damaged shall be further treated in accordance with the AWPA Standard M-4.

2.2 HARDWARE

A. Rough Hardware for Treated Woods and Exterior Use: ~~Hot-dipped galvanized or~~ Type 304 stainless steel.

B. Nails: Common steel wire, untreated for interior work as per ASTM F 1667.

C. Bolts: Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers conforming to the following:

    1. Bolts: ASTM A 307, Grade A.

    2. Nuts: ASTM A 563.

    3. Lag Screws and Bolts: ASME B 18.2.1.

D. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2; use stainless steel for treated woods and exterior use.

E. Wood Screws: ASME B 18.6.1.

F. Concrete and Masonry Anchors: Standard expansion-shield self-drilling type concrete anchors where so shown or noted on the drawings, or where approved by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where carpentry is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION OF FINISH HARDWARE

A. All finishing hardware specified in Section 087100 of this specification entitled "Finish Hardware" shall be received, accounted for, stored and applied under this Section.

B. Hardware shall be sorted and stored in space assigned by Contractor and shall be kept at all times under lock and key. The safety and preservation of all items delivered will be the responsibility of the Contractor.

C. Hardware shall be carefully fitted and securely attached, in accordance with these specifications and the instructions of the various manufacturers.

D. Unless otherwise noted, mount hardware units at heights established in Section 081113.

E. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.

F. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

G. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

H. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.

I. All keys used shall be construction keys which are to be tagged with fiber discs as approved, clearly labeled with identifying inscriptions and then neatly arranged in a temporary cabinet. All construction keys shall be returned to the Owner.

J. Adjusting and Cleaning

1. Adjust and check each operating item of hardware and each door, to ensure proper operation and function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.

2. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make a final check and adjustment of all hardware items in such space or area. Clean and re-lubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.3 INSTALLATION OF DOORS AND FRAMES

A. Preparation

1. Remove welded-in shipping spreaders installed at factory.

2. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

3. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

B. Installation

1. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

2. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. Install frames in accordance with ANSI 250.11-20001, Recommended Erection Instructions for Steel Frames, unless more stringent requirements are specified herein.
    b. At fire-protection-rated openings, install frames according to NFPA 80.
    c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    d. Install frames with removable glazing stops located on secure side of opening.
    e. Frames set in masonry walls shall have door silencers installed in frames before grouting.
    f. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    g. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

3. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

4. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames conforming to the requirements of Section 072100 "Thermal Insulation."

5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar; refer to Section 042000 "Unit Masonry" for installation of frames in masonry walls.

6. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

7. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other

structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.

9. Installation Tolerances: Adjust steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

10. Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

    a. Non-Fire-Rated Standard Steel Doors:
       1). Jambs and Head: 1/8 inch plus or minus 1/16 inch.
       2). Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
       3). Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
       4). Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
    b. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

11. Glazing: Comply with installation requirements in Division 8 Section "Glass and Glazing" and with standard steel door and frame manufacturer's written instructions.

    a. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

C. Wood Doors

1. Condition doors to average prevailing humidity in installation area prior to hanging.

2. Install doors in accordance with manufacturer's instructions.

3. Fit door to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.

4. Clearances: Install doors to meet clearance requirements specified in Section 081416.

5. Fire-Rated Doors: Install in corresponding fire-rated frames in accordance with the requirements of NFPA No. 80. Provide clearances complying with the limitations of the authority having jurisdiction.

D. Adjustments: Check and readjust operating finish hardware items just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

3.4 BLOCKING AND MISCELLANEOUS WOOD

A. General

1. Erect rough carpentry true to line, levels and dimensions required; squared, aligned, plumbed, and securely fastened in place.

2. Shim where required to true up furring, blocking and the like. Use wood or metal shims only.

3. Do all cutting, fitting, drilling and tapping of other work as required to secure work in place and to perform the work included herein. Do all the cutting and fitting of carpentry work, for the work of other trades as required.

B. Blocking and Miscellaneous Wood

1. Furnish and install all wood grounds, furring, blocking, curbs, bucks, nailers, etc., that may be necessary and required in connection with the carpentry and with the work described for any other trades and including required carpentry for electrical fixtures. All blocking and nailers shall be continuous wherever required, whether or not so indicated.

2. Blocking shall be as required for the proper installation of the finished work and for items in mechanical sections as required. Blocking, edgings, stops, nailing strips, etc., shall be continuous, unless distinctly noted otherwise. Provide blocking as required to install all equipment. Provide blocking and nailers where shown or required to fasten interior sheet metal work.

3. Fastening for wood grounds, furring and blocking shall be of metal and of type and spacing as best suited to conditions. Hardened steel nails, expansion screws, toggle bolts, self-clinching nails, metal plugs, inserts or similar fastenings shall be used, of suitable type and size to draw the members into place and securely hold same.

C. Rough Lumber for Roofing and Sheet Metal

1. Furnish and install all wood nailing strips and wood blocking required in connection with respective types of roofing, fans, flashings, and sheet metal work, using preservative treated wood as herein before specified.

2. Wood blocking shall be of sizes and shapes as indicated on the drawings and/or designed for the reception of curb flashings for roof ventilators and similar items.

3. All nailing strips and blocking shall be carried out in accordance with the printed installation instructions, and/or recommendations of the accepted manufacturer of the roofing materials, and in coordination and cooperation with the sheet metal work trades.

4. All blocking and nailing strips shall be firmly secured in place using counter bored bolt and nut fastenings, or secured by any other proposed flush surfaced fastenings.

5. Wood nailing strips or blocking required to be embedded in concrete work shall be furnished in time due for placing, prior to start of concrete operations. Locations and spacings of nailing strips or blocking shall be performed in coordination with the concrete trades, as required for respective installations.

3.5 TELEPHONE AND ELECTRIC EQUIPMENT MOUNTING BOARDS

A. Furnish and install 3/4" thick plywood panels to the walls of the telephone and electric equipment rooms in accordance with the requirements of the local utility company.

B. Secure to wall using proper devices for substrates encountered, spaced twelve (12) inches o.c., maximum around the edges, 1-1/2" from corners, and in three (3) rows of three (3) each in the field. Recess fastening devices flush with the plywood surface. Adjacent panels shall be butted with 1/16" space between without lapping.

3.6 ROUGH HARDWARE

A. Securely fasten rough carpentry together. Nail, spike, lag screw or bolt as required by conditions encountered in the field and the Contract Documents.

B. Provide rough or framing hardware, such as nails, screws, bolts, anchors, hangers, clips, inserts, miscellaneous fastenings, and similar items of the best quality and of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner.

C. Secure rough carpentry to masonry with countersunk bolts in expansion sleeves or other acceptable manner, with fastenings not more than sixteen (16) inches apart. Secure woodwork to hollow masonry with toggle bolts spaced not more than sixteen (16) inches apart.

D. Countersink bolts in nailers and other rough woodwork and include washers and nuts. Cut bolts off flush with surfaces and peen as may be required to receive finished work.

E. Inserts to secure wood nailers to concrete shall be malleable iron threaded inserts with 3/8" diameter bolts of length to allow for countersinking. Locate at end of each nailer and at intervals not exceeding thirty (30) inches o.c.

F. Furnish to the mason for building into the work, or attaching the work which is to be built in, anchors, bolts, wall plates bolted to masonry, corrugated wall plugs, nailing

blocks, etc., which are required for the proper fastening and installation for the work or other items as called for in this Section.

G. Detailed instructions with sketches of necessary requirements, shall be given to the masonry trade showing the location and other details of such nailing devices.

3.7 CLEANING UP

A. General: Keep the premises in a neat, safe and orderly condition at all times during execution of this portion of the work, free from accumulation of sawdust, cut-ends and debris.

B. Sweeping

1. At the end of each working day, or more often if necessary, thoroughly sweep all surfaces where refuse from this portion of the work has settled.

2. Remove the refuse to the area of the job site set aside for its storage.

3. Upon completion of this portion of the work, thoroughly broom clean all surfaces.

END OF SECTION

SECTION 064023 ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Clear finish, full overlay, wood laboratory and miscellaneous casework and woodwork including but not limited to fixed base cabinets, tall storage cabinets, wall cabinets, desk units, ventilated and OSHA cabinets, wall shelving, fillers, countertop supports, and movable/adjustable height tables.

   a. Stainless steel cabinets at Water Lab 108, all Controlled Environmental Rooms, and other noted locations.

2. Casework countertops of molded epoxy resin, quartzite solid surfacing and of plastic laminate with clear finish and stained wood edges.

   a. Butcher block countertops at First Floor Dry Labs.

   b. Stainless steel countertops at Water Lab 108, all Controlled Environmental Rooms, and other noted locations.

3. Casework hardware.

4. Shop applied casework finishes.

5. Molded epoxy resin bench sinks.

6. Laboratory service fixtures and fittings.

7. Drying racks.

8. Cylinder strap holders.

9. Clear finish and stained wood trim.

10. Ceiling mounted exhaust snorkel.

11. Gas cabinets.

12. **Glass Front Lockers and Tall Storage Cabinets.**

13. Blocking, nailers, furring, grounds, rough hardware, and accessories necessary to install architectural woodwork.

14. Solid wood wall bases

15. Perforated metal umbilicals

16. Shop applied metal finishes

Conformed Set - May 29, 2015

B. Related Sections:

1. Construction and Demolition Waste Management – Section 017419.

2. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

3. Construction Indoor Air Quality (IAQ) Management – Section 018119.

4. Carpentry - Section 062000.

5. Caulking between architectural woodwork and any wall, floor, or ceiling joints - Section 079200.

6. Wood Doors - Section 081416.

7. Glass and Glazing - Section 088000.

8. Painting and Finishing - Section 099000, for field finishing of architectural woodwork.

9. High Performance Laboratory Fume Hoods: Section 116100.

10. Mechanical work: Division 23.

11. Electrical work: Division 26.

1.02 REFERENCES

A. The following standards are cited in this Section. They govern the work of this Section only to the extent specified in each citation.

B. Architectural Woodwork Institute (AWI): "Quality Standards" of AWI shall apply and by reference are hereby made part of this Section. References to Premium in the Specification shall be as defined in the latest edition of the AWI Quality Standards. Any item not given a specific quality grade shall be premium.

C. U.S. Department of Commerce Commercial Standards (CS): CS236-66 Mat-Formed Wood Particleboard.

D. U.S. Product Standards (PS):

1. PS 1, Construction and Industrial Plywood.

2. PS 20, American Softwood Lumber Standard.

3. PS 51, Hardwood and Decorative Plywood.

4. PS 58, Basic Hardwood.

E. American National Standards Institute (ANSI):

1. A156.9-82 Cabinet Hardware.

2. A156.11 Cabinet Locks.

3. A208.1-79 Mat-Formed Particleboard.

F. Federal Specifications (FS):

1. FF-N-105B (3) Nails, Brads, Staples, and Spikes: Wire, Cut, and Wrought.

2. FF-S-325 Shield, Expansion, and Nail, Drive Screw (Devices, Anchoring, Masonry).

G. National Electrical Manufacturers Association (NEMA): LD3-1980 High Pressure Decorative Laminates.

1.03 PERFORMANCE REQUIREMENTS

A. Counters, low case tops, and stools shall support a 200-pound concentrated load at mid-span without noticeable springiness or finish/trim separation or overstress of anchorage or supports.

B. Work shall accommodate changes in temperature and humidity without separation of joints, warping, binding of moving parts, or overstress.

1.04 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

C. LEED Building Performance Requirements

1. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

2. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

3. Engineered wood, not including salvaged wood, shall contain a minimum of 10% (combined) pre-consumer/post-consumer recycled content (the percentage of

recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, medium density fiberboard) to be permanently installed on the interior of project shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI). Certification of these products shall be in accordance with the LEED Building Submittal Requirements of this Section.

5. Adhesives used for work in this section, including plastic laminating adhesives, shall contain no added Urea Formaldehyde.

6. Wood Materials manufactured, fabricated, and/or harvested within 500 miles (by air) of the project site shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

7. Solid wood materials shall be FSC-certified by the Forest Stewardship Council as sustainably harvested. Documentation of FSC certification shall be in accordance with the LEED Building Submittal requirements of this Section.

8. Adhesives, sealants, paints and coatings used for work in this section shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable. VOC Limits include, but are not limited to the following:
Clear Wood Varnish 350 g/l
Clear Wood Lacquer 550 g/
Wood Stains 250 g/l
Sanding Sealers 275 g/l
Clear Shellac 730 g/l
Pigmented Shellac 550 g/l

1.05 SUBMITTALS

A. Comply with Section 013000 requirements.

B. Shop Drawings: Shall be prepared by the manufacturer of the architectural woodwork, and shall:

1. Show dimensioned plans, elevations, profiles, and full or large-scale details. Identify details and key them to elevations.

2. Show relation to adjoining construction, including (but not limited to) provisions for fitting and trimming work to accommodate allowable tolerances in adjoining construction. Identify structural support furnished and installed under this and other Sections.

3. Show construction of all parts of the work: materials, thickness, and finishes; joining methods; details of field connections and anchorage; and provisions for moisture and thermal movement.

4. Show other information necessary to establish conformance to specified requirements and to fabricate, install, and coordinate work with affected trades.

C. Product Data: Manufacturers printed, descriptive data and catalog cuts for cabinet hardware, fume hoods, service fixtures and other manufactured items.

D. Samples:

1. Transparent-finished Wood Veneer: See PART 1: QUALITY ASSURANCE.

2. Transparent and stain finished Lumber Samples: Duplicate pairs of finished lumber of each species and cut. Each pair shall show the extremes of the range of variable appearance characteristics of lumber proposed for production work.

3. High-Pressure Decorative Laminate Samples: Two 2 x 3-inch (min.) size samples for each NEMA grade/color/pattern/finish combination.

4. Finished custom shelf bracket.

5. Surfacing materials: Two 4” x 4” (min) size for each type.

6. All casework hardware.

7. Finished Slotted Frame for Island Benches

8. Finished perforated metal for umbilicals.

9. Laminated and tempered glass.

E. Certificates:

1. Fire Retardant-Treated Wood: Treater's certificate and Contractor's affidavit for treated wood products per Section 06300 requirements.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:\

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.

b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).

c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify that no added urea formaldehyde is present in any composite wood materials, agrifiber material, or adhesive.

4. Documentation for all new wood products, including FSC Certified. Provide vendor invoices for all permanently installed wood products, FSC Certified or not. Each wood product must be identified on a line-item basis. FSC products must be identified as such on a line item basis. The dollar value of each line item must be shown. The vendor's Chain-of-Custody certificate number must be shown on any invoice that includes FSC products.

5. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

6. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.06 QUALITY ASSURANCE

A. Woodworker Qualifications: Work shall be done by a pre-qualified architectural woodworker regularly engaged in fabricating, shop-finishing, and installing custom woodwork of the kind and quality required for the Project. The Architect reserves the right to approve the manufacturer selected to produce laboratory casework.

B. Transparent-Finished Wood Veneer for Exposed Surfaces:

1. Display: Collect and display a leaf sample of the specified veneer from which the Architect can select wood veneers for transparent-finished work. Make finished samples from Architect-selected veneers.

2. Samples: Submit duplicate pairs of transparent-finished veneered panels. Each panel shall be 24 x 24 inches or larger, as required to show veneer face panel assembly. Each pair of panels shall show extremes of the range of variable appearance characteristics proposed for production work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 016000 requirements.

B. Do not deliver products until storage and installation areas are dry enough to eliminate damage caused by excessive moisture and changes in moisture content.

C. Deliver products in closed vans. Bundle loose materials to prevent loss and damage.

D. Store products in a clean, protected space in the Project, under specified environmental conditions.

1.08 PROJECT CONDITIONS

A. Environmental Conditions: HVAC system shall be operating and ambient occupancy conditions attained.

B. Adjoining Work: Constructed to specified tolerances and where applicable, to guaranteed dimensions.

C. Field Measurements: Fabricate work to field measurements. If field measurements cannot be made without delaying the Work, the Contractor shall provide guaranteed dimensions and coordinate work of affected trades/Sections to assure proper execution of adjoining work. The casework manufacturer is responsible for details and dimensions that result from field conditions and shall indicate on shop drawings all required field measurements.

1.09 SEQUENCING/SCHEDULING

A. The Woodwork Contractor shall coordinate delivery and installation of products furnished and/or installed under the work of this and other Sections/trades so that:

1. Locations of anchor plates, openings, and recesses for architectural woodwork are provided in time to be incorporated in drywall construction.

2. Access shall be provided for installation and testing of electrical work built into or concealed by architectural woodwork.

1.10 MOCKUP

A. See drawing 1/A9.29 for offsite laboratory casework and fittings mockup. The mockup is to be built off site in a location to be determined by the contractor in consultation with the owner. Provide a shop drawing indicating mockup size, proposed materials, and colors. Once accepted by the consultant, the mockup will be the finish standard against which the remaining work shall be judged.

PART 2 - PRODUCTS

2.01 APPROVED CASEWORK MANUFACTURERS

A. Wood casework shall be manufactured by, and other products of this section shall be the responsibility of:

1. OC River Laboratory Furniture, 300 S. Krueger Street, Suring, WI (416-998-1455).

2. CIF Lab Solutions, 56 Edilcan Drive, Concord, Ontario CA L4K 3S6 (905-738-5821).

3. Mott Manufacturing, 452 Hardy Road, Brantford, Ontario CA N3T 5L8 (304-497-2115) represented by Scientifix 37-24 24th Street, Long Island City, NY 11101 (718-669-7050).

2.02 LUMBER MATERIALS

A. Hardwood Lumber: PS 58; clear and free from defects; graded in accordance with AWI requirements; maximum moisture content of 6 percent; of the following species and grade for transparent finish:

1. Finish hardwood lumber materials shall be quarter-sawn, Select White Maple with charcoal grey stain to match Architect's sample.

1. Exposed exterior parts: AWI Lumber Grade I.

2. Semi-exposed parts: AWI Lumber Grade II.

2.03 SHEET MATERIALS

A. Hardwood Lumber Core Plywood: Balanced 5-ply construction consisting of a solid hardwood staved core, hardwood cross plies, and hardwood face veneers, glued with water-resistant resin adhesives. Lumber core shall comply with product standards of PS 51 and ANSI/HPMA HP 1983; with veneers of the following species, grade and face veneer cuts for transparent finish:

1. Veneers: "Vtec" Teak, quarter-sliced, no. 32230-FSC-NF, with transparent low sheen water white finish to match Architect's sample, with all veneers used on any floor cut from the same block, and with all parts of an assembly or space appearance matched for consistency of color, grain and other characteristics. Grain shall run vertically through all parts of the assembly. Bohlke Veneer Corp. (contact Dan Meyerson, 513-874-4400), or approved equal.

2. Exposed exterior parts: AWI face grade AA.

3. Semi-exposed parts: AWI face grade A.

B. Hardwood Veneer Core Plywood: Balanced 7-ply (min.) construction consisting of 5-ply (min.) hardwood veneer core plywood and hardwood face veneers, glued with water resistant resin adhesives. Veneer core shall comply with product standards of PS 51 and ANSI/HPMA HP 1983; with veneers of the species, grade and face veneer cuts as described above for hardwood lumber core plywood.

C. Particleboard Core Plywood: Balanced 3-ply construction consisting of 45-pound density particleboard core and hardwood face veneers glued with water resistant resin adhesives. Particleboard core shall comply with product standards of PS 51 and ANSI/HPMA HP 1983; with veneers of the species, grade and face veneer cuts as described above for hardwood lumber core plywood.

D. Fire-Retardant Treated Medium Density Fiberboard: UL listed wood fiberboard (FX MDF) with 20 Flame Spread and 25 Smoke Developed surface burning characteristics.

E. Hardboard: Pressed wood fibers with resin binder, tempered grade.

F. High Pressure Plastic Laminate: FS L-P-508H, .050 inch thick, matte finish, manufactured by Nevamar. See drawings for colors.

G. Backing Sheets: .020 inch thick high pressure paper base laminate without decorative finish.

H. Cork: 1/4-inch thick by size indicated; of natural color, with pure fine grain.

J. Linoleum based surfacing material bulletin boards, self-healing, Bulletin Board by Forbo. For color selections, see drawings.

K. Glass Doors: Tempered, 3/8" thick, clear glass. Provide glass doors that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to CPSC 16 CFR, Part 1201 for Category II materials. Reference specification section 088000 part 2.1C.

2.04 ACCESSORIES

A. Glue: Water-resistant type as recommended by manufacturer for application.

B. Nails: Size and type to suit application.

C. Bolts, Nuts, Washers, Lags, Screws: Of size and type to suit application; chrome plated brass or stainless steel finish in exposed locations; carbon steel in concealed locations.

D. High Pressure Plastic Laminate: FS L-P-508H, .050-inch thick, matte finish, manufactured by Nevamar. For color selections, see drawings.

E. Backing Sheets: .020-inch thick high-pressure paper base laminate without decorative finish.

F. Corkboard: 1/4-inch thick by size indicated; linoleum resilient tackable surface material, Forbo Bulletin Board, or approved equal.

G. Glass: 3/8-inch thick (or as indicated on drawings) laminated safety glass, complying with ANSI Z97.1 performance requirements for safety glass, consisting of two lights of 3 mm annealed clear float glass bonded to 0.06" polyvinyl butyryl interlayer. Float glass shall comply with ASTM C1036 requirements for Type I, Q3. PVB Interlayer shall be translucent or clear, depending on the application, as noted on drawings.
Refer to Interior Glass and Glazing Section 088000 and the Architectural Drawings for additional glass types and requirements.

H. Enameled Steel Whiteboards: Refer to Section 10100 for requirements.

2.05 GENERAL FABRICATION REQUIREMENTS

A. Fabricate all items in accordance with AWI Quality Standards for Premium Grade, transparent finish, as amended in this Section.

1. Transparent-Finished Wood: Select wood for uniform appearance in each assembly and among all assemblies in the same space. Distribute to best advantage the characteristics and defects allowed by specified AWI Quality Grade.

2. Matched Lumber and Veneer: Where required appearance match (after finishing) cannot be obtained with the same species, obtain the Architect's approval to change lumber species or to substitute veneered solid core assembly for lumber. For stained maple trim and base, prepare samples of minimum (3) stain color options for Architect’s selection

3. Scribing Trim: Where not otherwise shown or specified, match species, cut, and finish of work scribing trim is used with.

4. Panel Products: 3-ply construction with 3/4" thick core where not otherwise specified, with face veneers specified for each category of work. Use FX MDF core for all wall paneling, and for any cabinets to be installed in corridors or lobbies. Use MDF core where core edges are to be sanded and finished; use MDF or particleboard core elsewhere.

B. Panel Product Locations: Use 3/4" thick (min.) cores where not otherwise indicated, with face veneers specified for each category of work. Locations for various core types specified shall be as follows:

1. Cabinet doors and drawer fronts shall be hardwood lumber core plywood. At the woodworker's option, particleboard cores with flush solid lumber inserts at hinge attachment locations may be substituted for lumber core. Drawer sides, backs and fronts of drawer boxes shall be ½" 9-ply or solid hardwood.

2. Cabinet sides and backs, and wall shelves shall be hardwood veneer core plywood.

3. Wall paneling, trim, and for any cabinets or other woodwork to be installed in corridors, lobbies or public assembly spaces shall be FX MDF core, or fire-resistant particleboard core plywood.

C. Fit plywood and particleboard shelf, drawer front, fin and door edges with 3/16-inch matching hardwood edgebands, unless otherwise noted. Use full-length pieces only.

D. Use concealed fasteners wherever possible. Obtain prior approval for any exposed fasteners.

E. Provide access to electrical junction boxes and plumbing valves. Coordinate with other trades and indicate locations and means of access on shop drawings.

F. Provide concealed continuous stiffeners to the underside of any countertop spanning 4'-0" or more.

G. No particleboard or plywood shall be in contact with flooring. Cabinet bases shall be 4-inch (min.) high x ¾-inch (min.) thick solid clear, Select Northern White Maple lumber.

H. Cabinet Hardware: Factory-install cabinet hardware. Remove it as required for shipping. Package field-installed hardware with the assembly to which it is fitted.

I. Built-ins:

1. Cut/drill openings for fixtures, specialties, accessories, and other built-ins per template/instructions furnished by the manufacturer.

2. Cut/drill openings necessary to accommodate conduit, cable, wiring, and wiring devices. Provide wire access grommets for wire holes in exposed surfaces.

J. Assembly:

1. Trial-assemble all work. Permanently assemble work in the largest units that meet shipping and Project conditions.

2. Field Joints in Counters: Make counters in one-piece for-length where possible. Where field joints are unavoidable, prepare work for assembly with Flush Joint Fasteners.

2.06 SHOP APPLIED WOODWORK SEALING AND FINISHING

A. Transparent finish for exposed and semi-exposed surfaces: AWI Finish System TR-5, catalyzed vinyl, dull rubbed effect.

B. Sealing: Seal unfinished wood surfaces to prevent moisture gain. Seal immediately all bare wood that is exposed by field fabrication and fitting.

2.07 CASEWORK HARDWARE

A. Casework hardware includes, but is not limited to, the following:

1. Pulls:

a. Wire Pulls for laboratory casework: Lamp by Sugatsune KC-S640/S, stainless steel, satin finish finish. Pulls shall be inset 1 inch from door or drawer edges. Mount door pulls vertically and drawer pulls horizontally.
Wire Pulls for cases outside labs: Richelieu Hardware, 3487333, stainless steel, 16 ¼" x 1 3/8". Mount door pulls vertically.

b. Edge pulls: Lamp by Sugatsune SN-70/S stainless steel, satin finish.

c. Recessed: Lamp by Sugatsune HH-F-2 Series stainless steel, satin finish.

2. Hinges: Grass 1203, concealed self-closing hinges. For doors up to 24 inches wide, weighing up to 20 lbs., provide 2 hinges; for doors up to 24 inches wide, weighing 20-40 lbs., provide 3 hinges.

Hinges for Glass doors: Hafele Salice full overlay glass door hinges with soft close.

Hinges for Display Cabinets: Blumcraft by CR Lawrence, stainless steel pivot glass display hinges and Blumcraft stainless steel narrow profile glass display door top and bottom frame, stainless steel cam locks and stops

3. Drawer and shelf slides:

a. Box and file drawers over 4 inches deep: Accuride 7434, full extension (plus one inch) steel ball bearing, 100 lbs./pair capacity, with rail mounting system and closed position hold-in detent, bright zinc.

b. Lateral files: Accuride 4034, full extension (plus one inch) steel ball bearing, 150 lbs./pair capacity, with rail mounting system and closed position hold-in detent, bright zinc.

c. Computer keyboard tray: Accuride 2008, ¾ length of slide travel, 45 lbs./pair capacity, bright zinc.

d. Pullout shelves/drawers: Accuride 322 full extension steel ball bearing, 100 lbs/pair capacity, bright zinc.

4. Locks: Use at locations noted on drawings.

a. Cabinet Locks: Lamp Sugatsune #6810 Million Lock, master keyed. Stainless steel finish. Locks shall be separately keyed and two (2) keys shall be furnished for each lock. Supply three (3) master keys.

~~b. Locker Locks: Re-settable combination lock with three dials, key override function and code scrambling. Mastercombi Built-In Combination Locker Lock. Combi-Lock 1153, vertical orientation, Hafele 231.16.312. Provide two Combi-code Codefinders, Hafele 231.16.999. With Hafele 231.14.300 handle and Hafele 231.16.706 strike plate.~~ **Tall Glass Front Storage Cabinet Locks: Overlay Glass Door Cam Lock, master keyed, stainless steel finish. Locks shall be separately keyed and two (2) keys shall be furnished for each lock. Supply three (3) master keys.**

5. Shelf Standards/Brackets:

a. Wall Standards: Knape & Vogt #85 double-slotted type where shelf sections meet, matching #83 single-slotted type at ends of shelf sections, 16 gauge, anachrome finish.

b. Shelf brackets for Wall Standards: 16-gauge steel with three blade hooks as detailed. Shelves shall be screwed to brackets. Brackets paint color to be selected, semi-gloss enamel.

c. Standards/Brackets for Elevator Lobby Display Cabinets: Extruded aluminum Rakks Wall C-Standards, and BR2-16 shelf support brackets, by Ragine Corporation, Needham, MA (800-826-6006), or www.rakks.com.

6. Adjustable, dual-wheel swiveling locking casters: 3” (75mm) swivel lock/wheel brake with double row ball bearing swivels. Hard gray rubber tires. 200 lb capacity. Medium-Duty Dual-Wheel Casters by Jilson Group Caster Products Division (800) 969-5400.

7. Furniture levelers: Zinc-plated steel leg levelers and mounting brackets for bottoms of base cabinets.

8. Cable sets: Two-part with spring closure in top, 80 mm. Hafele 429.99.342. Gray.

9. Roller catches for flammable storage cabinets: Glynn Johnson.

10. Three-point latches for flammable storage cabinets: Hafele Espagnolette Lock.

11. Grilles for fin tube enclosure tops, vented cabinets: Aluminum bar grille linear diffuser with mounting frame and integral access doors; CT-540 x Type 3 concealed fastening mounting frames), 4"”wide, by Titus Products.

~~12. Sliding whiteboard hardware: Bartels Terra H ST.1061.TH barn door system with rail, valance, and wheels. 300 lb. capacity. Stainless steel.~~

13. Metal shelf supports: Hafele 282.04.739 (nickel-plated), ¼" diameter, spoon shaped pins.

2.08 WORK SURFACES

A. Laboratory bench tops: Molded chemical and abrasion resistant epoxy resin, one inch thick. Furnish with integral coved backsplash (wall benches), and cutouts for sinks, piping, etc., manufactured by **Durcon Incorporated, 206 Allison Drive, Taylor TX 76574 (512-595-8000). Color Lunar White, or** Epoxyn Products, 500 East 16th Street, Mountain Home, AR 72653 (870-425-0820). Color: 01, Superwhite.

B. Plastic laminate with solid wood edges: Countertops, backsplashes and curbs shall have a plastic laminate finish equal to AWI "Premium" grade standards. Wood core to receive plastic laminate finish shall be 1-1/4" thick. Provide 1/2" (12.7mm) hardwood edge banding on exposed edges. Edges shall be stained Select Maple. Plastic laminate for exposed horizontal surfaces shall be 0.050") thick, general purpose (high pressure). Plastic laminate for concealed panel backing shall be 0.020" thick, backer type (high pressure) and color shall be selected by Architect. Material shall be manufactured by Nevamar, or approved equal.

C. Stainless steel: Counter tops, curbs and integral sinks noted on drawings as "Stainless Steel" shall be constructed of 16-gauge stainless steel. Exposed surfaces shall have #4 finish. Stainless steel counter tops shall be constructed with raised front rim, marine edge construction. Top surface, rear curb and rear or top edge shall be one piece without seams or joints. The top of the 6" (152mm) high curb shall be chamfered 45 degrees. The joint where the rear curb meets the counter top shall be integral and slightly radiused. Carbon steel or stainless steel shall be welded to the underside in at least three locations along the length to prevent twisting, oil canning, or buckling of surface. The underside shall receive a coat of sound deadening material. Stainless steel counter tops shall be 1" thick. Tops shall be as long as practical to permit access to building and room. Field joints shall be provided to join oversized tops with welded channels and angles with bolting arrangements for pulling tops together to produce a hair-line waterproof seam, maximum 1/64". Where sinks are shown on drawings, they shall be integral and of the size specified. Tops shall be adequately reinforced to accept sinks. Seams and joints shall be welded, ground smooth and polished.

D. Butcher block countertops, backs guards and shelves: Edge-grained strips of maple with clear surfaces and ends. Seasoned, kiln-dried maple strips are bonded together with resin and electronically cured, planed, sanded and varnished (baked between coats) for a highly water and abrasion resistant clear finish and satin-smooth resilient work surface. Maple countertops are 1-3/4" thick, shelves and back guards are 1-1/4' thick.

2.09 UNDERCOUNTER VENTILATED CABINETS (BV)

A. Cabinet doors shall be full overlay, clear finish wood veneer construction to match the other custom wood laboratory casework. Cabinet bodies, interior and shelf shall be lined with white flame and chemical resistant polypropylene to withstand severe chemical exposure. Removable back shall be gasket-sealed and two gasket-tight 2-inch black

polypropylene vent pipes shall extend from cabinet to fume hood and 1/2-inch above hood work surface. Provide aluminum bar grille vents in doors. Shelf in BV cabinets shall be adjustable, full width of cabinet, and only one-half depth of cabinet. Provide in bottom of cabinet a 1/4-inch thick, heat welded, liquid tight, one-inch deep, removable polypropylene pan. Catches, glides and shelf clips shall be stainless steel.

2.10 UNDERCOUNTER FLAMMABLE STORAGE CABINETS (BO)

A. Cabinet doors shall be full overlay, clear finish veneer construction to match the other custom wood laboratory casework. Cabinet bodies, interior and shelf shall be lined with white flame and chemical resistant polypropylene to withstand severe chemical exposure. Cabinets shall be constructed to comply with NFPA 30 4-3.2.2 and OSHA 1910.106 (d) 93) (ii) (b) requirements. These requirements include, but are not necessarily limited to the following:

1. The bottom, sides and top of cabinets shall be constructed of exterior grade plywood at least 1-inch in thickness, which shall not break down or delaminate under fire conditions. All joints shall be rabbeted and shall be fastened in two directions with wood screws. When more than one door is used, there shall be a rabbeted overlap of not less than 1-inch.

2. Cabinet doors shall be equipped with a means of self-closing and latching, and hinges shall be constructed and mounted in such a manner as to not lose their holding capacity when subjected to fire exposure.

3. A raised sill or pan capable of containing a two-inch depth of liquid shall be provided at the bottom of the cabinet to retain spilled liquid within the cabinet.

B. Cabinets are not ventilated. All OSHA cabinets shall be labeled in painted (color to be selected) 1-1/2" high Helvetica Medium lettering: FLAMMABLE--KEEP FIRE AWAY

2.11 STANDING AND RUNNING TRIM

A. AWI Premium Grade x Transparent Finish.

B. Trim: Hardwood lumber in one-piece-for-length up to maximum production sizes; splined joints; plant-assembled miters and openings; milled to indicated profiles.

2.12 DRYING RACKS

A. Racks of type 304, 20 gauge stainless steel, with white 6-inch x 1/2-inch diameter polypropylene pegs, dimensions as indicated on drawings, with bottom gutter and drain tubing, and with brackets as required to mount to walls, by Mod-Rack or approved equal.

2.13 SINKS

A. Lab Bench Sinks: Molded epoxy resin sinks. Sinks shall be furnished with 1-1/2" outlets, open end overflow 2" shorter than depth of sink, and swivel sink strainer adapter with gasket. Sinks shall **be sizes indicated on drawings**, **Durcon Incorporated, Color Lunar White, or** Epoxyn Products Color: 01 Superwhite. Install in accordance with manufacturer's recommendations, with support straps, assembly kit, and acid resistant putty compound to seal sink rim, etc.

B. Stainless Steel: Stainless steel sinks shall be constructed of 16 gauge #4 finish on exposed surfaces. Sinks shall have interior coved corners with bottoms pitched toward drain. Stainless steel sinks shall have integral side mounted overflows. Standard stock sized sinks shall be deep drawn from a single sheet. Other sinks shall be fabricated having continuous heliarc welded joints ground and polished smooth. The type of stainless steel used to fabricate integral sink to be the same as that used in adjacent counter top (either type 302/304 or 316). Sinks placed in stainless steel counter tops shall be welded in and seams shall be ground smooth and polished to match the counter top finish. Those mounted in plastic laminate or wood tops shall use self rimming design. Those mounted in epoxy resin tops shall be installed in the same manner as epoxy resin sinks.

C. Sink Outlets, Tailpieces and Overflows. Sinks shall be equipped with an integral overflow that is connected directly to the tailpiece. Overflow shall consist of an outlet located 2" (50.8mm) below counter top and 1/2" (12.7mm) diameter tygon tubing to connect overflow to tailpiece which shall be modified to accept tubing.

2.14 LABORATORY SERVICE FITTINGS

A. Laboratory service fittings shall be products of Water Saver Faucet Co., unless otherwise noted. **Finish on all service fixtures shall be satin chrome**. Fittings include the following:

1. Natural Gas (G), Specialty Gases (G1-4), Compressed Air (A), Vacuum (V): L4200-132SWSA (180-degree straight) deck mounted at island benches; L4200-131WSA single deck mounted at wall benches and ADA locations as noted; L4200-141FT (island benches, undermounted).

2. Water fitting at lab bench sinks (HW CW): L2212VB-127BH with swing gooseneck and vacuum breaker, blade handle, removable aerator.

3. Eyewash fitting at noted lab bench sinks (EW): EW1022.

4. Pure water fitting at lab bench sinks (PW): L7853SC-LE WSA (self-closing).

5. Emergency shower stations with thermostatic mixing valve and recessed handle: ESBF670.

6. Glasswash stainless steel sink panel mounted pre-rinse HW-CW mixing fitting: PR1711WSA-110WSA with flexible stainless steel hose (rubber interior), spring, wall bracket and in-line vacuum breaker.

7. Glasswash stainless steel sink panel mounted pure water fitting (RO): L2784WSA with self-closing handle.

8. Panel Mounted CO2 Fitting with Low Pressure (0-30 psi) Regulator Gauge: L3170-364-758FT.

2.15 MOVABLE ADJUSTABLE HEIGHT TABLES

A. Movable adjustable height tables shall be constructed as indicated on the Drawings to be rigid, level workstations useful for a wide range of laboratory purposes. Movable tables shall have 1” x 1” tubular stainless steel telescoping legs fitted with a 1-1/2" diameter adjustable non-marring floor glides with 1” micro-adjustment capability.

Moveable tables shall have the ability to be adjusted in height from 31" to 38" in 1" increments inclusive of one-inch thick epoxy resin counter top.

B. Fixed solid hardwood lumber section of legs shall be set at height appropriate for a 31" high table top and adjustable portion of leg shall be stainless steel, drilled at 1" increments, and concealed within each wood table leg. Movable tables shall be reinforced with a deep welded steel channel frame of a gauge appropriate for the load bearing requirements and concealed by wood elements, if necessary to a rigid assembly. Load capacity of tables shall be 1,000 lb. uniformly loaded and support a 250 lb. concentrated load at mid-span with deflection not to exceed 1/8". Provide a countersunk metal slide plate with groves at underside of each wooden leg and provide chain for each pin support.

C. Tables to be installed in Water Lab 108, and at other noted locations shall be constructed of stainless steel.

2.16 EXHAUST SNORKEL

A. Alsident System 75AL Extraction Arm for ceiling mounting, including 280 mm PETG dome hood with white fittings, ceiling column, and all necessary mounting hardware, fasteners and accessories for a complete installation.

2.17 STAINLESS STEEL SINKS, FAUCETS AND APPLIANCES

A. Stainless Steel Sinks: Elkay Gourmet and Lustertone18-gauge Type 304 stainless steel sinks, of the following types and sizes:

1. SK-4: Elkay Gourmet Single Bowl LRAD2521 (25" x 21" x 6.5") barrier free, with Type 3 hole configuration.

B. Pantry Faucets: Chicago Faucets Model 527 with handle style 210, and GN-RGD2 swing spout.

C. Undercounter Refrigerator: 32" high, auto defrost, stainless steel, ADA Refrigerator Model 6ADAM-BS-F-R, by Marvel.

2.18 CYLINDER RACKS

A. Furnish and install wall mounted cylinder racks, constructed as indicated on the Drawings. The specific series and gauge required for each component shall be as indicated on the Drawings along with associated accessories. Channels and parts shall be furnished to laboratory furniture manufacturer in a plain state in order to allow them to weld and paint the finished assemblies with their standard acid resistant epoxy powder coat finish. Color to be selected by Architect.

2.19 ADAPTABLE TABLE SYSTEM

A. The table system shall have UL962 Certification applicable to all system components including table structure, shelving, plumbing service fittings, electrical services and all pre-piping and pre-wiring.

B. The table consists of a core structure with:

1. Height adjustable table structure on one or both sides

2. Ceiling service panels

3. Counter top working surfaces

4. Wood adjustable shelving on metal brackets

5. Integrated service fixtures with rigid pre-piping inside the core upright with top connections to flexible hoses and quick disconnect fittings

6. Electrical/data raceways and outlets installed on uprights, with pre-wiring inside core, and up to the top of the core upright

7. Mobile, suspended or floor mounted cabinets under the tables

C. The Core Structure consists of:

1. Two (2) uprights connected with an upper and a lower horizontal 14-gauge cross rail and channel to form a complete rigid unit. One upright houses the required pre-piped plumbing fixtures and data cables. The other upright integrates the electrical wiring of the raceways and the outlets located directly on the upright below the work surface. Both uprights offer full access to the interior with an easily removable full-height access panel.

2. The two (2) end uprights and the center upright for the sixty (60) inch, seventy-two (72) inch, eighty-four (84) inch and ninety-six (96) inch long tables are pre-punched to accommodate split shelving with one (1) inch vertical increments starting at nominal fifty-five (55) inches above the floor to top of upright.

3. The uprights are fabricated from 12-gauge, cold-rolled steel, two (2) inch by five (5) inch by eighty-four (84) inches high exterior dimensions; oval formed tubing equipped with two (2) 3/8” X 16NC by 3.5” levelers

4. For anti-seismic requirements, a bolting device attached to the core structure levelers is added to secure the table frame to the floor

D. Work Surface Table Frame

1. The work surface table leg frame is constructed of an 11-gauge channel welded to an 11-gauge – two (2) inch diameter tube leg each with a one and three-quarters (1.3/4”) inch inner 14-gauge telescoping bottom part for height adjustment. Both legs are equipped with a three-eighths inch (3/8”) by sixteen (16) NC by three and one half inch (3 ½”) leveller with non-marring floor glides.

2. The height adjustment varies from 29” – 37” including the 1” work surface and is capable of vertical adjustment in 2” increments.

3. Rear corners have welded oval formed supports to be mechanically fastened to the core uprights with supplied hardware.

4. Work surface frames are designed to support suspended door or drawer cabinets that can be installed at any position between the table legs. The cabinets can be

added, moved laterally or be re-positioned without the use of tools or the need for installers.

5. A suspended cabinet locking device prevents the cabinet from being removed from structural support rails, while maintaining the ability to be moved laterally. The locking device can be removed at anytime, without tools, to permit the relocation of cabinets.

E. Shelving is wood, supported on 14-guage painted cold-rolled steel supports.

F. Service Fixtures:

1. One of the uprights has the ability to house up to four service fixtures positioned between the work surface and the lower structural cross rail.

2. Plumbing lines within the table shall be 9/32” ID Type 316 stainless steel tubing, or as required by local jurisdiction.

3. Each service connection is made between the uprights with a keyed and double valve quick disconnect and the ceiling panel mounted quick disconnect using a 5/16” I flexible polyurethane coil hose.

4. Coil hoses are equipped with a stainless steel keyed quick disconnect. Coil hoses, sockets and plugs are color coded.

5. Plugs of coil hoses connect to the ceiling panel mounted socket and the socket of the coil hose connects to the plug of the service upright.

6. Double valves on plugs and sockets require no manual shutoff.

7. All fittings, pipe materials, and disconnects shall be acceptable to local authorities with jurisdiction (see 1.04 Submittals).

G. Electrical Raceways

1. A two-piece aluminum dual channel raceway, Wiremold AL3300, is installed on the full width of both sides of the table core under the lower structural cross rail.

2. Each raceway shall have three (3) 20A hospital grade duplex receptacles per table side for tables 48” in length, and four (4) duplex receptacles for tables 72” in length. One additional 20A duplex receptacle is located in one of the vertical uprights under the worksurface.

3. Each raceway can house up to eight (8) – T6 data connections.

4. Electrical wiring is in one upright, plumbing and data are in the opposite upright.

5. All electrical materials, methods, and disconnects shall be acceptable to local authorities with jurisdiction (see 1.04 Submittals).

H. Service Connections

1. All power services at each side of the tables shall have either a 20Atwist lock

plug with cord extension above the top of the upright, or multi-pin plugs for double-sided tables with a maximum of three (3) circuits on the same plug.

2. The outlet located on the upright under the worksurface shall be connected with one of the raceway sides.

3. Data lines shall have male plugs extending above the upright.

4. All electrical materials, methods, and disconnects shall be acceptable to local authorities with jurisdiction (see 1.04 Submittals).

I. Ceiling Service Panels

1. Ceiling panels constructed of 11-gauge painted cold-rolled steel are house required plumbing, electrical and data female connections. Panels are sized to fit within the ceiling grid as shown on drawings, and to be independently secured to the building structure.

2. Ceiling service panels integrate all required female connectors to fit the plumbing, electrical and data services. Final connection to the ceiling service panels shall be the responsibility of the Mechanical/Electrical subcontractors.

3. Gas services outlets shall be keyed quick-disconnect inlet plugs, pending acceptance of local authorities with jurisdiction. Keyed quick disconnects shall be compatible with the specified gas service hose as specified. **For flammable gases (G1-4) use Dormont Polytec coated stainless steel braided blue hose #1650 BP-XX.**

4. Electrical devices shall be provided with a twist lock fitting in order to prevent plugs from coming loose.

J. Load Rating

1. The table shall be designed and tested to meet or exceed SEFA 8 Standards. The table shall also be tested to UL 962 Standards to 4 times the following claimed load capacity.

a. Work Surface: one hundred twenty-five (125) pounds per linear foot to a maximum of seven hundred fifty (750) pounds.

b. Shelves: forty (40) pounds per linear foot to a maximum total weight of four hundred fifty (450) pounds per table

K. Table System Metal Finish

1. All surfaces shall be free of scratches, spot weld marks and material imperfections. Welds are ground smooth. Surfaces are prepared to receive finish application in accordance with paint manufacturer's recommendations.

2. Chemical-resistant thermosetting polyester enamel paint is applied to all surfaces using an electrostatic spray process, and components are baked in an oven in accordance with recommendations of the paint manufacturer.

3. The painted surfaces shall meet or exceed the SEFA 8 Specification for chemical resistance as specified by the Scientific Equipment and Furniture Association.

4. Technical Performance:

a. Adhesion to substrate: 100% 5B (ASTM D-3359B)

b. Hardness: 4H to 5H (ASTM D 2197-86)

c. Gloss: 40 to 50 ° (ASTM D-523-89)

d. Flexibility: 3mm mandrel (ASTM D-522)

e. Impact resistance: 100 in. / lb (ASTM D-2795) No effect

f. Corrosion resistance: Excellent (ASTM B 117-85) No visible effects after 250 hour salt spray.

g. Humidity resistance: Excellent (ASTM D-2247-85)

2.20 METAL MANUFACTURED ITEMS

A. Slotted Frame Assemblies for Island Benches. Adjustable shelves mounted above island benches shall be mounted to welded double-sided frame assemblies. Assemblies shall be fabricated of 14 ga. (min.) fully welded 1-1/2" x 6" steel posts with laser cut slots, bolted to the floor, and braced with horizontal tubular steel framing members. All fasteners shall be concealed. Assemblies shall be epoxy powder coated in a metallic finish approved by the Architect. Post slot pattern and shelf bracket hooks shall be fully compatible.

B. Wall and Island Shelf brackets: 16-gauge steel with three blade hooks as detailed to be fully compatible with slotted frame assemblies and shelf standards. Shelves shall be screwed to brackets. Brackets shall be epoxy powder coated in a metallic finish approved by the Architect.

C. Umbilicals: 18-guage perforated and unperforated sheet metal with collars at top and bottom to be attached to ceiling and work surfaces. Perforation pattern shall be 1/8-inch diameter holes on 3/32-inch staggered centers. Umbilicals shall be factory-finished in baked enamel, color to be selected by the Architect. Removable sections lift up and off to disengage 3 (min.) hooks per side, as detailed.

D. Corner Guards: Custom fabricated 2-1/2" x 2-1/2" x 1/8" corner guards of Type 304, 16-gage stainless steel with No. 4 finish, in lengths indicated on drawings.

E. Stainless steel **wire** shelving for Environmental Rooms:

1. Type 304 stainless steel wire shelves and posts, in the configurations indicated on the drawings. Super Erecta Shelf Wire Shelving by InterMetro Industries Corporation (570-825-2741).

2. Freestanding shelving identified by type on Drawings of the following types and sizes:

a. WS1854: Metro Model 1854NS (18" x 54").

b. WS2154: Metro Model 2154NS (21” x 54”).

3. All of the above are with (4) Metro Model 86PS stationary posts (86-1/2” high).

2.21 COUNTERSUNK FLUSH-BOLT GLAZING/MOUNTING SUPPORT FITTING SYSTEM FOR GLASS PANELS AT DESKS

A. Countersunk Flush-Bolt Glazing/Mounting Support Fitting System:

1. Countersunk Flush-Bolt Glazing/Mounting Support Fittings shall be a fully-engineered system specifically intended for point support of glass. Shop drawings shall be signed and sealed by a State of Connecticut licensed professional engineer.

2. Countersunk Flush-Bolt Glazing/Mounting Support Fittings shall be a complete assembly and typically include countersunk spanner head or socket head stainless steel bolts and washers, polyamide or extruded silicone bushing, extruded silicone washers, stainless steel ferrule, and all other components required for a complete installation. All stainless steel components shall be AISI Type 316.

3. Countersunk Flush-Bolt Glazing/Mounting Support Fittings shall be designed to allow for glass fabrication tolerances, construction tolerances, thermal and building movements, dead/wind load deflections, and structural support movements. Provide adjustment capability to accommodate the full range of building tolerances and movements.

4. The system shall provide for unitized pre-fixing of all items to glass prior to erection.

5. Brackets shall have slots and oversize holes to permit movement without inducing stress in glass.

6. There shall be no direct contact of glass and metal. Provide manufacturer’s standard gaskets and bushing between metal and glass.

7. Glass fittings shall be designed to provide flush appearance. There shall be no exterior plates, cap disks or buttons.

8. Glass shall be 5/16” laminated safety glass with translucent interlayer, as detailed.

B. Details are based upon use of Mamet Partition System by DORMA Group North America. Other acceptable manufacturers of point fitting hardware include GlasPro, Pilkington Ltd., and SADEV Architectural Glass Systems.

2.22 GAS CABINETS

A. Cabinet Enclosure:

1. Constructed to NFPA 55 Standards.

2. Constructed of not less than 12 gauge steel (0.097-inch).

3. Self-closing doors with limited access ports or noncombustible windows to give access to equipment controls within.

4. Interior and exterior shall be treated, coated or constructed of materials that are compatible with the hazardous materials stored.

5. The enclosure shall have an integral exhaust duct neck fabricated of the same material as the cabinet walls.

6. Provide adjustable mounting brackets and cylinder restraints for internal cylinders.

7. Glass components shall be fire resistant and be solidly mounted in the door.

8. The door shall have a lockable latch and shall latch tightly when the door closes.

9. Provide coupling for sprinkler head.

10. Provide sealed fitting for all electrical conduit penetrations.

11. Cabinet shall come with floor mounting holes.

B. Process Gas Panel:

1. Gas panel wetted parts shall be constructed with 316L seamless stainless steel tubing in accordance with tubing specifications.

2. All instruments such as diaphragm valves (ball valves are not acceptable), regulators, solenoid valves, check valves and pressure switches shall be constructed with 316 stainless steel.

3. Stainless steel, painted steel or aluminum mounting plate.

4. Attach valves and regulators to mounting plate and provide mechanical connection for lines exiting cabinet.

5. The process gas panel shall be mounted with the following:

   a) Fully automatic switchover manifold for two gas cylinders in the gas cabinet;

   b) Vent valve assembly for each cylinder;

   c) Line valve;

   d) Pressure relief valves (intermediate and pipeline);

5. All wetted electrical components such as pressure switches and solenoid valves shall be rated Class 1, Division 1, Group B, C and D.

6. All wetted components to be manufactured, cleaned, purged and bagged according to CGA-4.1 for oxygen service.

7. Panel to be helium leak tested to 1 x 10-6 std. cm^3/s minimum.

8. All valves shall be ¼-turn diaphragm valves and rated for 3500 psig.

9. Regulators shall meet the following specifications:

   a. High purity, single-stage

   b. Maximum Rated Inlet Pressure: 3,500 psig.

   c. Body and Diaphragm: Stainless Steel

   d. Seat: PTFE

   f. Gauges: 2 inch Stainless Steel

10. Cylinder leads shall be either rigid coiled stainless steel with welded CGA cylinder connection or flexible hoses with stainless steel over-braid, innercore and armor guard. Pressure rating to be 3,500 psig minimum.

C. Manifold Controller:

1. The manifold controller shall control the switchover process between a depleted "In Service" bank to a stand-by "Ready" bank without gas supply interruption.

2. The manifold controller box shall be mounted directly on outside of the gas cabinet.

3. A low pressure alarm signal shall be actuated by a pressure switch installed on the process panel (one pressure switch per cylinder bank).

4. The manifold controller shall be equipped with green (in service), yellow (ready) and red (bank depleted) LEDs indicating the status of each cylinder bank.

5. A buzzer shall sound when a bank is depleted. The buzzer shall be cancelled by a silence push button without canceling the red LED.

6. The manifold controller shall actuate an internal dry contact for remote alarm connection.

7. The manifold controller shall be powered with no more than 24 VAC.

D. Acceptable Product: BeaconMedaes IGC Series Gas Cabinets; Technical Contact: Denis Hache – 440.930.2150; Sales Representative: The Sherman Engineering Company; Sales Contact: Craig Ranalli – 215.262.5790

2.23 GLASS FRONT LOCKERS

A. Provide single-tier lockers with opaque colored glass doors as manufactured by Spec-Rite Marathon Glass Front Lockers, Hollman Glass Front Lockers, CP Prefino Glass Faced Lockers, or approved equal meeting these specifications.

B. Materials:

1. Aluminum Sheet: Cold-rolled, free from buckle, scale, and surface imperfections, conforming to ASTM B 209.

2. Glass: Opaque, low-iron tempered safety glass conforming to ASTM C 1048; color as selected by the Architect from manufacturer's standard colors.

C. Fabrication:

A. Construction: Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make all exposed metal edges safe to touch. Weld or rivet connections; bolted connections not permitted. Grind exposed welds flush. Do not expose rivet heads on fronts of locker frames.

B. Finishing: Chemically pretreat metal with degreasing and phosphatizing process. Apply powder coated finish to all surfaces, exposed and concealed, except plates and non-ferrous metal.

C. Color: Provide locker units in color(s) as selected by Architect from manufacturer's standards. Concealed parts may be manufacturer's standard neutral color.

D. Door Frames: Frames shall be 16 gauge formed in a channel shape. Vertical members shall have additional flange to provide a continuous door strike. Cross frame members shall also be 16 gauge channel shaped, including intermediate cross frames on double and triple tier lockers.

E. Doors: Tempered, 3/8" thick, back-coated ceramic frit float glass. Provide glass doors that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to CPSC 16 CFR, Part 1201 for Category II materials.

F. Body: Tops, bottoms and shelves shall be 1" thick injection molded ABS material with ventilation slots. Sides and backs shall be 14 gauge aluminum sheet cold rolled with radiused inside corners.

G. Hinges: Manufacturer's sprung, self-closing hinges with trim rosette for each fastener.

H. Projecting Handles: Manufacturer's standard, designed for use with digital locks; positive automatic latching, pry and vandal resistant.

I. Locks: Digital keypad locks.

J. Equipment: Furnish each locker with upper and lower shelves, hang rod, and not less than 2 single-prong wall hooks.

K. Number Plates: Manufacturer's standard. Number lockers in sequence as directed by Architect. Attach plates to each locker door, near top.

2.24 STAINLESS STEEL CABINETS

A. **Laboratory casework shall be manufactured in accordance with drawings and specifications, and shall have the following general characteristics:**

1. **Accuride 150 lb. full extension drawer slides.**

2. **Stainless steel 5-knuckle hinges with stainless steel screws.**

3. **Pulls located as indicated on drawings.**

4. **Stainless steel wire finger pulls.**

5. **Roller door catches.**

6. **National 5-Disc locks.**

7. **No label holders.**

8. **Removable back panels at cupboard areas only.**

9. **6mm tempered safety glass.**

10. **Full overlay cabinet fronts and drawers.**

11. **Half depth base cabinet shelves.**

B. **Cabinets, tables, countertops, sinks, shelves, shelf supports and other laboratory casework items noted on drawings as "Stainless Steel" shall be type 302/304, austenitic chromium nickel stainless steel in accordance with A.I.S.I. specification containing 8% nickel and 18% chromium. Exposed surfaces shall have #4 finish.**

C. **Cabinets, tables, countertops, sinks, shelves, shelf supports and other laboratory casework items in Water Lab 108 shall be type 316 stainless steel, similar to type 302/304 except molybdenum is added to improve the general corrosion and pitting resistance over that of type 302/304.**

D. **Stainless steel cabinets shall be constructed using the following gauges:**

1. **20-gauge: Back panels, inner door panels, drawer outer pan, inner pan and body, and shelves. Add reinforcement or use 18-gauge material for shelves over 36" long.**

2. **18-gauge: Sides, ends fixed backs, bottoms, tops, soffits, and outer door pans. Provide 18-gauge for other items where gauge is not specifically noted.**

3. **16-gauge: Intermediate horizontal rails, table frame aprons and cross rails, center posts, top gussets.**

4. **14-gauge: Sink supports, door and case hinge reinforcements.**

5. **11-gauge: Leveling and corner gussets.**

PART 3 - EXECUTION

3.01 EXAMINATION

A. Comply with Section 016000 requirements.

3.02 PREPARATION

A. Protecting Building Surfaces: Install work without damaging building surfaces and with all evidence of drilling, cutting, and anchorage concealed by installed work.

3.03 INSTALLATION

A. Comply with AWI requirements for Installation of Architectural Woodwork (Interior), as amended by the following.

B. Install work plumb, level and true to line and plane as measured from established lines and levels. Provide blocking, grounds, shims, supports, and rough hardware necessary for installation. Anchor work securely in place.

C. Cutting, Fitting, and Placement: Do all cutting, drilling, and fitting required for installation of the work.

D. Scribing Trim:

1. Cut and fit scribing trim closely and accurately to building surfaces. Use one-piece-for-length scribing trim wherever possible.

2. Make joints tight; back end joints with splicers/splines.

3. Secure scribes with concealed fasteners.

E. Anchors and Fasteners:

1. Face Nailing: Confine face nailing to inconspicuous locations. Set nails. Fill holes in exposed and semi-exposed surfaces to conceal nail locations.

2. Anchorage to Drywall Construction: Anchor work to framing/anchor plates with toggle bolts or tapping sheet metal screws; space screws to limit loads to 50 pounds withdrawal or 80 pounds shear per anchor. Where fastening to unreinforced gypsum board is necessary, limit loads to 20 pounds withdrawal or 40 pounds shear per anchor.

3. Anchorage to Concrete: Anchor work with bolts and expansion shields.

3.04 ADJUSTING, CLEANING, AND PROTECTION

A. Correct nonconforming, poorly fitting, and damaged work. Remove and replace work that cannot be satisfactorily corrected at the Project.

B. Cover casework for protection during remainder of construction period. Remove covering at completion of construction, inspect, and make any required final repairs.

END OF SECTION

SECTION 071326

SHEET MEMBRANE WATERPROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the sheet membrane waterproofing as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Sheet membrane waterproofing for underslab conditions including all pits and tunnels.

2. Sheet membrane waterproofing, for foundation wall surfaces, including tunnels.

3. Sheet membrane waterproofing for blindside of foundation wall surfaces, including elevator pits.

4. Sheet membrane waterproofing of horizontol over top of tunnel.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Concrete - Section 033000.

E. Earthwork - Section 312000.

1.5 SUBMITTALS

A. Shop Drawings: Typical installation details, showing details at flashings, at terminations, at joints, at intersection of horizontal and vertical surfaces, and at penetrations in membrane system.

B. Samples - Submit

1. Membrane, 6" x 6" samples of each membrane.

2. 6" x 6" sample of flashing.

3. 6" x 6" sample of drainage board.

C. Manufacturer's Literature: Submit manufacturer's technical, safety data sheets, and installation literature for all materials of this Section. Submit Independent Test data indicating that membrane meets properties specified herein.

D. General Contractor's Certification: Submit per Article 1.7.

E. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.6 STORAGE OF MATERIALS

A. All materials shall be stored in their original tightly sealed containers or unopened packages; shall be clearly labeled with the manufacturer's name, brand name and number, and batch number of the material with expiration date where appropriate.

B. Materials shall be stored in a neat and safe manner so as not to exceed the allowable live load of the storage area.

C. Material shall be stored out of the weather in a clean, dry area.

D. Liquid materials, such as adhesives, thinners and primers, shall be stored in areas away from sparks, open flames and excessive heat.

1.7 JOB CONDITIONS

A. No application of liquid applied urethane flashing shall commence or proceed during inclement weather, or the threat of imminent precipitation.

B. All surfaces to receive the system shall be thoroughly dry and free of dew or frost.

C. Application temperatures are not limited except that materials shall be stored until time of mixing at temperatures above 60 deg. F. to maintain a consistency suitable for mixing. Do no work below 40 deg. F.

D. Prior to and during application, all dirt and dust shall be removed from surfaces either by vacuuming, sweeping, blowing with compressed air, or similar methods.

E. Surfaces not designated to receive the system shall be properly masked or otherwise protected against accidental spillage or application of the material to those areas.

1.8 WARRANTY

A. The General Contractor shall jointly warrant with the manufacturer the waterproofing system executed under this Section to be watertight and free from defects in materials and workmanship for a period of ten (10) years from date of acceptance of this Contract, and that he, at his own expense, repair and/or replace all other work which may be damaged as a result of such defective work, and which becomes defective during the warranty period.

1.9 QUALITY ASSURANCE

A. Preinstallation Conference: Approximately 2 weeks prior to scheduled commencement of waterproofing installation, meet at Project site with Waterproofing Installer; preparer of substrate to receive waterproofing; installers of other work in and around waterproofing that must precede, follow, or penetrate waterproofing (including Mechanical and Electrical Installers as applicable); Architect; Owner; and waterproofing manufacturer's representative to review materials, procedures, schedules, and other requirements and conditions related to installing waterproofing.

B. Qualifications of Subcontractors

1. Subcontractors: All work of this Section shall be performed by a subcontractor who is approved by the manufacturer of the waterproofing material.

2. Qualifications of Subcontractors: Subcontractors shall submit evidence of being bona fide waterproofing subcontractors, for a period of not less than five (5) years, and that they are approved by the manufacturer of the waterproofing material for the installation of the manufacturer's material in accordance with the requirements of this Section.

   a. Subcontractor shall submit a letter from manufacturer of waterproofing material stating that subcontractor is approved by the manufacturer for the application of the waterproofing systems specified and accepted for use on the Project.
   b. Letter shall certify that the subcontractor has previously and satisfactorily applied the waterproofing systems specified herein, under manufacturer's supervision.
   c. Letter shall be on manufacturer's letterhead and shall be signed by an officer of the company, not by a local sales representative.

C. Manufacturer's Representative/Contractor's Certification

1. Representative of the waterproofing material manufacturer shall be required to provide field instructions and supervision for the installation of the waterproofing systems at the start of the work of this Section.

2. The manufacturer's representative shall be required to make sure that the workmen for waterproofing systems on the site of the Project are fully instructed and trained in the handling and application of all the materials, and shall see that all the materials are correctly installed.

3. Upon completion of the Installation, submit to the Architect written certification that the representative of the manufacturer of the waterproofing material has supervised the work of this Section and that all materials were correctly installed.

D. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. The Volatile Organic Compound (VOC) content of any field applied interior sealant used as a filler (as opposed to a coating) shall not exceed 250 grams per liter (g/l).

3. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.10 PROTECTION

A. Against Loads: Protect work of this Section against concentrated loads and any other loads or equipment that would damage the materials or work.

B. Against Traffic: Do not permit traffic on horizontally installed work of this Section, except for workmen doing the work, during the installation, and after the installation until membrane systems are covered with protective boards or with the specified finishing materials.

C. Against Damage: Protect vertically installed work of this section from damage by reinforcing and placement.

1. Take and maintain necessary preventative measures to protect work of this Section from damage until Project is accepted.

2. Rejection of Damaged Work

a. Damaged materials or work will be rejected.
b. Rejected materials or work must be immediately removed and replaced with new materials.

1.11 FIELD QUALITY CONTROL

A. Construction Traffic:

1. Limit construction traffic over completed membrane.

2. General Contractor shall provide 1/2 in. plywood protection layer, where construction traffic is unavoidable.

B. Inform Architect in writing on a daily basis of any of the following events. State specific location of each occurrence.

1. Buckling to the Waterproofing and other deformations as a result of ground water events.

2. Leakage through the finished waterproofing installation.

3. Damage by other trades.

C. Provide Manufacturer's Representative's report (prior to backfill) stating that the waterproofing has been inspected and is acceptable.

PART 2 PRODUCTS

2.1 WATERPROOFING MEMBRANE

A. Trade names used herein for membrane waterproofing are those of W.R. Grace. Alternate acceptable manufacturer is Laurenco.

1. Should the Contractor elect to use Laurenco products, he must submit complete specifications, instructions and full detail for Architect's review. Installation of Laurenco products must be in accordance with manufacturer's data and specifications.

B. For accessible foundation walls and horizontal over tunnel waterproofing, provide "Bituthene 4000" sheet waterproofing membrane, 60 mils thick, and "Bituthene Liquid Membrane," 60 mils thick, for flashing, as manufactured by W. R. Grace or equivalent.

C. At underslab conditions, provide adhesive coated HDPE Composite Sheet "Bituthene Preprufe 300R" system by W. R. Grace & Co. or equivalent.

D. At blind side waterproof condition, provide adhesive coated HDPE Composite Sheet "Bituthene Preprufe 160R" system by W. R. Grace & Co. or equivalent.

E. Bituthene Surface Conditioner: Latex/water based primer specifically formulated to provide adhesion of Bituthene Waterproofing Membranes.

F. Bituthene Elastomeric Mastic: Rubberized asphalt base mastic.

G. Bitustik Tape: Double-sided synthetic adhesive tape.

H. Protection Board: 1/4" thick semi-rigid protection board, Bituthene Asphaltic Hardboard.

I. Bituthene Liquid Membrane: Two-component 100% solids trowel grade asphalt modified urethane.

J. Hydroduct 220 Drainage Board/Composite: Prefabricated dimpled polystyrene drainage core with a non-woven filter fabric on one side and a polymer film on the reverse side.

1. At horizontal applications, use Hydroduct 660.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where membrane waterproofing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION OF SURFACES TO RECEIVE WATERPROOFING

A. Conform to the requirements of Bituthene Techletter No. BTL 82-02, published by W. R. Grace.

B. Earth or crushed stone substrates shall be compacted to produce an even, sound substrate. Loose aggregate, sharp protrusions and standing water shall be removed.

C. Conform to the requirements of Bituthene Techletter No. BTL 13, published by W.R. Grace, for "Forming Systems for Use with the Preprufe 160R Membrane."

3.3 INSTALLATION

A. General: Conform to recommendations and published specifications of the manufacturer' including environmental requirements.

B. Foundation Walls (Accessible Walls)

1. General: The membrane, when in place must withstand a minimum static ground water pressure of 150 feet.

2. Priming: Application of primer shall be limited to what can be covered with Bituthene Waterproofing Membrane in a given work day. Primed areas not covered by membrane during the work day will be reprimed. Apply primer by spray, roller or brush at a rate of 250 - 350 sq. ft. per gallon. Roller shall be natural material such as lamb's wool, having a nap of approximately one inch. Primer shall be applied to a clean, dry, frost-free and dust-free surface. Sufficient primer must be used on the day surface to condition it to a dust-free state suitable for the application of Bituthene Waterproofing Membranes.

   a. Bituthene Surface Conditioner should not be applied below 40 deg. F. on vertical surfaces. Allow primer to dry 30 minutes.

3. Membrane Installation: Apply Bituthene Waterproofing Membrane vertically in sections of 8' in length or less. On higher walls apply two or more sections with the upper overlapping the lower by a least 2-1/2". Press all membrane in place with heavy hand pressure or rollers during application.

4. Sealing Edges: Bituthene Waterproofing Membrane shall be applied over the edge of the slab or over the top of the foundation or parapet wall. If the membranes are terminated on the vertical surface, a reglet or counter flashing may be used or the membrane may be terminated directly on the vertical surface by pressing very firmly to the wall. Press edges with a metal or hardwood tool such as a hammer or knife handle. Apply a troweled bead of Bituthene Mastic to all vertical and horizontal terminations. Bituthene Liquid Membrane can be used as an alternative method at the General Contractor's option.

5. Sealing Seams: All edges and end seams must be overlapped at least 2-1/2". Apply succeeding sheets with a minimum 2-1/2" overlap and stagger end laps. Roll or press the entire membrane firmly and completely as soon as possible. Patch misaligned or inadequately lapped seams with Bituthene Membrane. Slit any fish mouths, overlap the flaps, and repair with a patch of Bituthene and press or roll in place. The edges of the patch shall be sealed with a troweling of mastic. Laps within 12" of all corners shall be sealed with a troweling of mastic.

6. Corner Forming: Outside corners must be free of sharp edges. Inside corners shall receive a fillet formed with Liquid Membrane, latex modified cement mortar equal to Daraweld C made by Grace mixed with cement mortar or epoxy mortar. Do not use fiber or wood cants. One of two methods may be used for treating corners at the General Contractor's option:

a. Apply Bituthene Liquid Membrane 6" in each direction from the corner and form a fillet with a minimum 3/4" face.
b. Install an 11" minimum strip of Bituthene Membrane centered on the corner. Install Bituthene Membrane over the treated inside and outside corners.

7. Over waterproofing, apply drainage composite board by adhering board to cured membrane using tape or adhesive per manufacturer's recommendations.

3.4 INSTALLATION OF WATERPROOFING FOR BLINDSIDE WALLS AND BELOW GRADE UNDERSLAB WATERPROOFING

A. General: Install adhesive coated HDPE composite sheet according to waterproofing manufacturer's written instructions.

B. Wall Applications

1. Refer to manufacturer's literature for complete installation instructions but not limited to the following:

a. Apply Hydroduct 220 Drainage Composite to a point 6" below grade line. Fasten Hydroduct 220 to the adjacent buildings foundation wall or soil retention system.
b. Peel back bottom flap of filter fabric and place core behind discharge pipe. Wrap loose filter fabric over and around discharge pipe. Tuck excess filter fabric behind pipe. Fold excess filter fabric at top termination down between drainage composite and membrane.
c. Apply membrane with the HDPE film facing the soil retention system or adjacent foundation. Remove the release liner and fasten membrane to Hydroduct drainage composite with large head nails or staples.
d. Apply succeeding sheets by overlapping the previous sheet 3 inches along the uncoated edge of the membrane.
e. Overlap the ends of the membrane 3 inches. Apply Preprufe Tape centered over the end lap and roll firmly. Remove release liner.
f. Concrete must be poured within 30 days of membrane application. Protect membrane until concrete pour.
g. If membrane ties into a vertical membrane, leave an additional 12" flap of Preprufe membrane to tie into Bituthene membrane.

C. Underslab Applications

1. Apply Hydroduct 660 drainage composite board as recommended by manufacturer over the compacted sub-grade.

2. Apply the membrane over the drainage composite board with the HDPE side facing the drainage composite board and the treated white coating surface facing the concrete to be poured. The membrane may be installed at any convenient length. Apply succeeding sheets by overlapping previous sheets 3" along the self-adhesive edge of the membrane. Remove the silicone coated release liner covering the membrane and roll the side lap to assure a tight seal.

3.5 SEAM REINFORCEMENT FOR HDPE COMPOSITE SHEETS ONLY

A. Provide a 6 in. strip of modified bituminous sheet membrane (Bituthene 4000) centered behind all laps.

B. At locations where a salvage edge is not present and at end laps, lap sheets 6 in., apply a 1/8 in. thick by 6 in. wide application of liquid membrane between sheets, to provide a 6 in. wide seal.

C. Integration of old onto new pre-applied sheet membrane.

1. Integration of Sheet Membrane onto Sheet Membrane that has been installed in excess of 30 days prior

   a. Lap sheets 12 in., apply a 1/8 in. thick by 12 in. wide application of fluid membrane between sheets, to provide a 12 in. wide seal at this location.
   b. Install Waterproofing Tape centered at edge of lap and roll firmly into place with an approved roller.
   c. Install additional Waterproofing Tape to cover white film that has been installed over 30 days prior.

2. Repair of pre-applied sheet membrane

   a. Scratch on white coating exposing underlying black surfing of Sheet Membrane: Install Waterproofing Tape at areas where the white coating of the membrane is damaged, including boot scuff marks and abrasions by rebar.
   b. Damage or Puncture of Sheet Membrane: Install Patch of short Membrane set in Liquid Membrane. Patch must extend 3 in. in every direction around extent of damaged area. Install Waterproofing Tape centered over the edge of the patch. If the damaged area does not have 5 in. of sound material around it, inject Liquid Membrane into puncture until Liquid Membrane backs out, and proceed with patch as space allows.

3.6 INSTALLATION OF TUNNEL ROOF WATERPROOFING

A. Apply membrane from the low point to the high point so that laps shed water. Overlap all seams at least 2". Stagger all end laps. Roll the entire membrane firmly and completely as soon as possible. Use a linoleum roller or standard water-filled garden roller less than 30" wide, weighing a minimum of 75 lbs. when filled. Cover the face of the roller with a resilient material such as a plastic foam or two wraps of indoor-outdoor carpet to allow the membrane to fully contact the primed substrate. Seal all T-joints and membrane terminations with Bituthene Mastic or Bituthene Liquid Membrane at the end of the day.

B. Patch tears and inadequately lapped seams with membrane. Slit fishmouths, repair with a patch extending 6" in all directions from the slit and seal edges of the patch with Bituthene Mastic. Do not apply Bituthene Mastic where it will be covered with membrane, except when used as a temporary cut-off.

C. Flood test application of waterproofing in accordance with Article 3.7 herein.

D. After flood testing and repairs is complete, cover membrane with drainage composite board using tape and/or adhesive per manufacturer's recommendations.

3.7 WATER TEST

A. Water tests shall be conducted for horizontal application at tunnel and must be judged to be successful by the Owner, before the installation of any subsequent components of the waterproofing system. Do not conduct water test during rain, other inclement weather, or if sections of exposed structural deck adjacent to the test area contain standing water or are wet.

B. Water test areas of membrane that are penetrated by dowels, electrical conduit, etc. after the penetrations are installed through the membrane and flashed. Testing the penetrations may be done as part of a test of a larger area or as separate test of individual or grouped penetrations after the membrane has been successfully tested.

C. Before beginning test, check area below membrane, and note any existing active leaking from other sources.

D. Test for leaks by plugging drains, damming the area and filling area with min, 2 in. of water, and let stand for 24 hours.

E. Check area below membrane for active leakage before releasing water.

F. Drain water and mark all area where water stands (flat areas).

G. Examine spaces below deck for signs of leakage, and walk all membrane seams watching for signs of "bubbling" or expulsion of water. Critically examine all seams in flat areas of standing water.

H. If leakage occurs, inspect the membrane and repair or replace defective areas.

I. Continue to water test until area being tested passes test.

3.8 CLEAN-UP

A. Upon completion of the waterproofing system, the General Contractor shall remove all equipment, material and debris from the work and storage area, and leave those areas in an undamaged and acceptable condition.

END OF SECTION

SECTION 072100

THERMAL INSULATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the thermal insulation as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Foundation wall insulation.

2. Rigid insulation within exterior wall construction.

3. Miscellaneous blanket insulation.

4. Attachment devices.

5. Spray applied foam insulation at soffits.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Masonry - Section 042000.

E. Roof insulation - Section 075423.

F. Firestops and smokeseals - Section 078413.

G. Acoustical insulation - Section 092900.

H. Earthwork - Section 321000.

1.5 SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

B. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.6 QUALITY ASSURANCE

A. Fiberglass insulation shall contain a minimum of 20% (by weight) recycled content, calculated by adding the post-consumer recycled content percentage to one-half of the post-industrial recycled content percentage.

B. Mineral wool insulation shall contain a minimum of 75% (by weight) recycled content, calculated by adding the post-consumer recycled content percentage to one-half of the post-industrial recycled content percentage.

C. Extruded polystyrene insulation shall contain a minimum of 5% (by weight) recycled content, calculated by adding the post-consumer recycled content percentage to one-half of the post-industrial recycled content percentage.

D. To the greatest extend possible, the Contractor shall use extruded polystyrene insulation products that do not utilize chlorine based gases in the production process.

E. LEED Building Performance Requirements

1. Fiberglass insulation shall contain a minimum of 20% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Mineral-wool insulation shall contain a minimum of 50% (combined) pre-consumer/post-consumer recycled content. Certification of recycled content shall be in accordance with the Submittal Requirements above.

2. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

3. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type and brand. Delivered materials shall be identical to approved samples.

B. Store materials under cover in a dry and clean location, off the ground. Remove materials which are damaged or otherwise not suitable for installation and replace with acceptable materials.

C. Take every precaution to prevent the insulation from becoming wet, cover with tarps or other weather/watertight sheet goods.

PART 2 PRODUCTS

2.1 FOUNDATION WALL INSULATION

A. Provide extruded polystyrene board insulation equal to "Styrofoam" manufactured by Dow Chemical Co., or approved equal made by Owens Corning or PACTIV Building Products, conforming to ASTM C 578, Type IV, with a maximum flame spread and smoke developed indices of 75 and 450 respectively.

B. Insulation shall have an aged R value of not less than 5/inch; shall be 2" thick unless otherwise noted on the drawings.

2.2 EXTERIOR WALL INSULATION

A. Provide "RainBarrier HD" by Thermafiber, "CavityRock DD" by Roxul, or approved equal conforming to ASTM C 612, with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. Insulation shall comply with NFPA 285.

1. Thickness: 5", unless otherwise indicated.

2. Nominal density of 6 lb./cu. ft., thermal resistivity of 4.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.3 BLANKET INSULATION

A. Provide flexible glass fiber blankets/batts equal to "Fiberglass Flame Spread 25 Insulation" as manufactured by Owens Corning or equal made by Manville or Certainteed conforming to ASTM C 612, Type 1Ae or ASTM C 665, Type III, Class A, faced on one side with foil reinforced Kraft vapor retarder; maximum flame spread and smoke developed indices 25 and 50 respectively.

B. Insulation shall have an R value of not less than 3.7/inch and shall be 3" thick unless otherwise noted on the drawings.

2.4 ACCESSORIES

A. Clips for Securing Insulation to Encountered Surfaces: Spindle anchor and washer type consisting of perforated metal plates with spindle welded to center and snap on washers. Spindle and washers shall receive a corrosion-resistant electro-zinc plating. Adhesives for securing clips in place shall be recommended by the approved clip manufacturer.

1. Acceptable Manufacturers

a. Miracle Adhesives Corp.
b. Stic-Klip Mfg. Co., Inc.
c. Midwest Fasteners

2.5 SPRAY FOAM INSULATION

A. Provide closed cell polyurethane foam insulation; Demilec Heatlok Soy 200 Plus, Bayseal Closed Cell (CC) by BaySystems (Bayer Material Science LLC), or equal by BASF or Dow Chemical Co.

1. Insulation shall be 3" thickness unless noted otherwise.

2. Spray applied 15 min. ignition barrier where required by code.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where thermal insulation is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

B. General

1. Cooperate in the coordination and scheduling of the work of this section with the work of other sections so as not to delay job progress.

2. Install insulation in as large components as practical and to cover entire areas indicated on the drawings, closely butted together at sides and ends, and against walls, beams, etc. Neatly fit and cut insulation around all projections such as pipes, conduits, hangers and all other elements encountered in the field, which will result in complete coverage of the scheduled areas.

3. Discard, off the site, insulation which becomes damaged during the course of installation, or is no longer in a physical condition to function for use intended, and replace with new material.

4. Clean surfaces on which adhesives are used to secure the insulation in place of dirt, grime, grease, oil, and other foreign materials, to assure that the surfaces are properly prepared to accept the bond of the approved adhesives.

5. Exercise extreme care to avoid damage and soiling of faces on insulation units which will be exposed to view. Align joints accurately, with adjoining surfaces set flush.

6. Set vapor barrier faced units with vapor barrier to inside of construction, except as otherwise shown. Do not obstruct ventilation spaces. All joints in vapor barriers shall be sealed with 4" wide, foil faced duct tape to prevent vapor and air migration.

7. Tape joints and ruptures in vapor barriers, using tape specified above, and seal each continuous area of insulation to surrounding construction so as to ensure vapor tight installation of the units.

8. Where insulation is impaled on stick clips, provide clips not less than 3" from corners or edges and not more than 12" o.c.

9. Comply with manufacturer's instructions for the particular conditions of installation in each case. If printed instructions are not available or do not apply to the project conditions, consult the manufacturer's technical representative for specific recommendations before proceeding with the work.

10. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

11. Apply a single layer of insulation to the required thickness, unless a double layer is required, to make up the total thickness shown.

12. Furnish mason trades rigid insulation to be installed within masonry cavity.

3.2 INSTALLATION OF FOUNDATION WALL INSULATION

A. Set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24" below exterior grade line.

3.3 INSTALLATION OF RIGID INSULATION

A. Set units in adhesive applied in accordance with manufacturer's instructions.

3.4 INSTALLATION OF BLANKET OR BATT FIBERGLASS INSULATION

A. Install blanket fiberglass insulation in largest pieces as practical with edges closely butted. Cut and fit insulation to closely fit intersecting or penetrating surfaces.

1. Face vapor barrier towards warm side, tape joints with 4" wide vaporproof aluminum tape applied over vapor barrier.

3.5 INSTALLATION OF SPRAY FOAM INSULATION

A. Install spray foam insulation in accordance with manufacturer's instructions.

3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 072700

AIR AND VAPOR BARRIER MEMBRANE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the air and vapor barrier membrane as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Continuous air and vapor barrier applied over exterior face of CMU cavity wall back-up.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Unit masonry - Section 042000.

E. Terra cotta assembly - Section 042800.

1.5 QUALITY ASSURANCE

A. Submit in writing, a document stating that the applicator of the primary air/vapor barrier membranes specified in this section is recognized by the manufacturer as suitable for the execution of the Work.

B. Perform Work in accordance with the manufacturer's written instructions of the air/vapor barrier membrane and this specification.

C. Maintain one copy of manufacturer's written instructions on site.

D. At the beginning of the Work and at all times during the execution of the Work, allow access to Work site by the air/vapor barrier membrane manufacturers' representative.

E. Components used in this section shall be sourced from one manufacturer, including sheet membrane, air/vapor barrier sealants, primers, mastics, and adhesives.

F. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be to be evaluated as part of this specific assembly test.

~~F.~~**G.** LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. The Volatile Organic Compound (VOC) content of any field applied interior sealant used as a filler (as opposed to a coating) shall not exceed 250 grams per liter (g/l).

3. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 MOCK-UP

A. Construct typical exterior wall panel, 3'0" long by 3'0" wide, incorporating substrate, window frame, attachment of insulation, showing air barrier membrane application details.

B. Allow 24 hour for inspection of mockup by Architect before proceeding with air barrier work. Mockup may remain as part of the Work.

1.7 SUBMITTALS

A. Product Data: Submit manufacturer's product information for all materials to be used. Data shall indicate that the submitted products are the products installed in the project.

B. Samples: Submit 12" x 12" sample of cured air and vapor barrier membrane.

C. Provide letter from air/barrier manufacturer confirming thru wall flashing material is compatible with air/barrier.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.8 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

1. Store air barrier membranes, adhesives and primers at temperatures of 40°F and above to facilitate handling.

2. Keep solvent away from open flames or excessive heat.

3. Protect rolls from direct sunlight until ready for use.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Subject to compliance with requirements, provide products manufactured by Henry Co., or equivalent.

1. Henry products are specified as basis for project design.

2. Acceptable Alternate: Perm-A-Barrier Liquid manufactured by W.R. Grace or Barriseal-S by Carlisle.

2.2 MATERIALS

A. Liquid Membrane: Air-Bloc 32MR as manufactured by Henry Company, a synthetic, spray applied to a wet film thickness of 75-115 mils and rubber based adhesive type; incorporating the following characteristics:

1. Air Leakage: 0.00012 CFM/ft^2 @ 1.6 psf.

2. Water Vapor Permeance: 0.08 perms (ASTM E 96 Method B).

3. Long Term Flexibility: Pass (CGSB 71-GP-24M).

B. Transition Membrane: Blueskin SA as manufactured by Henry, a SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film; incorporating the following physical properties:

1. Thickness: 40 mils minimum.

2. Air Leakage: <0.001 CFM/ft^2 @ 1.6 psf (ASTM E 283).

3. Water Vapor Permeance: 0.05 perms per ASTM E 96.

4. Low Temperature Flexibility: Pass -22°F (ASTM D 3111).

5. Elongation: 200% per ASTM D 412.

6. Provide transition membrane at inside and outside corners, cracks, masonry control joints, tie-ins to structural beams, columns, floor slabs and intermittent floors, parapet curbs, foundation walls, roofing systems and at the interface of dissimilar materials as indicated in drawings. Fiberglass tape is required at sheathing joints.

C. Thru-Wall Flashing Membrane: Blueskin TWF, SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film.

D. Substrate Cleaner: Mineral spirits or Xylol.

2.3 ADHESIVE AND PRIMERS

A. Primer for self-adhering membranes at temperatures above 25 degrees F shall be Aquatac™ Primer manufactured by Henry; a polymer emulsion based adhesive, quick setting. Primer shall have the following physical properties:

1. Colour: Aqua
2. Weight: 8.3 lbs/gal
3. Solids by weight: 53%
4. Water based, no solvent odours
5. Drying time (initial set): 30 minutes at 50% RH and 70 degrees F

B. Adhesive for self-adhering membranes at all temperatures shall be Blueskin® Adhesive manufactured by Henry, a synthetic rubber based adhesive, quick setting, having the following physical properties:

1. Color: Blue,
2. Weight: 6 lbs/gal,
3. Solids by weight: 35%,
4. Drying time (initial set): 30 minutes.

C. Adhesive with low VOC content for self-adhering membranes at all temperatures shall be Blueskin® LVC Adhesive manufactured by Henry, a synthetic rubber based adhesive, quick setting, having the following physical properties:

1. Color: Blue,
2. VOC: <240 g/L,
3. Solids by weight: 40%,
4. Drying time (initial set): 30 minutes.

2.4 JOINT TREATMENT, PENETRATION & TERMINATION SEALANT

A. Joint Treatment, penetration and termination Sealant shall be HE925 BES Sealant manufactured by Henry; a moisture cure, medium modulus polymer modified sealing compound having the following physical properties:

1. Compatible with sheet air barrier, roofing and waterproofing membranes and substrate,
2. Complies with Fed. Spec. TT-S-00230C, Type II, Class A
3. Complies with ASTM C 920, Type S, Grade NS, Class 25

4. Elongation: 450 – 550%

5. Remains flexible with aging

6. Seals construction joints up to 1 inch wide

B. Alternate joint treatment fabric: HE 183 yellow open weave glass fabric or approved.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions where the air and vapor barrier materials are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected to permit proper installation of the work.

3.2 PREPARATION

A. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants.

B. Cracks in masonry shall be sealed with a strip of Blueskin membrane lapped a minimum of 3" on both sides of the crack.

C. Apply transition membrane at exterior gypsum sheathing panel joints per manufacturer's installation instructions.

D. Ensure that CMU joints have been striked flush as specified in Section 042000.

3.3 PRIMER FOR TRANSITION AND THROUGH-WALL FLASHING MEMBRANE

A. Apply primer for self-adhering membranes at rate recommended by manufacturer.

B. Apply primer to all areas to receive transition sheet and/or through-wall flashing membrane, as indicated on drawings by roller or spray and allow minimum 30 minute open time. Primed surfaces not covered by Blueskin SA transition membrane or Blueskin TWF through-wall flashing membrane during the same working day must be re-primed.

3.4 TRANSITION MEMBRANE

A. Align and position Blueskin SA self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 4" overlap at all end and side laps.

B. Promptly roll all laps and membrane with a counter top roller to effect seal.

C. Ensure all preparatory work is complete prior to applying Air-Bloc ~~21S~~ **32MR**.

3.5 THROUGH-WALL FLASHING MEMBRANE

A. Align and position the leading edge of Blueskin TWF self-adhering through-wall flashing membrane with the front horizontal edge of the foundation walls or self angles, partially remove protective film and roll membrane over surface and up vertically.

B. Press firmly into place. Ensure minimum 4" overlap at all end and side laps.

C. Promptly roll all laps and membrane to effect the seal.

D. Ensure through-wall flashing membrane extends fully to the exterior face of the exterior masonry. Trim off excess as directed by the consultant.

E. Apply through-wall flashing membrane along the base of masonry walls, over windows, doors and all other wall openings. Membrane shall form continuous flashing and shall extend up a minimum of 8" up the back-up wall.

F. Configure TWF with end dams at jamb conditions.

G. Seal laps, seams, edges and penetrations in TWF with HE925 BES sealant or Polybitume by Henry, per Henry's installation requirements, or equal.

3.6 PRIMARY AIR/VAPOR BARRIER

A. Apply by spray or flat trowel a complete and continuous unbroken film of liquid air/vapor and rain barrier membrane.

1. For temperatures above 40 degrees F and rising, apply one component water based elastomeric emulsion air/vapor barrier membrane at a rate of 14 sq.ft/gallon to 22 sq.ft/gallon to a uniform wet film thickness of 75 - 115 mils.

B. Spray apply or trowel around all projections and penetrations ensuring a complete and continuous air barrier membrane. Lap liquid applied membrane 1 inch over self-adhering membranes to seal leading edge.

C. Allow air barrier membrane to dry as per manufacturers recommendations prior to placement of insulating materials.

3.7 APPLICATION OF TERMINATION SEALANT

A. Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the primary water resistive air barrier membrane and around the perimeter edge of membrane terminations at window and door frames with specified termination sealant.

3.8 INSPECTION

A. Notify Architect when sections of work are complete so as to allow for review prior to installation of cavity wall insulation (Section 042000).

3.9 PROTECTION

A. Protect all work of this section from excessive exposure to sunlight and other elements; comply with manufacturer's recommendations.

END OF SECTION

SECTION 074213

ALUMINUM COMPOSITE PANELS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the aluminum composite panels as shown on the drawings and specified herein, including, but not necessarily limited to, the following:

1. Prefinished, preformed composite panels at soffits.

2. Sub-girts, trim and accessories required for complete installation.

3. Sealant in conjunction with metal panel work.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Unit masonry – Section 042000.

1.5 QUALITY ASSURANCE

A. Qualifications of Installers: Use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

B. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 PERFORMANCE CRITERIA

A. Structural Design: Design calculations, certified by a registered professional engineer, licensed in the State of Connecticut, shall be submitted to verify load carrying capability of panel system. Panel system shall be capable of resisting a minimum positive and negative wind load of 30 psf without exceeding a deflection of L/175, unless greater required by Code.

B. Water Penetration: No evidence of water penetration under static pressure when tested in accordance with ASTM E 331 at a differential of 10% of inward acting design load, 6.24 psf minimum after 15 minutes.

C. Air Infiltration: At 1.57 psf, air infiltration through the wall shall not exceed 0.06 cubic feet per minute when tested in accordance with ASTM E 283 at a test pressure of 20 psf.

1.7 SUBMITTALS

A. Manufacturer's Data: Submit standard detail drawings and installation instructions for metal panels. Include manufacturer's certification or other data substantiating that the materials and finishes comply with the requirements. Indicate by copy of transmittal that the Installer has received a copy of the installation instructions.

B. Samples: Submit 12" long by full width samples of each type of metal panels, complete with factory-applied finish. Samples will be reviewed by Architect for pattern, texture and color only. Compliance with other requirements is the exclusive responsibility of the Contractor.

C. Shop Drawings: Submit shop drawings showing the profiles of preformed metal panel units, and the details of forming, jointing (gaskets, if any), internal supports, anchorages, trim, flashing, and accessories. Show details of weatherproofing at edges,

terminations, and penetrations of the metal panel work. Show small scale layout and elevations of entire work.

D. Engineering Data: Submit engineering and test data and tables showing performance characteristics of the panels for loads, deflections and infiltration of air and water meeting standards specified herein.

E. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.8 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.9 WARRANTY

A. Exterior panel finish shall be warranted for a period of 10 years against failures of any kind.

B. Composite wall panel system shall be warranted for a period of 5 years against failures of any kind.

1.10 COORDINATION

A. Contractor must carefully coordinate his work with work of other trades that are penetrating through, or connecting to the metal siding. Openings required in siding to accommodate penetrations must be neatly and accurately made in the shop prior to job site delivery.

B. Provide concealed reinforcing plates, anchors and supports to receive items mounted on panels as required to prevent deflection of panels.

C. Provide all necessary trim, flashing, sealant as specified herein to insure watertight integrity of panels where penetrations occur.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide aluminum faced composite panels equal to "Alucobond" manufactured by Alcan Composites, U.S.A., or equal by Alcoa, Mitsubishi, Kasei or approved equivalent.

1. Panel Thickness: 6 mm.

2.2 MATERIALS AND COMPONENTS

A. Core: Thermoplastic material which in composite assembly meets performance characteristics specified and code requirements as set forth in the BOCA Basic/National Building Code for Class A construction.

B. Face Sheets: 0.020" aluminum 3003 alloy, coated with specified high performance finish and bonded in a continuous process to core material to meet performance requirements.

C. Bond Integrity: When testing in accordance with ASTM D 1781 for bond integrity, simulating resistance to delamination:

1. Bond Strength: 220 psi minimum.

2. Peel Strength: 22.5" lbs./in. minimum.

3. Shall have successfully passed 6 each ASTM D 1037 weather cycling test.

4. Shall have had no change in bond performance after 8 hours of submersion in boiling water.

D. Painted aluminum panels shall be tested as non-combustible where 40 feet above the grade plane.

2.3 COMPOSITE WALL PANEL FABRICATION

A. Panels shall have a removable plastic film applied prior to fabrication and to remain on during fabrication, shipping, and erection. It will be removed just before caulking.

B. Composition: Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. Panels shall be factory formed and complete with all related extrusions, fasteners, gasketing, etc., as required or a complete installation. Shop fabricated panels to sizes and joint configurations indicated on the drawings.

C. Panel Weight: 1.59 lbs./sq. ft.

D. Tolerances

1. Panel Bow: Maximum 0.8% of panel dimension in width and length.

2. Panels Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.

3. Panel lines, breaks, and angles shall be sharp, true and surfaces free from warp or buckle.

4. Maximum deviation from panel flatness shall be 1/8" in 5 feet on any panel in any direction for assembled units.

2.4 ALUMINUM FINISH

A. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

1. Fluoropolymer Two-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color coat, containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605-98.

a. Color and Gloss: As selected by Architect, custom color and gloss.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where metal panels are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. General: Comply with panel manufacturer's instructions for assembly, installation and erection of metal panels.

B. Metal Separation: Apply a coat of bituminous paint, concealed, on one or both surfaces wherever dissimilar metals would otherwise be in contact. Use gasket fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

C. Anchor components parts of the metal panels securely in place, providing for necessary thermal and structural movement.

D. Tolerances: Erect the panels horizontally, plumb, level and true to line with tolerances not exceeding 1/8" in runs of 20'-0", and within 1/16" of adjoining faces and of alignment of matching profiles.

E. Fasteners: Provide an concealed fastener system, fastener finish to match panels.

F. Joint Sealers: Install gaskets, joint fillers and sealants where required for weatherproof performance of panel systems. Provide types of gaskets and sealants/fillers recommended by panel manufacturer.

G. Damaged Material: Remove and replace panels and component parts of the work which have been damaged (including finish) beyond successful repair, as directed by the Architect. Repair minor damage.

3.3 CLEANING AND PROTECTION

A. Clean exposed surfaces of metal panels work promptly after completion of installation. Comply with recommendations of both the panel and coating manufacturer.

B. Protection: The Installer of composite panels shall advise the Contractor in writing of protection and surveillance procedures which can be foreseen as needed to ensure that the work will be without damage or deterioration at the time of final acceptance after completion of other construction work.

END OF SECTION

SECTION 074510

PREFORMED METAL SIDING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the preformed metal siding as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Perforated metal siding with factory applied finish.

2. Sub-girts, trim, feature strips and accessories required for complete installation.

3. Sealant in conjunction with metal siding work.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: Use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

B. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.5 PERFORMANCE CRITERIA

A. Structural Design: Design calculations, certified by a registered professional engineer, licensed in Connecticut, shall be submitted to verify load carrying capability of panel system. Panel system shall be capable of resisting a minimum positive and negative wind load as specified in Division 8 Curtain Wall Section with a deflection of L/180.

B. Air Infiltration: The panel system shall be tested for static air infiltration in accordance with ASTM E 283. The maximum allowable leakage shall be 0.06 CFM/FT^2 at a positive pressure differential of 1.57 psf.

C. Water Penetration: No uncontrolled water shall occur when the panel system is subjected to a static water infiltration test per ASTM E 331 at a positive pressure differential of 6.24 or 20% of the design wind pressure, whichever is greater.

1.6 SUBMITTALS

A. Manufacturer's Data: Submit standard detail drawings and installation instructions for preformed metal siding. Include manufacturer's certification or other data substantiating that the materials and finishes comply with the requirements. Indicate by copy of transmittal that the Installer has received a copy of the installation instructions.

B. Samples: Submit twelve (12) inch long by full width samples of preformed metal siding, complete with factory applied finish. Samples will be reviewed by Architect for pattern, texture and color only. Compliance with other requirements is the exclusive responsibility of the Contractor.

C. Shop Drawings: Submit shop drawings showing the profiles of preformed metal siding units, and the details of forming, jointing (gaskets, if any), internal supports, anchorages, trim, flashing, and accessories. Show details of weatherproofing at edges, terminations, and penetrations of the metal siding work. Show small scale layout and elevations of entire work.

D. Engineering Data: Submit engineering and test data and tables showing performance characteristics of the panels for loads, deflections and infiltration of air and water meeting standards specified herein.

E. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 WARRANTY

A. Exterior panel finish shall be warranted for a period of ten (10) years against failures of any kind.

B. Wall system shall be warranted for a period of five (5) years against failures of any kind.

1.9 COORDINATION

A. Contractor must carefully coordinate his work with work of other trades that are penetrating through, or connecting to the metal siding. Openings required in siding to accommodate penetrations must be neatly and accurately made in the shop prior to job site delivery.

B. Provide concealed reinforcing plates, anchors and supports to receive items mounted on siding as required to prevent deflection of siding.

C. Provide all necessary trim, flashing, sealant as specified herein to insure watertight integrity of siding where penetrations occur.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide steel wall panel system as specified herein. The profiles and gauges of panel sections and methods of interconnecting shall be as required to provide a combined action as a wall system to resist a minimum wind load of forty-five (45) psf without exceeding a deflection of L/180.

B. Wall Assembly: Field assembled wall system shall consist of a concealed fastener exterior face and sub-girts anchored to steel frame back-up. The exterior face shall be fastened to the sub-girts with concealed screw fasteners, and side joints shall interlock so as to eliminate exposed fasteners.

C. Concealed Fastener Panels: Provide panels equal to "Concept" Series CS-260, manufactured by Centria, or approved equal.

1. Panels shall be nominal 7/8" in depth with 12" coverage width.

2. Panels shall have identical interlocking side joints to accommodate multiple panel profile integration.

3. Panels shall be fastened to the wall girts with minimum 16 gauge concealed clips and fasteners to allow for unimpeded thermal movement of the wall system. Clips shall be designed to hold panel 1/2" minimum from exterior sheathing. Exposed fastened panels are unacceptable.

4. Panels shall be factory fabricated by roll-forming operations to assure consistency and quality of manufacture. Panels fabricated by press brake or folding machine are unacceptable.

5. Metal panels shall be fabricated from zinc-coated steel conforming to ASTM A 653 SS Grade 37, G90 coating. Material shall be minimum 22 gauge with smooth surface texture.

6. All exterior metal flashing shall be fabricated of the same material, gauge, finish, and color as the exterior profile, unless otherwise noted.

D. Sub-Girts: Metal sub-girts shall be formed from 16 gauge zinc-coated steel conforming to ASTM A 653 SS Grade 37, G90 coating, and will provide the necessary combined action between the face sheet and liner to meet design criteria. Sub-girts shall be of the adjustable type.

E. Trim Material: Furnish necessary trim in conjunction with the metal wall system, including top, bottom, corner, end wall jamb, sill, head. Material shall be the same substrate and finish as the exterior panel.

F. Sealant: One part silicone conforming to the requirements of Section 079200.

2.2 FABRICATION

A. Comply with dimensions, profile limitations, gauges, and fabrication details shown on contract drawings; and if not shown, provide manufacturer's standard product fabrication and details.

B. Fabricate components of the system at factory, ready for field installation.

C. Fabricate components and assemble units to comply with fire and/or performance requirements specified.

D. Apply specified finishes in conformance with manufacturer's standards and according to coating manufacturer's instructions.

E. Changes of plane, parallel or transverse to longitudinal axis shall be accomplished as detailed on the drawings in the factory wherever practical and with a minimum of field fabrication.

2.3 FINISH

A. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Acid-chromate-fluoride-phosphate conversion coating; Organic Coating: As specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

1. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermo-cured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605-98.

2. Color shall be custom color and gloss as selected by the Architect. Color samples shall be submitted and approved prior to application of color coating.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where metal siding is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install panels and related components in strict accordance with manufacturer's instructions. Installation shall be performed under experienced supervision authorized by the manufacturer.

B. All supports and fastenings shall be protected against corrosion and the effects of moisture.

C. Each unit shall be accurately and securely erected, lined up with relations to adjoining parts, with all joints plumb, level and true within the limits as set by the flatness of the panels and the general contour of the building.

D. Dented, sprung, bent, chipped or otherwise face damaged units will not be accepted and, if erected must be replaced by undamaged units at no additional cost to the Owner.

E. Installation Tolerances: Align panels within 1/8" of 20'-0" on level/plumb and location. Hold surface plane of adjacent panel within 1/16" tolerance.

F. The work shall be designed to accommodate all tolerances and anticipate dead and live load movement, creep, sway and torsion of the structure without any harmful effects.

G. Conduct field water tests in accordance with AAMA 501.2.

3.3 CLEANING AND PROTECTION

A. Clean exposed surfaces (exterior and interior) of preformed metal siding work promptly after completion of installation. Comply with recommendations of both the panel and coating manufacturer.

B. Protection: The Installer of preformed metal siding shall advise the Contractor in writing of protection and surveillance procedures which can be foreseen as needed to ensure that the work will be without damage or deterioration at the time of final acceptance after completion of other construction work.

END OF SECTION 074510

SECTION 075300

MEMBRANE ROOFING, ROOF INSULATION AND ROOF PAVERS (ALTERNATE 7)

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the single ply membrane roofing as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Fleece-backed 145 mils thick EPDM sheet membrane roofing; fully adhered installation.

2. Roof insulation below roof membrane.

3. Membrane flashing.

4. Roof walkway pads.

5. Roof pavers.

1.4 RELATED SECTIONS

A. Concrete deck - Section 033000.

B. Wood blocking - Section 062000.

C. Sheet metal flashing - Section 076200.

D. Drains and vents - Division 22.

1.5 DESCRIPTION OF THE SYSTEM

A. The membrane roofing system shall consist of factory fabricated large sections of 145 mils thick fleece-backed sheet membrane fully adhered over the rigid roof insulation. Provide flashing at roof penetrations and vertical surfaces.

B. The 30-year Total System FleeceBACK Adhered Roofing System utilizes 10' wide Sure-Seal (white) FleeceBACK membrane with a total thickness of approximately 145-mil thick (90-mil thick non-reinforced EPDM membrane laminated to a 55-mil thick non-woven polyester, polypropylene blended fleece-backing).

C. Fleece backed membrane is fully adhered to an acceptable substrate with Carlisle's two-component low rise FAST Adhesive in a full coverage. Adjoining sheets of membrane spliced together with 6" wide Factory-Applied SecurTAPE and Primer. Sheet end laps are butted and overlaid with 6" wide Sure-Seal Pressure-Sensitive Cured Cover Strip and overlaid with 12" wide Sure-Seal Pressure-Sensitive Overlayment Strip. All field and flashing splices are sealed with Sure-Seal Lap Sealant.

D. Comply with UL 790 Class A rating for flammability for external fire exposure.

E. Projects with a 100-mph Peak Gust Wind Speed Warranty: The membrane assembly must incorporate 5/8" thick Carlisle Dens-Deck or Dens-Deck Prime as a membrane underlayment installed over a base layer of Sure-Seal Polyisocyanurate insulation (standard 20 psi compressive strength) with all joints staggered between layers. Both layers may be mechanically fastened (excluding fibrous cement or gypsum decks) or adhered with FAST Adhesive, where applicable.

1. NOTE: On fibrous cement or gypsum decks, all layers of insulation are required to be adhered with FAST Adhesive.

1.6 QUALITY ASSURANCE

A. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

B. Qualifications

1. The membrane roofing system specified herein shall be the product of a manufacturer who can furnish supporting evidence of manufacturing experience in the manufacture of the membrane roofing system and of having been regularly engaged in this business for not less than 5 years. Such experience shall be in projects similar to the requirements for this project.

2. The details and specifications are based on a particular manufacturer. It is not the intention of this specification to restrict competition. But if a manufacturer other than the one specified is selected, it shall be his obligation and responsibility to modify and adjust his materials to suit the encountered conditions and to consult and coordinate his work with other trade Contractors to assure that the installation will be watertight and function for use intended and that the guarantee will be issued to the Owner.

3. Acceptable Manufacturers:

   a. Carlisle Syntec, Inc. (“FleeceBACK Sure-Seal”; basis for project design).
   b. Firestone Building Products Company.
   c. Versico, Inc.
   d. or an equal acceptable to the Architect.

C. Installer: A firm with not less than 5 years of successful experience in installation of roofing systems similar to those required for this project and which is acceptable to or licensed by the manufacturer of the primary roofing materials.

D. UL Listing: Provide labeled materials which have been tested and listed by UL for application indicated and which have a "Class A" rating.

E. Wind Uplift Resistance: Design roof system for 100 MPH wind uplift resistance.

1.7 SUBMITTALS

A. The samples and certificates listed below are required to be submitted by the Contractor to the Architect, for review. An omission of an item or items, does not relieve the Contractor from this responsibility, and for compliance with the Contract Documents, of which this is a part.

1. Samples

   a. Membrane w/splice - 6” x 6”.
   b. Insulation, each type - 6" x 6".
   c. Flashing materials - 6" x 6".

2. Notarized Certificates of Compliance

   a. Sheet membrane, as specified.
   b. Manufacturers published specifications, which completely describe the preparation of surfaces and application of roofing systems.

c. Letter from membrane manufacturer issuing sample guarantee and approving the applicator, prior to pre-application conference.

B. Submit complete shop drawings showing details, dimensions, fabrication and fastening elements for each condition encountered, layout of each sheet noting seam locations, perimeter and penetration flashing and other details where roofing abuts other materials and/or conditions.

C. Submit copies of pre-roofing conference records.

D. Submit a letter signed by the manufacturer and Contractor acknowledging that the submitted roofing system complies with ASCE-7 for 100 MPH wind uplift resistance.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type, and brand. Delivered materials shall match approved samples. Fire classification labels shall be intact and visible.

B. Store materials under cover in a dry and clean location, off the ground and remove materials which are damaged, torn or otherwise not suitable for installation and replace with acceptable materials.

C. Keep insulation and membrane dry, before and during installation. Remove wet materials from project site.

D. Store roofing materials on platforms or pallets, above ground on roof level and cover with tarpaulins or on other suitable watertight covering. Store membrane, and handle, in such a way as to prevent damage to edges or ends.

1.9 PREROOFING CONFERENCE

A. Prior to ordering of materials, a preroofing conference will be held to discuss the specified roofing system, and its proper application. Conference shall include installer, roofing manufacturer, installers of related work, Architect and representatives of Owner. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours' advance notice to participants prior to convening conference.

B. Coordinate application of the roofing system in such a manner that the complete installation is weather-tight and in accordance with guarantee requirements.

1.10 JOB CONDITIONS

A. A minimum roof slope of 1/4" in 12" is recommended. Projects with a roof slope of minimum 1/8" in 12" may be accepted providing adequate positive drainage is provided. There is no maximum slope restriction for the application of this roofing system.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Work shall not be installed when the roof deck is damp, wet or spotted with frost or if the ambient temperature is 35 deg. F. and falling or if there is a forecast for inclement weather which will be adverse to the proper installation of the roofing system.

1.12 WARRANTY

A. Provide warranty for the roofing work as specified in this section. Warranty shall state that installed work shall be free from defects of materials and workmanship for 30 years starting from date of Substantial Completion.

B. Warranty shall be in a form acceptable to the Architect and shall be duly executed by officers or principals of the manufacturer.

C. Contractor shall inform the Architect if conditions exist which will interfere with issuance of the specified warranty. Start of work shall imply that the warranty as specified above will be issued.

D. In addition to manufacturer's warranty, provide roofing Installer's warranty for a period of 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Membrane Sheets: Provide 145 mils thick Sure-Seal (white) FleeceBACK membrane. The membrane shall conform to the minimum physical properties of ASTM D4637, Type III (fabric-backed membrane).

B. Membrane Flashing: 0.060" thick cured EPDM; or as recommended by roofing manufacturer.

C. Vapor Barrier: Carlisle CCW-725TR with CCW-702 Primer.

D. Foam Adhesive: Sure-Seal FAST 100 Adhesive.

E. Splicing Cement: Sure-Seal EP-95 Splicing Cement.

F. Splice Tape and Primer: Sure-Seal SecurTAPE and HP-250 or LV-600 Primer.

G. Internal Seam Sealant: Sure-Seal In-Seam Sealant.

H. Lap Sealant: For sealing the exposed edge of the splices and as otherwise required shall be of a consistency recommended by the manufacturer.

I. Prefabricated Pipe Seal Assemblies: Provide assemblies to accommodate vents, pipe penetrations and other similar roof penetrations.

J. Sealers: Provide sealers and other similar accessory materials as recommended by the manufacturer.

K. Cant Strips, Tapered Edge Strips, and Flashing Accessories: Types recommended by membrane manufacturer, including adhesive tapes, flashing cements, and sealants.

L. Roof Insulation: Minimum 4" thick flat and tapered (1/4" per foot) isocyanurate board roof insulation conforming to ASTM C1289. Roof insulation must have an LTTR R-Value of 7.2/inch at 75 deg. F. when tested in accordance with ASTM C1303.

1. Manufacturer of roofing system must approve use of insulation in writing in advance.

M. Walkway Protection: Provide standard 30" x 30" x 5/16" rubber walkway pads as approved by roofing manufacturer.

N. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

O. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

P. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

Q. Protection Fabric: Carlisle SynTec CCW 200V or approved equal; polypropylene non-woven needle-punched fabric.

R. H.P. Protective Mat shall be applied over insulation prior to placement of pavers.

S. Drainage Composite: "CCW MiraDrain 9000" by Carlisle, or equal.

T. Pavers: Nominal 24" x 24" x 2" thick pre-cast concrete paver, minimum 6500 psi air entrained concrete, stone aggregate conforming to ASTM C 33. Pavers shall weight not less than 18 lbs./lin. ft. and shall have texture and color as selected by the Architect. Pavers shall be manufactured by Hanover "Tudor Finish" or approved equal.

U. Pedestals for Pavers: Hanover "High-Tab" system, or equal.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where single ply membrane roofing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

B. Substrate Preparation (Concrete Deck)

1. Substrate must be even without noticeable high spots or depressions.

2. Remove accumulated water to prevent absorption of moisture in Roofing Components.

3.2 INSTALLATION

A. Nailers

1. Continuous nailers shall be firmly anchored to resist a force of 75 pounds per lineal foot in any direction. The thickness of the nailer shall be such that the top of the nailer is flush with the surface to which the membrane is attached at the horizontal plane.

2. Nailers shall be installed continuous at perimeters and around all roof penetrations unless otherwise noted.

B. Primer: Apply primer at rate specified by manufacturer.

C. Insulation

1. Clean the deck prior to installation of the insulation. Adhere insulation to deck in pattern to meet wind uplift requirements, including greater requirements for corners and perimeters as required. For tapered insulation, follow pattern of taper to ensure correct pitch.

2. Moderately butt end joints; stagger joints in adjacent boards. Do not install more insulation in any one day than can be covered by the membrane roof sheets.

3. Where two layers of insulation or cover boards are required, stagger joints 24” in both directions.

4. Neatly cut around all projections encountered and at abutting vertical surfaces. Where large gaps occur fill with a urethane foam pack.

5. Conform to applicable FM and ASCE 7 wind uplift resistance test.

D. Sheet Membrane Application

1. Surface to which membrane is adhered must be dry, free of debris, frost and loose foreign material.

2. Position and unroll successive sheets and align to provide the minimum 6" wide splice.

3. Fold adjacent sheets in half lengthwise to expose an approximate 10 foot wide by 50 foot long (the length of the sheet) substrate area.

a. Fold selvage sheet edges (along the length of the sheets) under the membrane to prevent overspray onto the splice area.

b. Membrane which will have the adjacent sheet spliced over it shall be adhered to the substrate first. In this fashion, selvage edge splice area will not be contaminated by setting splice edge into the FAST Adhesive.

4. Spray FAST Adhesive onto the substrate and allow to foam up approximately 1/8".

5. Place the membrane into adhesive and roll the membrane with a weighted rubber coated roller, approximately 18" wide weighing 40 - 60 pounds, to set the membrane into the adhesive.

6. Fold remaining half of sheet lengthwise to expose additional 10 feet by 50 feet substrate area (adjacent to area previously adhered).

7. Apply FAST Adhesive to the substrate and continue process described above until all sheets are fully bonded.

8. Install mechanical fasteners, flashings and counterflashings, and accessories at locations and as recommended by manufacturer.

E. Splicing

1. Membrane Splicing with Splice Tape

   a. Overlap adjacent sheets and mark a line 1/2" out from the top sheet.
   b. Fold the top sheet back and clean the dry splice area (minimum 2-1/2" wide) of both membrane sheets with Sure-Seal Primer as required by the membrane manufacturer.
   c. Apply SecurTAPE to bottom sheet with the edge of the release film along the marked line. Press tape onto the sheet using hand pressure. Overlap tape roll ends a minimum of 1".
   d. Remove the release film and press the top sheet onto the tape using hand pressure.
   e. Roll the seam toward the splice edge with a 2" wide steel roller.
   f. Install a 6” wide section of Pressure-Sensitive Flashing or Elastoform Flashing over all field splice intersections and seal edges of flashing with Lap Sealant.
   g. The use of Lap Sealant with tape splices is optional except at tape overlaps and cut edges of reinforced membrane where Lap Sealant is required.

2. Membrane Splicing with Splicing Cement

   a. Fold the top sheet back and clean the dry splice area (minimum 3" wide) of both membrane sheets by scrubbing with clean natural fiber rags saturated with Splice Cleaner. When using PRE-KLEENED membrane, cleaning the splice area is not required unless contaminated with field dirt or other residue.
   b. Apply Splicing Cement and In-Seam Sealant in accordance with the manufacturer's specifications and roll the top sheet onto the mating surface.
   c. Roll the splice with a 2” wide steel roller and wait at least 2 hours before applying Lap Sealant to the splice edge following the manufacturer's requirements.
   d. Field splices without In-Seam Sealant must be overlaid with uncured flashing.

F. Membrane Flashing

1. Perimeter flashing and flashing around vents and other roof penetrations shall be preformed using the recommended flashing, compatible with the approved roofing system and utilizing the longest pieces practicable.

2. The splice between the flashing and the main roof sheet should be completed before bonding the flashing to the vertical surface. Seal this splice at least 3” beyond the fasteners which attach the membrane to the horizontal nailer.

3. Bonding adhesive shall be applied to both the flashing and the surface to which it is being bonded. After the adhesive has dried to the point where it does not string or stick to a dry finger touch, roll the flashing into the adhesive. Take care to assure that the flashing is not bridging where there is any change of direction of the flashing (e.g., where the parapet meets the roof deck).

4. Nail the flashing at the top every 12” on center maximum under metal counterflashing or cap. Metal counter is specified under Section 076200.

G. Pipe Flashing

1. Flashing for pipes, conduits and other similar items which are scheduled to penetrate (pass through) the membrane shall be provided with factory prefabricated elements when such use is possible. When prefabricated devices are not possible field fabricated seals shall be used.

2. Bases of the pipe seals shall be spliced to the membrane roofing sheet as specified above for sheet laps and the top portion shall be secured to the pipe with a stainless steel clamping ring and continuously sealed with sealant in a watertight manner.

3. Field fabricated pipe seals shall be fabricated with base and cap membrane flashing which shall be spliced to the membrane and to itself and continuously sealed with sealant in a watertight manner.

H. Drains: At drain locations, where the insulation is tapered to form a smooth transition from roof surface to membrane, the membrane sheet shall be accurately cut-out so as to fit the encountered clamping ring, and shall be secured to the ring with the addition of the approved mastic in a secure, neat and watertight manner.

I. Curbs, Corners

1. Field fabricated outside corners shall consist of approved membrane flashing which shall have not less than 6" horizontal legs which shall be spliced to the roof membrane and vertical legs as required which shall be nailed at 12" o.c. maximum. Corners shall be lapped a minimum of 3" and be secured by splicing to each flashing section

2. Field fabricated inside corners shall consist of approved membrane flashing with 6" horizontal legs which shall be spliced to the roof membrane, with vertical legs

as required which shall be nailed at 12" o.c. maximum. Corners shall be lapped a minimum 6" and secured by splicing to each flashing section.

3. Install lap type sealant along all seams to insure a watertight installation.

J. Daily Seal: Care should be exercised to ensure that the water does not flow beneath any completed sections of roof. Temporarily seal loose edge of membrane with sealant when weather is threatening.

1. Mix the two components thoroughly according to the instructions on the label.

2. Apply the sealant at a rate of 100 lineal feet per gallon, (on smooth surface) 12" back from edge of sheet onto exposed substrate surface. If necessary, use a trowel to spread material in order to achieve complete seal.

3. After embedding membrane in sealant, check for continuous contact. Then weight the edge, providing continuous pressure over the length of the cutoff. The recommended weight for the continuous pressure is a 10 foot length of 2-1/2" tubing filled with dry sand.

4. When work is resumed, pull sheet free before continuing installation.

K. Walkway Protection: Set walkway pads in adhesive in accordance with manufacturer's requirements. See drawings for pattern.

L. Extruded Polystyrene Board and Protection Fabric:

1. After membrane has cured sufficiently to prevent thermal insulation from adhering, install board directly over membrane.

2. Install protection fabric over thermal insulation.

M. Night Seal: At the completion of each day's work, all edges of membrane must be temporarily sealed. Care must be used to guarantee that no water flows beneath any completed section of roofing. Night seals must be cut out and discarded to resume membrane installation.

3.3 PAVER INSTALLATION

A. Install pavers in pattern indicated on drawings.

B. Where indicated, set pavers on pedestals following manufacturer's instructions; provide 3/16" open joint between pavers and support each corner of paver on a pedestal. Adjust paver height to proper elevation using accessories that come with paver pedestal system.

3.4 FIELD QUALITY CONTROL

A. Inspections: Provide a minimum of three (Substrate, Application and Final) inspections, by an approved manufacturer's representative.

B. Prior to installation of insulation and pavers, provide water test. Plug drains and flood roof with 1" of water for 48 hours, or as otherwise specified. Check for leaks, drain and dry membrane and repair if necessary.

3.5 WATER TEST

A. Roof area shall be water tested by ponding water a minimum depth of 2" for a period of 48 hours to check the integrity of the installation. Before testing, it should be verified that the structure can support the dead load of the water. If leaks occur the water must be drained completely, and the membrane installation repaired and retested.

3.6 CLEANING AND PROTECTION

A. From time to time during the progress of the work and at the completion of the work, remove all rubbish, debris, dirt, equipment and unused materials from the site. Clean adjoining surfaces which may have been soiled by roofing work.

B. Protect installed roofing from damage and abuse by other trades. Repair damages to watertight conditions at no additional cost to the Owner.

C. Exercise care to protect installed work. Work which does become damaged in any way or is not watertight, shall be repaired and/or replaced as directed to the satisfaction of Architect and/or Owner at no additional cost or time.

END OF SECTION

SECTION 075625

FLUID APPLIED ROOFING SYSTEM

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the cold fluid applied reinforced polyurethane roofing and waterproofing membrane, and all other ancillary waterproofing work including but not limited to installation of drains, pipe flashings, penetration flashings, sealants and metal work as specified, and including but not limited to, the following:

1. Adhered cold fluid-applied reinforced polyurethane waterproofing system including, membrane, penetration flashings, base flashings, and expansion joints.

2. Substrate preparation, cleaning, leveling and patching.

3. Temporary waterproofing and priming.

4. Waterproofing membrane installation.

5. Flashing installation and expansion joint installation.

6. Protective surfacing.

7. Alkalinity protection.

8. Drainage board.

9. Insulation installation.

10. Precast concrete pavers.

11. Vegetated tray system.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Wood blocking and nailers – Section 062000.

E. Sheet metal flashing and trim – Section 076200.

1.5 REFERENCES

A. National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual.

B. ACI-308 - Recommended Practice for Curing Concrete

C. ASTM D 638 - Test Methods for Tensile Properties of Plastics

D. ASTM D 4258 - Standard Practice for Surface Cleaning Concrete for Coatings

E. ASTM D 4259 - Standard Practice for Abrading Concrete

F. ASTM D 4541 - Method for Pull-Off Strength of Coatings using Portable Adhesion Tester

G. ASTM E 96(A) - Test Methods of Moisture Transmission of Material

H. ASTM E 108, ANSI/UL 790 for Fire Resistance

I. International Concrete Repair Institute Guideline 03732 Concrete Surface Preparation

J. Steel Structures Painting Council (SSPC)

K. FM Global RoofNav and wind uplift requirements. Data FM Global Property Loss Prevention Data sheets.

1. 1-28 Wind Design.

2. 1-29 Roof Deck Securement.

3. 1-35 Green Roof Systems.

4. 1-49 Perimeter Flashing.

1.6 SUBMITTALS FOR REVIEW

A. Membrane System Product Data: Provide current standard printed product literature indicating characteristics of membrane materials, flashing materials, components, and accessories product specification and installation.

B. Vegetated System Product Data: Provide current standard printed product literature for vegetated system components, growing media type, and planting types indicating characteristics and limitations.

C. Product Samples: Submit product samples of membrane and flashing materials showing color, texture, thickness and surfacing representative of the proposed system for review and approval by the Owners Representative and Architect.

D. Submit sample copies of both the Manufacturer and Applicator warranties for the periods stipulated. Each specimen must be a preprinted representative sample of the issuing company's standard warranty for the system specified.

E. Submit copies of current Material Safety Data Sheets (MSDS) for all components of the work.

F. Membrane Shop Drawings: Submit shop drawings of cold fluid-applied reinforced polyurethane showing all a project plan, size, flashing details, and attachment for review and approval by the Owners Representative and Membrane Manufacturer.

G. Vegetated System Shop Drawings: Plan layout and details at critical terminations of garden roof system with adjacent building construction. Include flashing connections to planter system, pavers, and building systems. Include plant schedule and layout.

H. Vegetated System Maintenance Instructions: Manufacturer's instructions for Owner maintenance of planting media as needed for long term propagation and health of vegetation. Include special provisions as applicable for specific plant media and climatic zone, as well as requirements for irrigation and fertilization.

I. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 QUALITY ASSURANCE

A. Membrane Supplier: Company specializing in manufacturing the products specified in this section with ten (10) years documented experience. Membrane Manufacturer shall submit the following certifications for review:

1. Substrates and conditions are acceptable for purpose of providing specified warranty.

2. Materials supplied shall meet the specified requirements.

B. Vegetated System Supplier: Company specializing in manufacturing/supplying the products specified in this section with five (5) years documented experience. Vegetated System Supplier shall submit the following certifications for review:

1. Substrates and conditions are acceptable for purpose of providing specified warranty.

2. Materials supplied shall meet the specified requirements.

C. Applicator: Company specializing in performing the work of this section with (3) years documented experience and approved by system manufacturer/supplier for warranted membrane system installation. Applicator shall submit the following certification for review:

1. Applicator shall submit documentation from the membrane manufacturer to verify contractor’s status as an approved applicator for warranted installations.

2. Submit applicator's qualifications at the time of the bid.

D. Evaluate moisture content of substrate materials. Constructor shall determine substrate moisture content throughout the work and record with Daily Inspection Reports or other form of reporting acceptable to the Owner or designated Representative, and Membrane Manufacturer.

E. Provide FM Global wind uplift testing per FM Global Datasheet 1-52.

F. Random tests to determine tensile bond strength of membrane to substrate shall be conducted by the Contractor at the job site using an Elcometer Adhesion Tester Model 106 or similar device, or by the performance of a manual pull test. Contractor shall perform tests at the beginning of the Work, and at intervals as required to assure specified adhesion with a minimum of three (3) tests per 5000 square feet. Smaller areas shall receive a minimum of three (3) tests. Test results shall be submitted to the Owner or his designated Representative and the Membrane Manufacturer. Contractor shall immediately notify the Owner or his designated Representative and Membrane Manufacturer in the event bond test results are below specified values.

1. Adequate surface preparation will be indicated by tensile bond strength of membrane to substrate greater than or equal to 220 psi (1.5 N/mm^2), as determined by use of an adhesion tester.

2. Adequate surface preparation will be indicated by 135° peel bond strength of membrane to substrate such that cohesive failure of substrate occurs before adhesive failure of membrane/substrate interface.

3. In the event the bond strengths are less than the minimum specified, additional substrate preparation is required. Repeat testing to verify suitability of substrate preparation.

G. Monitor quantities of installed materials. Monitor application of resin mixture, reinforcing fleece and flashing. Perform Work in accordance with manufacturer's instructions.

H. Mock-up areas shall be used to determine required methods and tools to obtain degree of substrate preparation required by the membrane manufacturer. Conduct tests as required to verify that substrate preparation meets specified requirements. Tests shall include, but are not limited to, tensile bond strength and moisture content of substrate. In addition, mock-up areas shall be used to confirm application practices in the installation of the membrane system assembly.

1. Prepare and clean a three (3) foot (0.9 m) by three (3) foot (0.9 m) area of each substrate material type.

2. Submit findings in writing to Owner or his designated Representative and Membrane Manufacturer.

3. Mock-up areas shall be maintained for quality control for the entire project.

I. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. The Volatile Organic Compound (VOC) content of any field applied interior sealant used as a filler (as opposed to a coating) shall not exceed 250 grams per liter (g/l).

3. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

J. Roof edges, perimeter systems and parapet copings shall be engineered to meet FM Global wind uplift requirements, review and approval.

K. Field, perimeter and corner fastening patterns shall be engineered to meet FM Global wind uplift requirements, review and approval.

L. Roofing system shall be an FM Global RoofNav approved assembly, subject to review by FM Global for approval. Submit a completed FM Global Form 2688 Checklist for roofing system and the FM Global RoofNav assembly number for all FM approved roofing systems to be used.

M. Mechanically-fastened insulation shall provide a uniform and planar installation for insulation cover board.

N. FM approved flashing assembly with class 105 rating or greater and roof nailer securement shall be designed by a professional engineer to resist field uplift pressures.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable building and jurisdictional codes for roofing/waterproofing assembly and fire resistance requirements.

B. Comply with requirements of OSHA, NIOSH or local governing authority for work place safety.

C. Comply with authority or agency “Confined Space Policy” during and throughout all work to be performed.

1.9 PRE-INSTALLATION MEETING

A. Convene a pre-installation meeting at the job site (1) week before starting work of this section. Require attendance of parties directly affecting work of this section, including but not limited to, Architect and Owner's Representative, Roofing/ Waterproofing/ Landscaping Contractor, and Membrane Manufacturer's Representative/ Vegetative System Representative. Review roofing and waterproofing system preparation and installation procedures, coordination and scheduling required with related work, and condition and structural loading limitations of deck/substrate.

1.10 FIELD INSPECTION SERVICES

A. Manufacturer's technical representative shall provide the following inspections of the membrane application:

1. Jobstart inspection at the beginning of each phase of the project, to review special detailing conditions and substrate preparation.

2. Periodic in-progress inspections throughout duration of the project to evaluate membrane and flashing application.

3. Final punch-list inspection at the completion of each phase of the project prior to installation of any surfacing or overburden materials.

4. Warranty inspection to confirm completion of all punch list items, followed by 24 hr. flood test to confirm watertightness of installed waterproofing membrane.

5. In-progress inspection during vegetative system installation to confirm tray, perimeter metal securement, and irrigation system installation prior to growing media installation.

6. Final inspection to confirm completion of planting installation.

1.11 DELIVERY, STORAGE, AND PROTECTION

A. The Contractor together with the Owner or his designated Representative shall define a storage area for all components. The area shall be cool, dry, out of direct sunlight, and in accordance with manufacturer's recommendations and relevant regulatory agencies. Materials shall not be stored in quantities that will exceed design loads, damage substrate materials, hinder installation or drainage.

B. Store solvent-bearing solutions, resins, additives, inhibitors or adhesives in accordance with the MSDS and/or local fire authority. After partial use of materials replace lids promptly and tightly to prevent contamination.

C. Rolls of fleece reinforcing materials shall be stored horizontally on platforms sufficiently elevated to prevent contact with water and other contaminants. DO NOT use rolls that are wet, dirty or have damaged ends. Fleece reinforcing materials must be clean, dry, and free of all contaminants.

D. Roofing/waterproofing materials must be kept dry at all times. If stored outside, raise materials above ground or roof level on pallets and cover with a tarpaulin or other waterproof material. Plastic wrapping installed at the factory should **not** be used as outside storage covers.

E. Follow manufacturer's directions for protection of vegetated system materials prior to and during installation. Do not use materials that have been damaged to the point that they will not perform as specified.

F. Store preplanted trays, hardscape materials, growing media, and palletized materials over plywood panels or protective sheeting laid over the finished waterproofing membrane to prevent damage to the membrane.

G. Maintain health of plants as recommended by nursery guidelines prior to rooftop installation. Provide water source for irrigation of and maintenance of plants until permanent drip or alternative irrigation system is in place.

H. Copies of all current MSDS for all components shall be kept on site. Provide any and all crew members with appropriate safety data information and training as it relates to the specific chemical compound he or she may be expected to deal with. Each crew member shall be fully aware of first-aid measures to be undertaken in case of incidents. Comply with requirements of OSHA, NIOSH or local governing authority for work place safety.

1.12 ENVIRONMENTAL REQUIREMENTS

A. Do not apply roofing/waterproofing membrane during or with the threat of inclement weather.

B. Application of cold fluid-applied reinforced polyurethane roofing/waterproofing membrane may proceed while air temperature is between 40°F (5°C) and 85°F (30°C) providing the substrate is a minimum of 5°F above the dew point.

C. When ambient temperatures are at or expected to fall below 50°F (10°C), or reach 85°F (30°C) or higher, follow Membrane System Manufacturer's recommendations for weather related additives and application procedures.

D. Ensure that substrate materials are dry and free of contaminants. DO NOT commence with the application unless substrate conditions are suitable. Contractor shall demonstrate that substrate conditions are suitable for the application of the materials.

E. Odor control and elimination measures are not typically necessary, but if required by the Owner or his designated Representative, Contractor shall implement odor control and elimination measures prior to and during the application of the roofing/waterproofing materials. Control/elimination measures shall be field tested at off-hours and typically consists of one (1) or a multiple of the following measures:

1. Sealing of air intakes with activated carbon filters. Install filters in accordance with requirements and recommendations of the filter manufacturer. Seal filters at joints and against building exterior walls to prevent leakage of unfiltered air where required due to size of intake opening. Provide track system to secure filters.

2. Erection and use of moveable enclosure(s) sized to accommodate work area(s) and stationary enclosure for resin mixing station. Enclosure shall be field constructed or pre-manufactured of fire retardant materials in compliance with local code requirements in accordance with requirements of the Owner or his designated Representative. Equipment enclosure(s) with mechanical air intake/exhaust openings and Odor Control Air Cleaners, as required to clean enclosed air volume

and to prevent odor migration outside the enclosure. Exhaust opening shall be sealed with activated carbon filter.

3. Placement of odor elimination stations inside and outside of the enclosure(s) as required by field condition, in coordination with the Owner or his designated Representative.

4. Protection of Contractor personnel and occupants of the structure and surrounding buildings as necessary to comply with requirements of OSHA, NIOSH and/or governing local authority.

F. Install plant materials at temperatures between 40 degrees F and 95 degrees F. Do not install plants in freezing conditions or when overnight frost is expected.

G. When disposing of all refuse or unused materials, observe all EPA, OSHA or local disposal requirements.

1.13 COORDINATION AND PROTECTION

A. Coordinate the work with the installation of associated metal flashings, accessories, appurtenances, etc. as the work of this section proceeds.

B. Building components shall be protected adequately (with tarp or other suitable material) from soil, stains, or spills at all hoisting points and areas of application. Contractor shall be responsible for preventing damage from any operation under its Contract. Any such damage shall be repaired at Contractor's expense to Owner's satisfaction or be restored to original condition.

C. Provide barricades, retaining ropes, safety elements (active/passive) and any appropriate signage required by OSHA, NIOSH, and NSC and/or the Owner or designated Representative.

D. Protect finished roofing/waterproofing membrane from damage by other trades. Do not allow waste products containing petroleum, grease, acid, solvents, vegetable or mineral oil, animal oil, animal fat, etc. or direct steam venting to come into direct contact with the membrane.

1.14 WARRANTY

A. Manufacturer's Premier Warranty: Provide (20) year manufacturer's premier warranty under provisions of this section. This warranty provides for cost of labor and materials for loss of watertightness, limited to amounts necessary to effect repairs necessitated by either defective material or defects in related installation workmanship, with no dollar limitation ("NDL").

1. Warranty to include basic removal and replacement of vegetated overburden and pavers as required for performance of warranty repairs to the waterproofing membrane.

B. Waterproofing Contractor's Warranty: Provide (5) year "Applicator Maintenance Warranty" covering workmanship for all work of this section including installation of membrane, flashings, metal work, and roofing/waterproofing accessories.

C. Extensive Sedum and Ground Cover Plus: 2- year thrive and coverage (plus: minimum 50% cover end of year 1; 80% coverage end of year 2).

D. Submit (2) executed copies of both the manufacturer and applicator warranties for the periods stipulated, starting from the date of substantial completion. Each warranty must be signed by an authorized representative of the issuing company.

1.15 MATERIAL SUBSTITUTIONS

A. Materials proposed for use in the performance of the work that are not specified herein must be submitted to the Owner/Owner's Representative for evaluation no later than ten days prior to bid.

PART 2 PRODUCTS

2.1 GENERAL

A. The products herein specified are totally pre-engineered products of the listed manufacturer and establish criteria for the approval of substitutions. Products must be part of a virtually odorless, pre-engineered, low-VOC, fully-reinforced, cold-fluid-applied liquid waterproofing membrane system, equivalent in function, quality, composition and method of application to be considered for approval as an "Approved Substitute". Substitute materials must meet or exceed the physical performance characteristics of the specified materials.

2.2 MANUFACTURERS - MEMBRANE

A. The products herein specified are totally pre-engineered products of the listed manufacturer and establish criteria for the approval of substitutions. Products must be part of a virtually odorless, pre-engineered, low VOC, fully reinforced, cold fluid applied liquid waterproofing membrane system, equivalent in function, quality, composition and method for application to be considered for approval as an "Approved Substitute". Substitute materials must meet or exceed the physical characteristics of the specified materials.

1. Basis of Design: Kemper System's 2K-PUR resin for use in an adhered waterproofing system, Soprema Alsan RS 260 LO PMMA for use in adhered waterproofing system or equal by ~~Derbigum or Triflex~~**Siplast or approved equal**.

B. Physical Properties:

Property	**Typical Value**	**Test Method**
Color	Gray-Green	-
Physical state	Cures to solid	-
Nominal thickness (165 fleece)	70 mils	-

Tensile strength @ break	120 lb/in	ASTM D 751
Elongation	50%	ASTM D 751
Tearing strength	5.0 lbs	ASTM D 751
Puncture resistance	140 lbf	FTMS 101-2031
Dimensional stability	0.1%	ASTM D 1204
Water absorption	2.2%	ASTM D 471
Surface hardness	Shore A 85	ASTM D 2240
Water vapor transmission	0.04 perms	ASTM E 96
Usage time*	30 minutes	-
Rainproof after*	6 hours	-
Solid to walk on after*	24 hours	-
Solid to drive on with air rubber tires after*	48 hours	-
Overburden may be applied after	2 days	-
Completely hardened after	3 days	-
Crack spanning	2mm/0.08 inch	-
Resistance to temperatures up to (short term)	250°C/482°F	-
*all times are approximate and depend upon air flow, humidity and temperature.		

2.3 FLASHINGS

A. Membrane Flashings: A composite of the same resin material as field membrane with 165 fleece reinforcement.

2.4 ACCESSORIES

A. Epoxy Primer: Two-component, solvent-free epoxy coating for use in improving adhesion of membrane to cementitious/masonry substrate surfaces. Monitor application rate and adjust depending on substrate absorbency. Kemper EP Primer is basis of design.

B. Accelerator: Additive specifically designed to accelerate the resin reaction time at ambient temperatures below 50ºF (10ºC). Accelerator to be used with cream resin Component A prior to mixing of multi-component resin. Continuously monitor substrate surface temperatures.

C. Tools, Accessories, and Cleaners: Supplied and/or approved by membrane manufacturer for product installation.

D. Topcoat Surfacing Aggregate: Silica sand, ceramic-coated quartz, or specialty aggregate shall be washed, kiln-dried, and dust-free with the following size specification (provide where drawings call for traffic sandcasting):

1. Aesthetic/Fire Rating: 0.3 - 1.0 mm

2. Alkalinity/Adhesion Key: 0.5 - 1.2 mm

3. Pedestrian Traffic: 0.4 - 1.0 mm

4. Light Vehicular Traffic: 0.5 - 1.2 mm

E. Leveling and Patching Aggregate: Silica sand shall be washed, kiln-dried, and dust-free, suitable for troweling or pourable self-leveling, round grain or angular with the following size specification:

1. For voids less than 1" in depth: 0.3 - 0.6 mm

2. For voids 1" to 2" in depth: 0.5 - 1.2 mm

Mixing Proportions shall be a ratio of resin to sand at 1:2 by volume or as approved by membrane manufacturer.

F. Backer Rod: Expanded, closed-cell polyethylene foam designed for use with cold-applied joint sealant.

G. Caulking: Single component, non-sag elastomeric polyurethane sealant, as recommended or supplied by membrane manufacturer for use in making airtight and watertight seals where required.

H. Wood Nailers and Cant Strips: New wood nailers and cant strips shall be pressure treated for rot resistance (e.g., "Wolmanized" or "Osmose K-33"), #2 or better lumber. Asphaltic or creosote treated lumber is not acceptable.

I. Miscellaneous Fasteners: FM-approved and appropriate for purpose intended, length required for thickness of material, with metal plates, and approved by membrane system manufacturer.

J. Drains: Spun/cast aluminum or cast iron roof drain with strainer/grate, strainer, as supplied or approved by membrane manufacturer.

K. Temporary and Night Sealant: As recommended or required by membrane manufacturer.

2.5 DRAINAGE/PROTECTION BOARD

A. Dimpled polystyrene core, 0.25" thick, with nonwoven geotextile filtering fabric suitable for applications where a direct topping of stone aggregate, concrete pavers, extruded polystyrene insulation, or sand setting bed will be applied, as provided by the following manufacturer:

1. American Wick Drain, Inc.'s Sitedrain 454-T.

2.6 BASE SHEET

A. UL-rated G2 asphalt-coated fiberglass base sheet conforming to ASTM D 4601, Type II.

2.7 INSULATION COVER BOARD

A. Cover Board (Durock and Permabase): High compressive strength underlayment board consisting of aggregated Portland cement slurry with polymer-coated glass fiber mesh, with the following characteristics:

1.	Board Weight	3.0 lb/sq. ft.
2.	Board Size	48 x 96 inches.
3.	Board Thickness	1/2 inch.
4.	Thermal Conductivity	K factor of 1.92 as determined by ASTM C 177.
5.	Board Edges	Square

2.8 INSULATION

A. Polyisocyanurate insulation board having non-asphaltic facers meeting or exceeding the requirements for Fed. Spec. HH-I-1972/Gen., with minimum compressive resistance of 25 psi, 1.0 inch minimum thickness, with the following characteristics:

1.	Board Density	2.0 lb/cu. ft.
2.	Board Size	48 x 96 inches.
3.	Board Thickness	2 inches.
4.	Thermal Conductivity	K factor of 0.17 as determined by ASTM C 177, aged 12 months at 75 degrees.
5.	Board Edges	Square

2.9 TAPERED INSULATION

A. Tapered polyisocyanurate insulation board having non-asphaltic facers meeting or exceeding the requirements for Fed. Spec. HH-I-1972/Gen., with minimum compressive resistance of 18 psi, 1.0 inch minimum thickness, with the following characteristics:

1.	Board Density	2.0 lb/cu. ft.
2.	Board Size	48 x 96 inches.
3.	Board Taper	1/4 inch per foot
4.	Total Thickness	1/2 inch minimum
5.	Thermal Conductivity	K factor of 0.17 as determined by ASTM C 177, aged 12 months at 75 degrees.
6.	Board Edges	Square

B. Provide crickets at drain sump assemblies and at other locations that require additional drainage considerations.

2.10 SUBSTRATE BOARD

A. Provide Dens Deck as manufactured by Georgia-Pacific Corp., or equivalent, conforming to ASTM C 1177, glass-mat, water-resistant gypsum substrate, thickness as indicated.

2.11 BASE/ CAP SHEET AND INSULATION SECUREMENT

A. Polyurethane Adhesive (Insulation and Cover Board): FM-approved single-component, moisture-cured polyurethane adhesive. Adhesive application rate shall be in accordance with specified wind uplift rating for system application. Roofing adhesive shall be a type approved by membrane and insulation manufacturer. NOTE: Prior written approval by the adhesive, insulation and membrane manufacturers for use of polyurethane roofing adhesive must be obtained.

B. Asphalt Adhesive (Base Sheet): FM-approved steep roofing asphalt conforming to ASTM D 312, Type III. Provide label on each container indicating flash point, finished blowing temperature, softening point, and equiviscous temperature. Asphalt primer, cutback solvent type, conforming to ASTM D 41, required for concrete, masonry, and metal surfaces.

2.12 SLIP SHEET

A. Slip Sheet: Non-woven needle-punched polyester fleece suitable for use over extruded polystyrene insulation and beneath vegetative trays, as provided by the following manufacturer:

1. Kemper System, Inc.'s 120 Fleece

2. Columbia Green Technologies, Inc.'s AVRS multilayer Filter Fabric

2.13 PRECAST CONCRETE PAVERS

A. Concrete Pavers: Freeze-thaw resistant precast concrete pavers, minimum 2" thickness, with the following characteristics:

1.	Compressive Strength	8,000 psi avg. min. (ASTM C 140)
2.	Flexural Strength	1,000 psi avg. min. (ASTM C 293)
3.	Water Absorption	5% max. (ASTM C 140)
4.	Freeze/Thaw	1% max. loss of dry weight – 50 cycles (ASTM C 67)
5.	Center Load	1,750 lbs. avg. min. (WTCL 99)
6.	Weight	24 lbs./sq.ft. avg. min. (based on 2" thickness)

7. Dimensions 24 x 24 inches

8. Manufacturer Hanover or equivalent.

9. Style Prest Paver.

10. Color Glacier White.

B. Paver Pedestal System: Heavy-duty polyethylene pedestals specifically designed for use with specified precast concrete pavers. Provided with shim system or integral height adjustment mechanism. Provided with drainage channels within the pedestal base.

2.14 FLASHING SURFACINGS AND COATINGS

A. Aggregate Finish Coating: Single component polyurethane-based resin suitable for use to seal aggregate, as provided by the following Manufacturer**:**

1. Kemper System, Inc.'s Kemperdur ECO Finish.

2. Kemper System, Inc.'s Kemperdur BSFR Finish.

B. Color Coating: Polyurethane-based coating suitable for use as a colored coating for exposed and submerged applications, as provided by the following Manufacturer:

1. Kemper System, Inc.'s Kemperdur 1K Deko Colored Finish.

2. Color coated is required at all horizontal roof surfaces in order to achieve an SRI 78 greater than 78. See drawings for custom colors applied to vertical surfaces.

2.15 INTERLOCKING VEGETATIVE TRAYS

A. Vegetative Trays: Injection molded, interlocking, 100 mil polypropylene trays, 2 ft. x 2 ft. x 4-5/8 in. deep, with water-detention ridges and troughs that also de-energize wind flow and facilitate drainage beneath the trays, as provided by the following manufacturer:

1. Columbia Green Technologies, Inc.'s AVRS Trays, or equal by LiveRoof or Green Grid.

2.16 GROWING MEDIA

A. Growing Media: Produced from organic recycled material and inorganic by-products for use as a lightweight growing media for hardy succulent or phytoremediation plants, typically sedum. For extensive applications, typically up to a 12" depth. Preblended regionally in accordance with German FLL Greenroof guidelines, as provided by the following supplier:

1. Columbia Green Technologies, Inc.'s AVRS or Max-Lite AVRS Growing Media or approved equal by LiveRoof, Green Grid or Nature TEC.

B. Typical Tray Weights with Growing Media: The following roof loading weights are provided for filled vegetative trays:

1. AVRS Growing Media, 5-1/4 in. depth to overfill trays. Suitable for post-planting, hydroplanting, sedum tiles and blankets.

   a. Fully Saturated Weight: 26 psf
   b. Field Moisture Capacity Weight: 20.5 psf

2.17 PLANTS

A. General: Conform to project landscape design requirements and requirements of authorities having jurisdiction, including Fire Marshal, for specific recommendations and regulations. Design mix of firewise/firesafe hardy long-lasting fiberous succulents, capable of thriving in limited-irrigated rooftop environment for project location/USDA hardiness zone classification, as provided by the following supplier:

1. Columbia Green Technologies, Inc.'s nursery affiliates.

B. Planting Method: Select planting method in accordance with design requirements from the following:

1. Post-Planting of Trays – Plug Size min. 1-1/2", 12 plugs per tray min. or as otherwise specified. Distribute differing plant species evenly and uniformly within each tray for overall appearance of in-place installation. Healthy plants of a species and variety shown on listed on drawings.

2.18 DRAIN INSPECTION BOXES

A. Drain Inspection Boxes: Drain inspection boxes to be installed.

B. Provide roof drain stones in mesh bags and galvanized steel cages over drains to prevent small missile exposure.

2.19 EDGE ELEMENTS/METAL TRIM

A. Edge Flashing and Trim: Manufacturer's standard 26 gauge stainless steel sidewall flashing and trim at trays and walkways to frame, connect, and tie tray and walkpad systems into each other and adjacent building components. Intended to be connected to the trays and mechanically attached to the adjacent building components. As provided by the following supplier:

1. Columbia Green Technologies, Inc.'s Metal Flashing or approved equal.

2.20 SUPPLEMENTAL BUILT-UP ASSEMBLY

A. General: Intended for extensive assembly application at radius turns and other locations where tray installation is difficult or not possible. Multi-layered system components include 0.75" thick polypropylene entangled-matrix drainage layer, non-woven polypropylene filter layer, and 2" thick polyester blanket designed for water retention,

drainage, and anchorage points for promoting secure rooting of plants, as provided by the following supplier:

1. Columbia Green Technologies, Inc.'s Multi-Layered System or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck/substrate openings, curbs, and protrusions through deck/substrate, wood cant strips and reglets are in place and solidly set.

C. Verify deck/substrate is structurally supported, secure and sound.

3.2 PREPARATION OF SUBSTRATE

A. General**:** Surfaces to be prepared as a substrate for the new waterproofing system as follows:

1. The Contractor shall determine the condition of the existing structural deck/substrate. All defects in the deck or substrate shall be corrected before new waterproofing work commences. Areas of deteriorated deck/substrate, porous or other affected materials must be removed and replaced with new to match existing.

2. Prepare flashing substrates as required for application of new waterproofing membrane flashings.

3. Inspect substrates, and correct defects before application of new waterproofing. Fill all surface voids greater than 1/8 inch wide with an acceptable fill material.

4. Remove all ponded water, snow, frost and/or ice from the work substrate prior to installing new waterproofing materials.

5. The final substrate for waterproofing shall be clean, dry, free of loose, spalled or weak material including coatings, mineral aggregate, and flood coat/gravel surfacing, oil, grease, contaminants, abrupt changes in level, waterproofing agents, curing compounds, and free of projections which could damage membrane materials.

B. Concrete

1. New concrete shall have cured a minimum of 28 days in accordance with ACI-308, or as approved by Waterproofing Manufacturer's Technical Department.

2. New or existing concrete shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, bituminous products and previous waterproofing materials.

3. New or existing concrete shall be dry with a maximum moisture content of five (5) percent. Determinations of moisture content shall be performed by the Contractor. Contractor shall be responsible to perform periodic evaluations of moisture content during the work. Moisture evaluation results shall be submitted in writing to the Owner or his designated Representative and Waterproofing manufacturer for acceptance.

4. Where required, concrete shall be abrasively cleaned in accordance with ASTM D 4259 to provide a sound substrate free from laitance. Achieve an open concrete surface in accordance with ICRI surface profiles CSP 3-5. When using mechanical methods to remove existing waterproofing products or surface deterioration, the surface profile is not to exceed ¼ inch (peak to valley).

5. The substrate shall be sound and all spalls, voids and blow holes on vertical or horizontal surfaces must be repaired prior to placement of the primer coat. Spalls and other deterioration shall be repaired in accordance with the requirements of the Owner or his designated Representative and Membrane manufacturer.

6. Areas of minor surface deterioration of 0.25" (6 mm) or greater in depth shall be repaired to prevent possible ponding of the system, leading to excessive usage of primer and resin.

7. Extent and location of thin surface patching shall require approval of the Owner or his designated Representative and Waterproofing Manufacturer prior to the application of any system component.

8. For concrete materials with a compressive strength of less than 3,500 psi contact Waterproofing Manufacturer Technical Department for substrate preparation requirements.

C. Masonry:

1. Walls shall be built with hard kiln dried brick or waterproof concrete block construction.

2. Areas of soft or scaling brick or concrete, faulty mortar joints, or walls with broken, damaged or leaking coping shall be repaired in accordance with the requirements of the Owner or his designated Representative and Flashing Membrane Manufacturer.

D. Steel/Metal:

1. Clean and prepare metal surfaces to near white metal in accordance with SSPC - SP3 (power tool clean) or as required by membrane manufacturer. Extend preparation a minimum of three (3) inches beyond the termination of the membrane flashing materials. Notch steel surfaces to provide a rust-stop.

2. In addition to cleaning, all metal surfaces shall be abraded to provide a rough open surface. A wire brush finish is not acceptable.

E. Other Flashing Surfaces: Remove all contaminants as required by membrane manufacturer. Surface preparation shall be performed by means approved by Owner or his designated Representative.

F. Finish Leveling, Patching and Crack Preparation:

1. General: EP primer/sand mix is the preferred material for all concrete and masonry substrate finish leveling, crack and wall/deck preparation and patching. EP primer/sand patching mix provides a set time of approximately twelve (12) hours and does not require surface grinding. Kemperol primer/sand mix is typically applied in conjunction with general surface priming.

2. Concrete and Masonry Substrate Leveling ans Patching: Substrate conditions are to be evaluated by the Contractor, the Owner, or his designated Representative, and Membrane manufacturer. Perform leveling and patching operations as follows:

   a. Level uneven surfaces with a leveling mixture of primer and approved kiln-dried silica sand in a 1:2 primer to sand ratio by volume. Spread and plane this compound with a squeegee and trowel to achieve a flat surface.
   b. Fill cavities with a patching mixture of primer and approved kiln-dried sand in a 1:3/1:3.5 primer to sand ratio by volume.
   c. Silica sand must be kept absolutely dry during storage and handling.
   d. Any surface to be leveled or filled must first be primed with an appropriate primer.

3. Joint and Crack Preparation: Joints, cracks and fractures in the structural deck/substrate shall be prepared as defined below prior to installation of the waterproofing membrane. NOTE: Joints, cracks, and fractures may telegraph through the waterproofing membrane.

   a. Non-Moving Cracks: Determine that crack is non-moving. Clean out crack by brushing and oil-free compressed air. Fill crack with polyurethane sealant. Allow for a minimum of twelve (12) hours cure or as required by sealant Manufacturer.
   b. Moving Cracks: Determine that crack is moving. Clean out crack by brushing and oil-free compressed air. Fill crack with polyurethane sealant. Allow for a minimum of twelve (12) hours cure or as required by sealant Manufacturer. Apply resin and 4 inch (10 cm) wide strip of membrane (resin and fleece) in strict accordance with Membrane manufacturer's written instructions.

3.3 PRIMER APPLICATION

A. General:

1. Mix and apply two-component primer in strict accordance with written instructions of Membrane Manufacturer. Use only proprietary materials, as supplied by the membrane manufacturer.

2. The substrate surface must be dry, with any remaining dust or loose particles removed using clean, dry, oil-free compressed air, industrial vacuum, cloth wipe or a combination of methods.

3. Do not install primer on any substrate containing newly-applied and/or active asphalt, coal-tar pitch, creosote or penta-based materials unless approved in writing by Membrane Manufacturer. Some substrates may require additional preparation before applying primer.

B. Mixing of Standard EP Primers:

1. Premix primer Component A thoroughly with a spiral agitator or stir stick. Pour primer Component B into Component A and mix the components for approximately 2 minutes with a clean spiral agitator on slow speed or stir stick without creating any bubbles or streaks. DO NOT AERATE. The Primer solution should be a uniform color, with no light or dark streaks present.

2. Do not thin primer. Determine required primer coverage for each substrate material/condition and apply in strict accordance with written instructions of Membrane Manufacturer.

3. Mix only that amount of primer components A & B that can be used in 30 minutes.

C. Application of Primer:

1. Apply primer at the rate recommended by the manufacturer based on substrate material to receive application.

2. Roll or brush the primer evenly onto the surface to fully saturate the substrate in one application. Do not allow primer to pond or collect in low areas.

3. Apply primer only up to the edge of the membrane flashing terminations. Primer application past the membrane terminations requires surfacing with an approved material.

4. For EP primer applications over cementitious substrates where protection from substrate wetness is required, apply primer coat at a heavier application rate until pore saturation is achieved.

5. For all EP primer applications, apply kiln-dried sand into the final coat of EP primer while still wet at the rate of 40 lbs. per 100 square feet.

6. Allow standard primers to cure for a minimum of twelve (12) hours before membrane application. Allow methyl methacrylate primer to cure for a minimum of one (1) hour before membrane application. Membrane must be applied to primer only when completely dry and without tack.

7. Exposure of the primer in excess of eight (8) days or premature exposure to moisture may require removal and application of new primer. DO NOT apply new primer over exposed primer older than eight (8) days, primer prematurely exposed

to moisture, or primer used as temporary waterproofing, unless approved in writing by the Membrane Manufacturer.

D. Disposal of Primer:

1. Cured primer may be disposed of in standard landfills. This is accomplished by thoroughly mixing all components.

2. Uncured primer is considered a hazardous material and must be handled as such, in accordance with local, state and federal regulation. Do not through uncured resin away.

3.4 MEMBRANE APPLICATION

A. General:

1. Mix and apply cold fluid-applied reinforced polyurethane waterproofing membrane in strict accordance with written instructions of Membrane Manufacturer. Use only proprietary membrane resins and materials, as supplied by the membrane manufacturer.

2. The primed substrate surface shall be dry, with any remaining dust or loose particles removed using clean, dry, oil-free compressed air, industrial vacuum, cloth-wipe or a combination.

3. Protect all areas where membrane has been installed. Do not work off installed membrane during application of remaining work before forty-eight (48) hours of curing. Movement of materials and equipment across installed membrane is not acceptable. If movement is necessary, provide complete protection of affected areas.

4. Closely follow the Membrane Manufacturer's recommendation for hot and cold weather application. Monitor surface and ambient temperatures, including the effects of wind chill.

B. Mixing of Resin:

1. Mix resin Component A (cream formulation) with a spiral agitator until the liquid is a uniform cream color. If the ambient temperature is below 50°F (10°C), then a weather related additive should be combined and mixed into the Component A.

   a. Accelerator should be added to resin Component A when the ambient temperature is 50°F (10°C) and below. The accelerator should be mixed with the spiral agitator for 5 minutes or until both liquids are thoroughly blended.

2. Mix resin Component B (dark brown formulation) with a separate spiral agitator until the color is a uniform dark syrup color.

3. Pour resin Component A and Component B into a third clean bucket at a 4:1 ratio (by weight) and thoroughly mix the components with a clean spiral agitator. The Resin solution should be a uniform color, with no light or dark streaks present.

4. Mix only that amount of resin components A & B that can be used in 30 minutes.

C. Application of Resin/Fleece

1. Apply mixed resin to the prepared surface at the approximate rate of 4.5 gallons (16.9L) per 100 square feet (9 m^2). The resin should be rolled or brushed liberally and evenly onto the surface using a broad, even stroke. Cover one working area at a time, between 15 – 20 $ft.^2$ (1.4 – 1.9 m^2).

2. Roll out dry polyester fleece onto the liquid resin mix, making sure the SMOOTH SIDE IS FACING UP (natural unrolling procedure), avoiding any folds and wrinkles. The fleece will begin to rapidly saturate with the liquid resin mix. Use a medium nap roller or brush to work the resin into the fleece, saturating from the bottom up, and eliminating air bubbles, wrinkles, etc. The appearance of the saturated fleece should be light opaque amber with no white spots. White spots are indications of unsaturated fleece or lack of adhesion. It is important to correct these faults before the resin cures.

3. Apply additional liquid resin mix on top of fleece at the approximate rate of 2 gallons (7.5L) per 100 square feet (9 m^2) to finish the saturation of the fleece. Roll this final coating into the fleece, which will result in a glossy appearance. The fleece can only hold so much resin and all excess should be rolled forward to the unsaturated fleece, eliminating ponding or excessive build-up of the resin. Any excess resin left on the top of the fleece will weather and peel off. The correct amount of resin will leave no whiteness in fleece and there will be a slightly fibrous surface texture. The final resin coating should be smooth and uniform.

4. Prevent contact between mixed/unmixed resin and new/existing membrane. If any unmixed resin contacts membrane surface remove immediately and clean thoroughly with a cloth rag.

5. At all fleece seams, allow a 2" (5 cm) overlap for all side joints and a 4" (10 cm) overlap for all end joints.

6. At membrane tie-offs, clean in-place membrane with MEK (methyl ethyl ketone) solvent once resin has cured. Allow solvents to fully evaporate before application of new resin.

D. Disposal of Resin:

1. Cured resin may be disposed of in standard landfills. This is accomplished by thoroughly mixing all components.

2. Uncured resin is considered a hazardous material and must be handled as such, in accordance with local, state and federal regulation. Do not throw uncured resin away.

3.5 FLASHING APPLICATION

A. General:

1. Install flashing system in accordance with the requirements/recommendations of the Membrane manufacturer and as depicted on standard drawings and details. Provide system with base flashing, edge flashing, penetration flashing, counter flashing, and all other flashings required for a complete watertight system.

2. Wherever possible, install the flashings before installing the field membrane to minimize foot traffic over newly installed field membrane.

3. All membrane flashings shall be installed concurrently with the waterproofing membrane as the job progresses. Temporary flashings are not allowed without prior written approval from the Membrane manufacturer. Should any water penetrate the new waterproofing membrane because of incomplete flashings, the affected area shall be removed and replaced at the Contractor's expense.

4. Provide a minimum vertical height of 8" for all flashing terminations. Flashing height shall be at least as high as the potential water level that could be reached as a result of a deluging rain and/or poor slope. Do not flash over existing through-wall flashings, weep holes and overflow scuppers.

5. All flashings shall be terminated as required by the Membrane Manufacturer.

6. Alkalinity surface protection consisting of two applications of EP primer and one application of approved broadcast mineral aggregate surfacing shall be applied wherever stone, concrete, or masonry elements will be placed directly over the flashing.

B. Metal Flashing – General:

1. Metal flashings shall be fabricated in accordance with the current recommendations of SMACNA and in accordance with standard drawings and project details.

2. Metal flashing flanges to which membrane is to be bonded shall be a minimum of four (4) inches in width, and secured to the substrate six (6) inches on center staggered with fasteners appropriate to the substrate type. The flanges shall be provided with a roughened surface that has been cleaned of all oil and other residue.

3. Metal edges that will be overlaid with membrane shall be provided with a 1/4" min. hemmed edge.

4. Apply primer, resin and fleece to metal flange, extending membrane to outside face of metal edging, and to vertical face of metal base/curb flashing.

C. Membrane Flashing – General:

1. Membrane flashings shall be fabricated with primer appropriate for the substrate surface, resin of the same base chemical type as the field membrane, and fleece of the same weight as the field membrane unless specified otherwise.

2. Primer, resin, and fleece mixing and application methods as specified for field membranes are also suitable for membrane flashing.

3. Fleece shall overlap 2" (5 cm) minimum for all joints. Fleece shall be cut neatly to fit all flashing conditions without a buildup of multiple fleece layers. Work wet membrane with a brush or roller to eliminate blisters, openings, or lifting at corners, junctions, and transitions.

D. Pipes, Conduits, and Unusually Shaped Penetrations:

1. Flash all penetrations using cold fluid-applied reinforced polyurethane waterproofing membrane. Flashing material shall be the same resin used in the field membrane with 165 fleece reinforcement.

2. Flashing is typically constructed as a two-part assembly consisting of a vertical wrap and a horizontal target patch. There must be a minimum of a two (2) inch (5 cm) overlap between vertical and horizontal flashing components.

E. Drains and Scuppers:

1. Acceptable drain and scupper materials are cast iron, cast aluminum, and copper.

2. Connect new drains and scuppers to existing storm sewer system.

3. Alternatively, replace all broken or damaged parts of existing drains and scuppers, or provide and install an acceptable insert.

4. Flash drains and scuppers using cold fluid-applied reinforced polyurethane waterproofing membrane. Flashing material shall be the same resin used in the field membrane with 165 fleece reinforcement.

5. Flashing material shall extend four (4) inches minimum onto drain, scupper, or insert flange.

6. Install clamping ring if provided as part of the drain or scupper design. Install a strainer basket to prevent debris from clogging the drainage line.

F. Hot Stacks:

1. Protect the membrane components from direct contact with steam or heat sources when the in-service temperature exceeds 150 degrees F. In all such cases flash to an intermediate "cool" sleeve.

2. Fabricate "cool" sleeve in the form of a metal cone using galvanized metal in accordance with Membrane manufacturer's details.

3. Flash all penetrations using cold fluid-applied reinforced polyurethane waterproofing membrane. Flashing material shall be the same resin used in the field membrane with 165 fleece reinforcement.

4. Flashing is typically constructed as a two part assembly consisting of a vertical wrap and a horizontal target patch. There must be a minimum of a two (2) inch (5 cm) overlap between vertical and horizontal flashing components.

G. Flexible Penetrations:

1. Provide a weathertight gooseneck of round cross-section for each penetration or group of penetrations. Set in water cut-off mastic and secure to the structural substrate.

2. Acceptable gooseneck material is copper, of a sheet weight appropriate for the application.

3. Flash all penetrations using cold fluid-applied reinforced polyurethane waterproofing membrane. Flashing material shall be the same resin used in the field membrane with 165 fleece reinforcement.

4. Flashing is typically constructed as a two-part assembly consisting of a vertical wrap and a horizontal target patch. There must be a minimum of a two (2) inch (5 cm) overlap between vertical and horizontal flashing components.

H. Walls, Curbs and Base Flashings

1. Wall, curb and base flashings shall be installed to solid substrate surfaces only. Adhering to gypsum-based panels, cementitious stucco, synthetic stucco, wood or metal siding, and other similar materials is not acceptable.

2. Flash all walls, curbs and base flashings using cold fluid-applied reinforced polyurethane waterproofing membrane. Flashing material shall be the same resin used in the field membrane with 165 fleece reinforcement.

3. Reinforce all transition locations and other potential wear areas with a four (4) inch wide 165 polyester fleece bottom layer evenly positioned over the transition prior to installing the exposed flashing layer.

4. Reinforce all inside and outside corners with a four (4) inch diameter conical piece of 165 fleece prior to installing the exposed flashing layer.

5. All pins, dowels and other fixation elements shall be flashed separately with a vertical flashing component prior to installing the exposed flashing layer.

6. Extend flashing a minimum of four (4) inches onto the field substrate surface.

I. Drip Edges and Gravel Stops: Engineered to meet FM Global wind uplift requirements.

1. Metal drip edges and gravel stops shall be installed to solid substrate surfaces only. Securement to gypsum-based panels, cementitious stucco, synthetic stucco, wood or metal siding or coping, and other similar materials is not acceptable.

2. Flash all drip edges and gravel stops by extending the field membrane all the way to the edge of the exposed face prior to installing the metal edging. Strip in the metal flange with a separate 8-inch wide strip of membrane adhered to both the securement flange and to the field membrane.

3. For conditions where water infiltration behind the exposed drip edge or gravel stop face is possible, install a separate 165 polyester fleece bottom layer positioned behind the face area and extending a minimum of four (4) inches past the securement flange onto the field substrate prior to installing the drip edge or gravel stop.

J. Field Fabricated Control or Expansion Joint Flashing

1. Control or expansion joints in excess of two (2) inches in width require the use of a separate engineered joint system.

2. Control or expansion joints two (2) inches or less in width may be flashed with two layers of cold fluid-applied reinforced polyurethane waterproofing membrane and a compressible foam or rubber insert. Use a 165 polyester reinforcing fleece bottom layer and 165 polyester fleece top layer.

3. Grind or otherwise bevel the inside edges of the joint opening to provide a smooth transition edge for the fleece.

4. Flashing typically consists of a 165 polyester reinforcing fleece bottom layer looped into the joint as a cradle, a compressible foam or rubber insert at 25% compression fitted into the joint, and a 165 polyester fleece top layer applied over the joint. Extend both fleece layers four (4) inches minimum onto the field substrate on both sides of the joint.

5. Apply the field membrane over the entire joint area.

K. Electrical Conduit, Gas Lines and Lightning Protection

1. Supports for electrical conduit and gas lines greater than one (1) inch in diameter require the use of a separate engineered support system.

2. Supports for electrical conduit and gas lines one (1) inch or less in diameter, and bases for lightning protection rods and cable, can be adhered directly to the membrane surface with a single-component, high quality polyurethane sealant.

3.6 SURFACING AND FINISHES

A. Kiln-Dried Aggregate Finish Surfacing

1. Where specified, provide and install approved kiln-dried silica sand, or other approved mineral surfacing to achieve an aesthetic and/or non-skid surface.

2. Broadcast specified and approved sand or aggregate in excess into a bonding coat application of Kemperol 2K-PUR resin (without fleece reinforcement) applied over clean, freshly-cured membrane at the rate of approximately 0.8 gal. per 100 square feet. Aggregate shall be applied at the rate of 60 lbs. per 100 square feet. Obtain uniform and full coverage.

3. Following minimum 24-hour cure time remove loose/un-embedded mineral aggregate by blowing with oil-free compressed air or with a vacuum.

4. Manufacturer's approved aggregate coating, applied at the rate of approximately 0.8 gal. per 100 square feet. After completion of mineral aggregate broadcasting, avoid any traffic for a minimum of two (2) days to allow for surfacing to cure.

B. Coating-Type Finish Surfacing

1. Where specified, provide and install Membrane Manufacturer's approved urethane-based coating applied over clean, fully cured membrane.

2. For two-component coatings, premix resin component A thoroughly with a spiral agitator or stir stick. Pour Color Component B into Component A and mix the components for approximately 2 minutes with a clean spiral agitator on slow speed or stir stick without creating any bubbles or streaks until material is consistent in color. Transfer to a clean container and mix again to ensure a thorough combination of the two components.

3. Apply coating at a rate of approximately 0.8 gallons per 100 square feet. Avoid any traffic for a minimum of two (2) days to allow for surfacing to cure.

C. Alkalinity Protection

1. Where placement of concrete, mortar or adhesive setting beds are required over sections of the waterproofing membrane or flashing, the application of the following alkalinity protective measure is mandatory:

   a. Application of one (1) heavy or two (2) lighter coats of Primer EP at 1.5 gal (5.7L)/100 SF (9 m^2) total application, with broadcast of kiln-dried silica sand at the approximate rate of 30 lbs. per 100 square feet into final wet coat of primer.

2. Protection shall extend a minimum of one (1) foot (0.3m) past the concrete form on all sides.

3. Provide continuous cleaning with water and brush to eliminate settlement of concrete residues on in-place waterproofing membrane adjacent to area of concrete placement.

D. Adhesion Key: Where placement of non-cementitious material such as asphalt pavement is required over sections of the waterproofing membrane or flashing, the application of the following adhesion key measure is mandatory:

1. Application of one (1) coat of Primer EP at 1.0 gal (3.8L)/100 SF (9 m^2) total application, with broadcast of kiln-dried silica sand at the approximate rate of 30 lbs. per 100 square feet into wet primer.

3.7 TEMPORARY CLOSURES AND WATERSTOPS

A. Contractor shall be responsible to ensure that moisture does not damage any completed section of the new waterproofing system. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition. All temporary closures shall be made as recommended or required by the membrane manufacturer.

3.8 PROTECTION

A. Upon completion of waterproofing and flashings (including all associated work), institute appropriate procedures for surveillance and protection of roofing during remainder of construction period. Protect all areas where membrane has been installed.

3.9 VERIFICATION OF MEMBRANE INTEGRITY

A. General: After installing horizontal membrane and before placing overburden, verify installed membrane is waterproof. Provide testing to verify membrane is free of any holes, open seams and capillary defects that will allow water to pass.

1. Utilize electrical conduction method EFVM (Electric Field Vector Mapping) as provided by International Leak Detection, Phone (1) 905-428-8283, as follows:

2. Installation of EFVM impulse conductor wire around perimeter of area to be tested. The testing agency will determine size and shape of area. Areas will typically range between 2000 SF and 7,500 SF. The conductor wire will consist of braided polyethylene (1.5 mm diameter) interwoven with a minimum of nine (9) strands of stainless steel wire. The conductor wire will have a tensile strength of not less than 180 lbs.

3. Place conductor wire 4 inches from perimeter and secure against accidental movement or damage. Place so not to create a tripping hazard. Place wire directly on membrane.

4. Isolate all metal items contacting the membrane by placing isolation strands of conductor wire to isolate the field or by removing the metal items temporarily if possible.

5. Isolate field of membrane from contact with grounded soil or structure contacting the membrane by placing isolation strands of conductor wire to isolate the field.

6. Wet the test area with potable water sufficiently to create a continuous conducting "plate" above the membrane.

7. Attach EFVM impulse generator to conductor wire with removable connectors and to ground or building structure creating a potential circuit. (The circuit will complete if water finds a path to ground by way of a breech in membrane.)

8. Deliver a one second long 40 volt potential electrical impulse to the conductor wire at an average rate of one impulse every three seconds.

9. Utilizing a EFVM potentiometer and two probes placed at the surface of the membrane detect the presence or absence of electrical flow across the surface to the membrane.

10. If there is no flow detected after a systematic search then the certified inspector shall report the installed membrane in that area tested free of holes, seam and capillary defects and is therefore waterproof at that time.

11. If there is flow detected during the search then the certified inspector shall work to identify the source of electricity and therefore the breach in the membrane. The technician shall report to the waterproofing contractor immediately if possible the exact location of any defects on the installed membrane in that area tested.

12. Defects found shall be repaired and retested.

13. The technician providing the EFVM testing shall provide a report of each day's test results containing a written description and photograph of all defects and any corrections made and a schematic CAD drawing indicating location of stationary conductor wire and of any defects found in testing to within 1 inch of accuracy. This report shall be made in hard copy and submitted to the Architect and Owner.

3.10 DRAINAGE/PROTECTION MAT INSTALLATION

A. Place the drainage mat fabric side up on top of the finished waterproofing membrane. Secure the drainage mat in place by placing temporary ballast on top of the drainage mat.

B. Connect adjacent panels at the longitudinal edge by pulling the filter fabric back to expose the flange. The panel edge should be butted to the edge of the adjacent panel dimple to dimple or the edge of the next panel may be placed over two dimples and interlocked. Panel ends are to be attached in the same manner. Connections should be completed in shingle fashion so the moisture will flow with the overlap and not against it. Overlap fabric in the direction of water flow. Cover all terminal edges with the filter fabric flap by tucking the fabric behind the core.

C. The drainage mat should be channeled into an internal drain or perimeter drain system. Create openings in the drainage core to correspond with all discharge holes in the drain at the structural deck level. Fabric must be left intact at these holes to prevent intrusion of soil, grout, sand, or concrete into the drainage core.

D. At roof penetrations, cut the drainage core around the protrusion, cut an X in the fabric, and tape the fabric around the protrusion to prevent intrusion of overburden materials into the core.

3.11 INSULATION/COVER BOARD INSTALLATION

A. General: Insulation and cover board shall be installed in accordance with the insulation/cover board manufacturer's current published specifications and recommendations for use with adhered roofing.

B. Install Insulation/Cover Board: Install only as much insulation and cover board as can be primed, sealed, and protected before the end of the day's work or before the onset of inclement weather.

C. Fit Insulation/Cover Board: Neatly fit insulation/cover board to all penetrations, projections, and nailers. Insulation shall be loosely butted, with gaps not greater than 1/4". All gaps greater than 1/4" shall be filled with acceptable insulation. Cover board shall be loosely butted, with gaps not greater than 1/4". All gaps greater than 1/8" shall be filled with primer; all gaps greater than ¼" shall be filled with polyurethane sealant.

D. Strip In Cover Board Joints: Strip all cover board joints with four inch (4") wide strip of flashing membrane. Under no circumstances shall the membrane be left unsupported over a space greater than 1/4".

E. Stagger Insulation/Cover Board Joints: When installing multiple layers of insulation, all joints between succeeding layers shall be staggered a minimum of 6" in each direction.

F. Steel Deck Substrates: Place boards perpendicular to steel deck flutes with edges over flute surface for bearing support. Edges shall be checked so that no edges are left substantially unsupported along the flutes.

G. Drain Sumps: Insulation shall be feathered or tapered to provide a sump area a minimum of 36" x 36" where possible at all drains. Taper insulation around roof drains so as to provide proper slope for drainage. In areas where feathered or tapered insulation leaves insulation core exposed, cover with an appropriate cover board or base sheet/cap sheet assembly to provide a sound and smooth substrate surface.

H. Tapered Insulation: Place the constant thickness first layer and the tapered thickness insulation to the required slope pattern in accordance with insulation manufacturer's instructions.

I. Polyurethane Adhesive Attachment: Follow insulation/cover board and adhesive manufacturers' recommendations for the appropriate adhesive application rate and application procedure. Under normal application rate, dispense the first bead 3" inside the outside edges of the insulation/cover board to be attached, with sequential beads equidistant. Place the boards onto the roofing adhesive beads. Walk on the boards to spread the roofing adhesive for maximum contact. Periodically walk on the boards until firmly attached. Reference FM approvals for adhesive application patterns that satisfy FM wind uplift requirements. Typical application is a 3/4" bead of roofing adhesive at a rate of one lineal foot per square foot of insulation/cover board to be attached. Note: additional adhesive is required in the corner and perimeter regions of the roof. Secure insulation/cover board in accordance with approval requirements.

J. Provide mechanically-attached insulation to provide a uniform and planar installation for cover board and membrane. Fastener pattern shall meet FM Global wind uplift requirements at field, perimeter, and corners.

3.12 FILTER FABRIC INSTALLATION

A. Roll out filter fabric over the extruded polystyrene insulation as specified, avoiding wrinkles. Overlap all side and end laps by 12".

B. Extend the filter fabric mat vertically to just above the height of the solid overburden or growing medium.

C. Cut filter fabric neatly around all penetrations and projections.

3.13 TRAY INSTALLATION

A. Place trays directly on waterproofing membrane or over filter fabric/extruded polystyrene insulation. Position bottom troughs of trays perpendicular to roof slope, except minor crickets. Orient edges to interlock and hold trays in place. Secure trays together with manufacturer's quick-lock fasteners through aligned holes in tray sidewalls.

B. Promptly after placing trays on roof, install edge flashing to secure tray array to structure, and fill trays with growing media or otherwise ballast trays as necessary to prevent movement of trays due to weather and construction activities.

3.14 SUPPLEMENTAL BUILT-UP ASSEMBLY INSTALLATION

A. Install drainage layer parallel to roof slope directly on waterproofing membrane or over filter fabric/extruded polystyrene insulation at all areas within vegetated installation area not receiving trays or walkpads.

B. Place filter layer parallel to roof slope over drainage layer, providing 2" overlaps at all side and end laps.

C. Place retention layer parallel to roof slope over filter layer.

D. Promptly after placing built-up assembly on roof, install edge flashing and growing media or ballast as necessary to prevent movement of multi-layer components due to weather and construction activities.

3.15 METAL EDGE FLASHING INSTALLATION

A. Provide stainless steel retaining angle and perimeter gravel where noted on the drawings. Retaining angle shall be a minimum of 18 gauge Type 316 stainless steel.

B. Install trim flashing to conceal tray sides/built-up assembly components and to lock into metal counter flashing at building perimeter flashing systems. Install interlocking metal anchor flashing at openings between trays and perimeter roof edges to anchor trays, building perimeter flashings, counter flashings, and walkpad system together.

C. Fasten metal edge flashing to structure 12" o.c. Use ¼" lead drive pins into concrete and masonry. Use #12 stainless steel screws into wood and metal.

3.16 DRAIN INSPECTION BOX INSTALLATION

A. Install drainage inspection boxes at all drain locations to allow periodic inspection and cleaning of all drainage outlets.

3.17 GROWING MEDIA INSTALLATION

A. Distribute growing media evenly into the trays and over the built-up assembly to achieve the specified media thickness.

3.18 PLANT INSTALLATION

A. See landscape drawings for layout and extensive green roof plant list.

B. Install plants by the method selected, conforming to landscape design and other requirements.

C. If post-planting with individual plants, distribute differing plant species evenly and uniformly within each tray for overall uniform appearance, or install in specific pattern or arrangement as specified by designer.

D. Following installation of plants, irrigate using potable water free of substances harmful to plant growth.

3.19 PLANT MAINTENANCE

A. Maintain a uniform stand of succulent plants by watering and maintaining vegetated areas for the duration of the guarantee period. Include watering, spot weeding, fertilization, and other measures as necessary to maintain health and propagation of plant materials and as necessary for stabilization, in accordance with horticultural/nursery recommended plant maintenance procedures.

B. Following installation of plant media, irrigate using potable water free of substances harmful to plant growth. Provide holes in lengths reaching from water supply to source planting areas,

C. Instruct Owner and furnish written maintenance instructions to be followed after initial plant maintenance period. Instructions shall describe typical work necessary for planting materials to develop complete root structure and to become stabilized. Periodic watering is required for the first year after installation to ensure proper root development.

3.20 CONCRETE PAVER APPLICATION

A. Install precast concrete pavers in accordance with paver manufacturer's currently published specifications, and as per layout schedule. Pavers can be installed over a drainage mat without pedestals, or supported by a pedestal system approved by the paver manufacturer. The use of insulation blocks in lieu of pedestals is not acceptable.

B. Pavers shall be installed with a 1/8" maximum, 1/16" typical height variation between adjacent pavers. Pavers shall be installed without rocking. Pavers shall be installed in a straight line with a maximum variance of ½" within a distance of 10' measured at any location and in any direction. Joints between pavers shall be 3/16" typical.

C. Cracked, broken or otherwise damaged pavers must be removed and discarded, and replaced with undamaged units. Cut and fit pavers neatly around all penetrations and projections, and at the perimeter, achieving a 1" maximum gap.

3.21 CLOSEOUT

A. Correction of Work: Work that does not conform to specified requirements including tolerances, slopes, and finishes shall be corrected and/or replaced. Any deficiencies of membrane application, termination and/or protection as noted during the membrane manufacturer's inspections shall be corrected and/or replaced at Contractor's expense.

B. Clean-Up: Site clean-up, including both interior and exterior building areas that have been affected by construction, shall be restored to preconstruction condition.

END OF SECTION

SECTION 076200

SHEET METAL WORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the sheet metal work, as indicated on the drawings and/or specified herein, including but not limited to, the following:

1. Stainless steel cap metal flashing.

2. Stainless steel through wall flashing.

3. Field fabricating (including bending, cutting, soldering, etc.), if required, of stainless steel flashing.

4. Stainless steel flashing elsewhere, where metal flashing is indicated on drawings.

5. Separation of contacting surfaces of dissimilar metals.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Unit masonry – Section 042000.

E. Terra cotta assembly - Section 042800.

F. Roofing - Section 075560 and 075400.

1.5 QUALITY ASSURANCE

A. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Shop Drawings: Submit, showing all materials, finishes, fastenings, joint details, dimensioned profiles, fabrication, construction and relation to adjoining construction. Shop drawings shall illustrate all flashing locations and conditions using plans and elevations.

B. Samples: Submit 12" x 12" samples of flashing materials and finishes.

C. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 WARRANTY

A. The Contractor shall warrant that all Metal Flashing Work executed under this Section will be free from defects in materials and workmanship for a period of ten (10) years from date of acceptance of the Project, and he shall remedy any defects in the Metal Flashing Work.

1.8 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stainless Steel Flashing Materials

1. Stainless Steel Flashing: ASTM A 167, Type 304, stainless steel, with 2D finish, dead soft temper, fully annealed, as manufactured by International Nickel Co., Republic Steel Corp., United States Steel, or Washington Steel Corp. Thickness of stainless steel shall be as listed below.

   a. Concealed Flashings: .012" thick, thirty (30) gauge (U.S. Standard).
   b. Exposed Flashings: .015" thick, twenty-eight (28) gauge (U.S. Standard).
   c. Edge Strips: .025" thick, twenty-four (24) gauge (U.S. Standard).

2. Through wall flashing shall have sawtooth ribs at three (3) inch interval as manufactured by Keystone Flashing Co., or approved equal.

3. Accessories and Fastenings: AISI, Types 302 and 304 stainless steel.

4. Solder: Composed of sixty (60) percent block tin and forty (40) percent pig lead, except that solder at seams exposed to public view shall be eighty (80) percent tin and twenty (20) percent lead.

5. Flux: An acid type flux manufactured specifically for soldering stainless steel, as approved.

B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where sheet metal work is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 METAL FLASHING INSTALLATION

A. Reference Standard: Conform to the requirements of 5th Edition of the Sheet Metal and Air Conditioning Contractors Association (SMACNA) Architectural Sheet Metal Manual.

B. General: Fabricate and install metal flashing work in accordance with details and specifications of above Reference Standard, with manufacturer's instructions, and as herein specified, to provide a watertight installation. Apply metal flashing to smooth, even, sound, clean, dry surfaces free from defects. Make provisions to allow for expansion and contraction of metal flashing work. Wherever practicable, shop form all metal flashing work and deliver ready for installation. Form metal flashing work accurately to required profiles, with flat surfaces, straight edges and corners, free from defects. Fold exposed metal edges back not less than 1/2" and form drip.

C. Nailing: Confine to sheets twelve (12) inches or less in width. Confine nailing to one edge only, locate nails where concealed. Use No. 12 x 1" long flat headed, annular threaded, Type 302 stainless steel nails for nailing to wood blocking; use one (1) inch long masonry nails for nailing to concrete. Space nails four (4) inches o.c. maximum.

D. Cleating: Use cleats where sheets are more than twelve (12) inches in width. Space cleats approximately twelve (12) inches o.c. Cleats two (2) inches wide by three (3) inches long, of the same material and weight as the metal flashing being installed. Secure one end of the cleat with two (2) nails and fold edge back over the nail heads. Lock other end into seam or into folded edge of metal flashing sheets. Pre-tin cleats for soldered seams.

E. Joining: Join metal flashings with one (1) inch locked and soldered seams except at slip joints. Mallet seams flat and solder full length of seam as specified below.

F. Soldering: Clean and pre-tin edges of metal flashing to be soldered before soldering is begun with solder on both sides for a width of not less than 1-1/2". Solder slowly with well heated metal surfaces. Use ample solder. Show not less than one full inch of evenly flowed solder on seam. Seams shall have a liberal amount of flux brushed in

before soldering is commenced. Where soldering paste or killed acid is employed as a flux, soldering shall follow immediately after application of the flux. Upon completion of soldering, clean surfaces of all flux.

G. Slip Joints: Locate slip joints not more than twenty-four (24) feet apart and not more than eight (8) feet from corners. Form slip joints as three (3) inch wide joints with cover piece behind flashing, and fill locked ends neatly with sealant.

H. Cap Flashing: Install over base flashings, in eight (8) to ten (10) foot lengths, lapped six (6) inches at ends. Cap flashing shall be increased longitudinally to produce spring action to hold bottom edge of cap flashing firmly against base flashing. Cap flashing shall lap base flashing at least four (4) inches, with exposed bottom edge at a forty-five (45) degree angle downward and folded back on underside at least 1/2" to form drip. Make cap flashing continuous at corners and angles.

I. Miscellaneous Flashing: Provide all other miscellaneous metal flashing not specifically mentioned herein, but indicated on drawings and/or required to provide a watertight installation.

J. Separation of Dissimilar Materials: Back paint surfaces of metal flashing in contact with dissimilar metals or with concrete or masonry with bituminous paint.

K. Reglets

1. Provide watertight reglets in masonry and concrete work to receive cap flashing. Form reglets of stainless steel using same thickness as stainless steel sheet metal specified.

2. In masonry work use open or closed slot reglets with slat at least one (1) inch deep and 3/16" wide. Provide hook dams or turn-ups for anchoring securely into mortar joints. Insert cap flashing into slot full depth using button punch or lead wedges to lock in place.

3. In concrete work, use open or closed slot reglets with slot sloped upward at forty-five (45) degrees, at least one (1) inch deep and 3/16" wide. For fastening reglets to concrete forms use double-head stainless steel nails spaced twelve (12) inches apart maximum.

4. Insert cap flashing full depth into reglet slot, and wedge in place using lead strips spaced on twelve (12) inch centers maximum or lead caulking rope. When lead strips are used for continuous caulked reglets, use approved weather-resistant fibrous compounds.

L. Through Wall Flashings: Provide through wall flashings as shown. Form bonding features so as not to puddle water on surface. Lap cross joints to interlock design pattern at least three (3) inches. Stop typical flashings in mortar joint 1/2" from exterior face of wall.

M. Scupper: Continuously support scupper, set to correct elevation, and seam frames to interior wall face, over cants or tapered edge strips, and under roofing membrane.

END OF SECTION

SECTION 077100

ROOF SPECIALTIES AND ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the roof specialties and accessories as shown on the drawings and/or specified herein, including but not necessarily limited to the following:

1. Aluminum copings.

2. Prefabricated roof curbs.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Roofing - Section 075560 and 075400.

E. Sheet metal flashing - Section 076200.

1.5 QUALITY ASSURANCE

A. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Before any roof specialties and accessories are delivered to the job site, submit shop drawings showing profiles and anchoring devices.

B. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's

literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 ALUMINUM COPINGS

A. Aluminum copings that fasten membranes down shall be engineered to meet building code and FM Global uplift requirements.

~~A.~~**B.** Fabricate of 0.063" thick aluminum alloy 5005-H154, smooth, no pattern.

~~B.~~**C.** Provide concealed splice plates 12'-0" o.c. fabricated of 0.050" thick aluminum to match exposed aluminum; finished to match exposed aluminum.

~~C.~~**D.** Provide pre-fabricated mitered and welded corner units.

~~D.~~**E.** For copings, provide galvanized steel anchor plates, anchors spaced 6'-0" o.c. and snap-lock coping design; all anchors concealed. Provide structural blocking at edge of coping to resist deformation from façade maintenance and window washing rope loading.

~~E.~~**F.** High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Acid-chromate-fluoride-phosphate conversion coating; Organic Coating: As specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

1. Fluoropolymer Three-Coat System: Manufacturer's standard Three-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605-02.

2. Custom color and gloss as selected by the Architect.

~~F.~~**G.** Provide units manufactured by MM Systems, or equal made by Cheney, Hickman or approved equal.

2.2 PREFABRICATED ROOF CURBS

A. Provide manufacturer's standard shop fabricated units made of 14 ga. zinc coated steel factory primed with rust inhibitive primer, and insulated with 2" thick fiberglass board. Provide units manufactured by Pate, Louvers & Dampers, Inc., Industrial Louvers, Inc.

B. Reinforce units over 8'-0" long and units requiring reinforcement due to heavy loads by forming units of double-walled box-type construction with stiffeners of heavy gauge with flanges as required to provide sufficient rigidity and strength to withstand max. lateral forces in addition to super imposed vertical loads.

C. Sloping Roof Decks: For deck slopes of 1" per ft. and more, fabricate curb units (except expansion joint curbs) to form a level top edge. Where slope is less than 1" per ft., and curb is used to support equipment with moving parts, or supports vertical elements such as gravity ventilators which are intended to be plumb, provide tapered wood nailers (treated wood) at top of curb units to form a level top edge.

D. Provide treated wood nailer, not less than 1-5/8" thick and of the width shown, but not less than the width of the curb wall assembly. Anchor nailer securely to the top of the metal frame unit. Refer to Section 062000 of these specifications for pressure-treatment required for wood nailers.

E. Provide 22 ga. galvanized steel curb liners; where required extend curb liners through deck construction to coordinate with work below.

F. Provide 18 ga. galvanized steel cap flashing to cover a min. of 3" over roof flashing.

G. Where curb units are shown to support shop fabricated items of equipment, do not proceed with fabrication of curb units until size or dimensions have been checked for coordination with equipment.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where roof specialties and accessories are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, and with roof insulation, roofing and flashing; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

B. Isolation: Where metal surfaces of units are to be installed in contact with non-compatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.

C. Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal and plastic surfaces in accordance with manufacturer's instructions. Touch up damaged metal coatings.

END OF SECTION

SECTION 078100

SPRAYED FIRE-RESISTIVE MATERIALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the sprayed fire-resistive materials as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Spray on fireproofing for structural steel.

2. Seal coat over fireproofing in special areas.

3. Preparation of surfaces.

4. Field quality control.

B. NOTE: All sprayed fireproofing and firestopping materials shall be FM approved and installed in accordance with manufacturer's guidelines and the *Approval Guide*, a publication of FM Approvals.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Structural steel - Section 051200.

E. Metal decking - Section 053100.

F. Intumescent fireproofing - Section 078123.

G. Firestops and smokeseals - Section 078413.

1.5 SUBMITTALS

A. Product Data: For each fire-resistive product specified.

B. Shop Drawings: Submit structural framing plans indicating the following:

1. Locations and types of surface preparations required before applying sprayed fire-resistive material.

2. Extent of sprayed fire-resistive material for each construction and fire-resistance rating, including the following:

a. Applicable fire-resistive design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies, as indicated on contract documents.

C. Product Certificates: Signed by manufacturer of sprayed fire-resistive material certifying that the products furnished comply with requirements.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. If primer is used on steel or metal deck, submit certifications by supplier of primer that primer is compatible with materials, and will not impair the required performance of the installed fireproofing. Such certification shall be accompanied by evidence that the primer was successfully used in conjunction with the fireproofing material in a UL test applicable to the construction.

1. Coordinate with Section 051200 – Structural Steel, and Structural Drawings prior to application of primer.

G. Product Test Reports: Indicate that physical properties of proposed sprayed fire-resistive materials comply with specified requirements based on comprehensive testing

of current product formulations by a qualified testing and inspecting agency according to requirements specified in "Quality Assurance" Article.

H. Research/Evaluation Reports: Evidence of sprayed fire-resistive material's compliance with building code in effect for Project.

I. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by sprayed fire-resistive material manufacturer as having the necessary experience, staff, and training to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its sprayed fire-resistive materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Source Limitations: Obtain each type of sprayed fire-resistive material from one source and by a single manufacturer.

C. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR, Part 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

D. Mockups: After processing of initial submittals and before delivery and installation of fireproofing materials, prepare a sample installation of fireproofing work, approximately 100 sq. ft. in area; providing an example of each type required, applied on each different substrate, to produce each different rating as required and reasonably representative of entire sprayed on fireproofing work, for joint approval by representative of fire resistant material manufacturer and Owner. Work in other areas shall not proceed until mock-up has been completed. Mock-up work which remains in compliance with requirements and is in undamaged and acceptable condition may be retained as final work in place.

E. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable. Some applicable VOC limits are as follows:

a. Firestop Sealants: 250 g/l less water.
b. All Architectural Sealants: 250 g/l less water.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; shelf life, if applicable; and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

C. Store materials inside, under cover, aboveground, so they are kept dry until ready for use. Remove from Project site and discard materials that have deteriorated.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperatures are 40 deg F. or lower, unless temporary protection and heat is provided to maintain temperatures at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of sprayed fire-resistive material to achieve a minimum of four air changes per hour. Use natural

means or, where this is inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.9 SEQUENCING

A. Sequence and coordinate application of sprayed fire-resistive materials with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosures for interior applications to prevent deterioration of fire-resistive material due to exposure to unfavorable environmental conditions.

2. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.

3. Do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material. Fireproofing shall be considered dry when the moisture content is 6% or less.

4. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.

5. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.

6. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, tested, and corrections have been made to defective applications.

7. Protect permanently exposed walls, floor or special surfaces.

1.10 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty, executed by Contractor and cosigned by Installer, agreeing to repair or replace sprayed fire-resistive materials that fail within the specified warranty period.

1. Failures include, but are not limited to, cracking, flaking, eroding in excess of specified requirements; peeling; and delaminating of sprayed fire-resistive materials from substrates due to defective materials and workmanship within the specified warranty period.

2. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than

those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

C. Warranty Period: Three (3) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SPRAYED FIRE-RESISTIVE MATERIALS

A. General: For exposed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated for material composition and for minimum physical properties of each product listed, measured by standard test methods referenced with each property.

B. Cementitious Sprayed Fire-Resistive Material: Factory-mixed, dry, cement aggregate formulation, chloride-free formulation of gypsum or Portland cement binders, additives, and inorganic aggregates, mixed with water at Project site to form a slurry or mortar for conveyance and application, complying with the following requirements:

1. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination," but with an average density of not less than 22 lb./cu. ft.

2. Thickness: Provide minimum average thickness required for fire-resistive design shown on approved submittals.

   a. Fireproofing shall be of thicknesses and density to meet the requirements of the State of Connecticut Building Code for Type 1B construction.

3. Bond Strength: 1500 psf per ASTM E 736.

4. Compressive Strength: 10,000 psf. per ASTM E 761.

5. Corrosion Resistance: No evidence of corrosion per ASTM E 937.

6. Deflection: No cracking, spalling, delamination, or the like per ASTM E 759.

7. Effect of Impact on Bonding: No cracking, spalling, delamination, or the like per ASTM E 760.

8. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. per ASTM E 859.

9. Combustion Characteristics: Passes ASTM E 136.

10. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

a. Flame Spread: 10 or less.
b. Smoke Developed: 0.

11. Fungal Resistance: No observed growth on specimens per ASTM G 21.

12. For exterior applications of sprayed fire-resistive material, provide manufacturer's formulation approved for surfaces exposed to the exterior.

C. Products: Subject to compliance with requirements, provide one of the following:

1. Cement-Aggregate Cementitious Sprayed Fire-Resistive Material:

a. Pyrocrete 239; Carboline Co., Fireproofing Products Div.
b. Monokote Type Z106HY; W.R. Grace & Co.--Conn., Construction Products Div.
c. 7GP; Southwest Vermiculite.
d. Cafco 400.

2.2 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with sprayed fire-resistive materials and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistive designs indicated.

B. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of sprayed fire-resistive material, used where required by manufacturer to insure proper bond.

C. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistive designs indicated and fire-resistive product manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive sprayed fire-resistive material.

D. Sealer for Sprayed Fire-Resistive Material in Elevator Shafts: Transparent-drying, water-dispersible protective coating by manufacturer of fire-resistive material.

1. Product: Subject to compliance with requirements, provide "Firebond Concentrate" by W. R. Grace, or similar product recommended by the manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, to determine whether they are in satisfactory condition to receive sprayed fire-resistive material. A substrate is in satisfactory condition if it complies with the following:

1. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fire-resistive material with substrate under conditions of normal use or fire exposure.

2. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.

3. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.

B. Do not proceed with installation of fire-resistive material until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances that could impair bond of fire-resistive material, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.

B. For exposed applications, repair substrates to remove any surface imperfections that could affect uniformity of texture and thickness in finished surface of sprayed fire-resistive material. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

C. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintenance of adequate ambient conditions for temperature and ventilation.

3.3 INSTALLATION

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to convey and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Install metal lath, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by fire-resistive material manufacturer. Attach lathing accessories where indicated or required for secure attachment to substrate.

C. Coat substrates with adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by fire-resistive material manufacturer for material and application indicated.

D. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by fire-resistive material manufacturer, install body of fire-resistive covering in a single course.

E. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by manufacturer.

F. Where sealers are used, apply products that are tinted to differentiate them from the sprayed fire-resistive material over which they are applied.

G. Maintain ambient conditions during installation and for cure period following installation, as recommended by manufacturer. Provide ventilation and avoid excessive rate of drying.

H. Installation Sequence of Fireproofing: All patching and repairing of sprayed fireproofing, due to cutting by other trades or testing and inspection, shall be performed under this Section.

I. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing and inspecting of completed applications of sprayed fire-resistive material will take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of fire-resistive material for the next area until test results for previously completed applications of fire-resistive material show compliance with requirements.

1. Extent: For each 1000-sq. ft. area, or partial area, on each floor, testing and inspecting agency will evaluate the following characteristics. Tested values must equal or exceed values indicated and values required for approved fire-resistance design.

a. Thickness for Floors, Roofs, and Walls: From the average of 10 measurements from a 144-sq. in. sample area, with sample width of not less than 6 inches per ASTM E 605.
b. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.
c. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination."

d. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: Cohesion and adhesion at frequency and from sample size indicated for determining thickness of each type of construction, per ASTM E 736.

2. When testing discovers applications of fire-resistive material not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

C. Remove and replace applications of fire-resistive material where test results indicate that they do not comply with specified requirements for cohesion and adhesion or for density, or both.

D. Apply additional fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING, PROTECTING, AND REPAIR

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Cure exposed sprayed fire-resistive material according to product manufacturer's written recommendations to prevent premature drying.

C. Protect fire-resistive material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at the time of Substantial Completion.

D. Coordinate application of fire-resistive material with other construction to minimize the need to cut or remove fire protection. As installation of other construction proceeds, inspect fire-resistive material and patch any damaged or removed areas.

E. Repair or replace work that has not been successfully protected.

END OF SECTION

SECTION 078123

INTUMESCENT FIREPROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the intumescent fireproofing on interior fireproofed steel exposed to view, as indicated on drawings and as specified herein.

B. NOTE: All sprayed fireproofing and firestopping materials shall be FM approved and installed in accordance with manufacturer's guidelines and the *Approval Guide*, a publication of FM Approvals.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Structural steel - Section 051200.

E. Joint sealants - Section 079200.

1.5 REFERENCES

A. Publications listed herein are part of this specification to the extent referenced.

B. American Society for Testing and Materials: ASTM E 119 Method for Fire Tests of Building Construction and Materials.

C. Warnock Hersey - 2001 Certification Listings.

D. Underwriters' Laboratories, Inc. - List of Equipment and Materials.

E. Steel Structures Painting Council (SSPC) Surface Preparation Standards.

1.6 SUBMITTALS

A. Product Data

1. Submit manufacturer's literature describing product characteristics, performance, and limitation criteria, including thickness for typical shape, curing time and application sequence.

2. Submit schedule of material thickness for members to receive intumescent coating.

B. Samples

1. Submit two (2) samples of the intumescent fireproofing.

2. The manufacturer shall provide stepped samples applied to the same material as the finished installation. The first layer is the specified primer. The top layer is the intumescent fireproofing. The finished application will have a smooth paint-like finish.

C. Quality Assurance Submittals

1. Test Designs/Results: Submit test designs for intumescent fireproofing prepared by a nationally recognized, certified, independent testing laboratory indicating full compliance with specified fire resistance performance requirements.

2. Certificates

a. Provide certification that contractor/applicator utilized for application of intumescent fireproofing is approved by manufacturer.
b. Provide certification that specialized equipment as may be recommended by manufacturer for proper application of intumescent fireproofing shall be utilized for work of this section.

3. Manufacturer's Instructions: Submit manufacturer's installation procedures which shall be basis for accepting or rejecting actual installation procedures.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

    a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
    b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
    c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 QUALITY ASSURANCE

A. Qualifications

1. Applicator shall be approved by manufacturer for application of intumescent fireproofing. Applicators shall be trained and qualified in techniques and procedures for proper application and shall demonstrate a minimum of five (5) years' successful experience in such application.

2. Single Source Responsibility

    a. Intumescent fireproofing, decorative, protective, top coat shall be products from a single manufacturer or approved for use by the manufacturer.
    b. Provide primers and other undercoat materials which are produced or are specifically recommended by manufacturer of intumescent fireproofing to ensure compatibility of system.

B. Certifications: Intumescent fireproofing materials shall bear classification marking by Warnock Hersey, UL or other nationally recognized testing agency using ASTM standards and having a factory inspection service subject to approval of authorities having jurisdiction. Products shall be manufactured under testing agency's follow-up program.

C. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.8 DELIVERY, STORAGE, HANDLING

A. Packing, Shipping, Handling, and Unloading

1. Deliver products factory mixed, ready for application, in manufacturer's original unopened containers. Each container shall have manufacturer's label, intact and legible.

2. Include on the label for each container:

a. Manufacturer's name and address.
b. Type of coating.
c. Referenced Warnock Hersey, UL or nationally certified testing laboratory design number.
d. Warnock Hersey, UL or national certified testing laboratory seal.

B. Storage and Protection

1. Store materials in a clean, dry, protected area. Stack containers raised off ground, using blocking or skids to provide drainage.

2. Store materials at temperatures not less than 40 deg. F.

3. Protect material from freezing.

4. Discard materials which come in contact with contaminates or water, prior to actual use. Remove damaged materials from site.

1.9 PROJECT CONDITIONS

A. Environmental Requirements

1. Intumescent fireproofing shall not commence or proceed when steel surfaces are below 40 deg. F. or when ambient temperature is less than 40 deg. F. or expected within 24 hours.

2. Relative humidity shall not exceed 80% throughout total period of application and drying of intumescent fireproofing, and shall not exceed 85% throughout application and drying period for protective decorative finish coat, unless approved by the manufacturer prior to application.

3. Provide ventilation in areas to receive intumescent fireproofing during and for 24 hours following application to dry materials.

1.10 SEQUENCING AND SCHEDULING

A. Schedule application of intumescent fireproofing with the General Contractor. The General Contractor shall coordinate preparation and primer application with steel fabricators along with repairs and repriming of welds.

B. Do not apply intumescent fireproofing until concrete toppings have been installed.

C. Sequence work in conjunction with placement of hanger tabs, mechanical component hangers, electrical devices and any other similar devices connected to members scheduled to be coated.

D. Steel surfaces with less than 36'-0" clear working access may necessitate application of material to inaccessible surfaces prior to erection of finished steel members, either at point of fabrication or on-site.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Intumescent Fireproofing: Albi Clad TF.

B. Products manufactured by Nu-Chem, Carboline, and Cafco Inc. shall be considered as equivalent if surface finish, texture, thickness, and specified material characteristics comply with the conditions shown for this Project, and manufacturer can provide above certifications.

2.2 MATERIALS

A. Intumescent Fireproofing: Solvent, thin-film fireproofing.

1. Ratings: As indicated on drawings.

2. Surface Burning Characteristics: ASTM E 84:

a. Flame Spread: Less than 15
b. Smoke Developed: Less than 65.

B. Primer: Provide primer tinted differently from intumescent coating and appropriate base for finish top coat; Albi 490W, or approved equal.

C. Finish Coat: Type recommended by manufacturer of intumescent in custom color.

2.3 EQUIPMENT

A. Spray and roller equipment shall be as recommended by intumescent coating manufacturer.

B. Dry film thickness gage.

C. Air movement equipment.

D. Dehumidification equipment.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions

1. Examine surfaces and conditions under which intumescent fireproofing is to be applied. Report any defects which may affect the work of this Section.

2. Confirm compatibility of surfaces to receive fireproofing materials prior to application of fireproofing. Steel surfaces shall be primed with a compatible primer. The primer must be approved by the intumescent fireproofing manufacturer prior to shop priming to ensure sufficient adhesion. Coordinate work with Section 051200 to insure proper coordination.

3. Applicator shall submit in writing certifications of substitute acceptance prior to proceeding with application of fireproofing.

4. Correct conditions detrimental to timely and proper execution of work.

5. Verify that all clips, hangers, sleeves and similar devices have been attached.

6. Do not proceed until unsatisfactory conditions have been corrected. Beginning application indicates acceptance of substrate surfaces.

3.2 PREPARATION

A. Clean substrate free of dust, dirt, grease or other foreign matter which would impair bond of fire resistance materials.

3.3 PROTECTION

A. Protect adjacent surfaces and equipment from overspray of sprayed fireproofing materials.

3.4 APPLICATION

A. Intumescent Fireproofing

1. Prior to application, allow materials to reach same temperature as surface temperature of steel by storing unopened containers in areas where application is to take place.

2. No spackle compound, gypsum basecoats, additives to intumescent paint fireproofing (other than reducers approved by the manufacturer) will be acceptable.

3. Thoroughly mix intumescent fireproofing in accordance with manufacturer's instructions and apply in sufficient thickness to achieve the fire resistance rating. Apply in as many passes as necessary to cover, with uniformed texture.

4. Apply intumescent fireproofing in strict adherence with manufacturer's instructions by spray method. Brush or roller application shall be allowed only when spray application is not practical.

5. Spray apply material using heavy duty, self-cleaning (reversible), type tip. Increase distance between tip and surface if necessary to adjust orange peel effect due to pressure. Adjust fan width accordingly.

6. Fireproofing material dries quickly, a viscosity increase may be experienced after container has been opened. Keep container covered as much as possible during application. Use recirculation feature on spray equipment at all times, especially at breaks or interruptions during spraying.

7. When applying fireproofing with roller or brush, work from small containers, mixing frequently. Original pail shall be kept tightly closed and surface of material covered with plastic sheet provided for that purpose.

8. Fireproofing materials are designed for high build with minimum number of coats, however do not exceed 40 mils per dry coat, as shrinkage may occur.

9. Follow manufacturer’s recommendations for recoat times and times to finish coat.

10. Final thickness shall be measured by dry film thickness gage. Do not apply protective top coat until it has been determined that required dry film thickness of intumescent fireproofing has been provided.

11. All runs, sags, orange peel in excess of 1/32" (peak to valley), depressions shall be sanded to achieve a uniform appearance in selected high finish areas.

12. Protect coating from running water during curing process.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing and inspecting of completed applications of intumescent material will take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of fire-resistive material for the next area until test results for previously completed applications of fire-resistive material show compliance with requirements.

1. The intumescent coating thickness shall be measured in accordance with Technical Manual 12-B, "Standard Practice of the Testing and Inspection of Field Applied Thin-Film Intumescent Fire Resistive Materials; an Annotated Guide" published by the Association of the Wall and Ceiling Industries.

2. When testing discovers applications of fire-resistive material not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

C. Remove and replace applications of intumescent material where test results indicate that they do not comply with specified requirements.

D. Apply additional fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION

SECTION 078413

FIRESTOPS AND SMOKESEALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the firestops and smokeseals as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

4. Sealant joints in fire-resistance-rated construction.

5. Penetrations at each floor level in shafts and/or stairwells.

6. Construction joints, including those between top of fire rated walls and underside of floors above; and those between exterior curtain walls and the outer perimeter edge of floor assemblies.

B. NOTE: All sprayed fireproofing and firestopping materials shall be FM approved and installed in accordance with manufacturer's guidelines and the *Approval Guide*, a publication of FM Approvals.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Cast-in-place concrete - Section 033000.

E. Unit masonry - Section 042000.

F. Joint sealers - Section 079200.

G. Aluminum curtainwall - Section 084413.

H. Drywall - Section 092900.

I. Piping penetrations - Division 22.

J. Duct penetrations – Division 23.

K. Cable and conduit penetrations - Division 26.

1.5 REFERENCES

A. ASTM E 814 "Standard Method of Fire Tests of Through-Penetration Firestops."

B. UL 1479, UBC 7-5 (Both are same as A. above).

C. ASTM E 119 "Standard Method of Fire Tests of Building Construction and Materials."

D. UL 263, UBC 7-1 (Both are same as C. above).

E. UL 2079 "Tests For Fire Resistance of Building Joint Systems."

F. ASTM E 1399 "Test For Dynamic Movement Conditions."

G. ASTM E 1966 (Same as E. above).

H. Published Through-Penetration Systems by recognized independent testing agencies.

1. UL Fire Resistance Directory, Volume II of current year.

2. Warnock Hersey Certification Listings, current year.

3. Omega Point Laboratories, current year.

1.6 SUBMITTALS

A. Submit manufacturer's product literature for each type of firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance, limitation criteria, test data and indication that products comply with specified requirements.

B. Submit shop drawings detailing materials, installation methods, and relationships to adjoining construction for each firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspection agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.

C. Material Safety Data Sheets: Submit MSDS for each firestop product.

D. Submit qualifications of firestop installer, including letter from firestop manufacturer of products proposed to be installed, wherein manufacturer approves or recognizes as trained/ or certifies installer for installation of that manufacturer's products.

E. Manufacturer's Letters: For installations or configurations not covered by a UL or Warnock Hersey design number, a recommendation shall be obtained from the manufacturer, in writing, for the specific application.

F. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 QUALITY ASSURANCE

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, and the passage of smoke and other gases.

B. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM E 814 or UL 1479. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. T rating, when required by code authority, shall be based on measurement of the temperature rise on the penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.

C. Firestopping products shall be asbestos free and free of any PCBs.

D. Do not use any product containing solvents or that requires hazardous waste disposal.

E. Do not use firestop products which after curing, dissolve in water.

F. Do not use firestop products that contain ceramic fibers.

G. Firestopping Installer Qualifications: Firestop application shall be performed by a single firestopping contractor who specializes in the installation of firestop systems, whose personnel to be utilized have received specific training and certification or approval from the proposed respective firestop manufacturer, and firestop installer shall have a minimum of three years experience (under present company name) installing firestop systems of the type herein specified.

H. Mock-Up: Prepare job site mock-ups of each typical Firestop System proposed for use in the project. Approved mock-ups will be left in place as part of the finished project and will constitute the quality standard for the remaining work.

I. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

J. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable. Some applicable VOC limits are as follows:

   a. Firestop Sealants: 250 g/l less water.
   b. All Architectural Sealants: 250 g/l less water.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original unopened containers with manufacturer's name, product identification, lot numbers, UL or Warnock Hersey labels, and mixing and installation instructions, as applicable.

B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturer.

C. All firestop materials shall be installed prior to expiration of shelf life.

1.9 PROJECT CONDITIONS

A. Verify existing conditions and substrates before starting work

B. Do not use materials that contain solvents, show sign of damage or are beyond their shelf life.

C. During installation, provide masking and drop cloths as needed to prevent firestopping products from contaminating any adjacent surfaces.

D. Conform to ventilation requirements if required by manufacturer's installation instructions or Material Safety Data Sheet.

E. Weather Conditions: Do not proceed with installation of firestop products when temperatures are in excess or below the manufacturer's recommendations.

F. Schedule installation of firestop products after completion of penetrating item installation but prior to covering or concealing of openings.

G. Coordinate this work as required with work of other trades.

1.10 SEQUENCING AND SCHEDULING

A. Pre-Installation Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

B. Sequence: Perform work of this and other sections in proper sequence to prevent damage to the firestop systems and to ensure that their installation will occur prior to enclosing or concealing work.

C. Install all firestop systems after voids and joints are prepared sufficiently to accept the applicable firestop system.

D. Do not cover firestop systems until they have been properly inspected and accepted by the authority having jurisdiction.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following manufacturers:

1. Tremco
2. Bio-Fireshield
3. 3M
4. Specified Technologies Inc.
5. U.S. Gypsum Co.
6. Nelson
7. Hilti, Inc.
8. Grace Flame Safe

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

B. Accessories: Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:

    a. Semirefractory fiber (mineral wool) insulation.
    b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Joint fillers for joint sealants.

2. Temporary forming materials.

3. Substrate primers.

4. Collars.

5. Steel sleeves.

C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

D. Smokeseals at top of partitions shall be flexible to allow for partition deflection.

2.3 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.

B. Intumescent, Latex Sealant: Single-component, Intumescent, latex formulation.

C. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

D. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum or polyethelene foil on one side.

E. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.

F. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

G. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

H. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.

I. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/gunnable sealant, unless firestop system limits use to non-sag grade for both opening conditions.

2.4 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

1. Sealant Colors: Color of exposed joint sealants as selected by the Architect.

B. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand 33 percent movement in both extension and compression for a total of 66 percent movement.

C. Multi-Component, Non-Sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated.

D. Single-Component, Non-Sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

2.5 MINERAL FIBER/CERAMIC WOOL NON-COMBUSTIBLE INSULATION (FIRE SAFING)

A. Provide min. 4 pcf Thermafiber as manufactured by Thermafiber Co., min. 4 pcf FBX Safing Insulation as manufactured by Fibrex, or approved equal to suit conditions and to comply with fire resistance and firestop manufacturer's requirements.

B. Material shall be classified non-combustible per ASTM E 119.

2.6 MIXING

A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping 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 configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form release agents from concrete.

B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 CONDITIONS REQUIRING FIRESTOPPING

A. Building Exterior Perimeters

1. Where exterior facing construction is continuous past a structural floor, and a space (i.e. construction joint) would otherwise remain open between the inner face of the wall construction and the outer perimeter edge of the structural floor, provide firestopping to equal the fire resistance of the floor assembly.

a. If mineral wool is part of firestop system, the mineral wool must be completely covered by appropriate thickness of UL or Warnock Hersey listed firestop sealant or spray.
b. Refer to Article 3.6 herein for description of fire safing insulation.

2. Firestopping shall be provided whether or not there are any clips, angles, plates, or other members bridging or interconnecting the facing and floor systems, and whether or not such items are continuous.

3. Where an exterior wall passes a perimeter structural member, such as a girder, beam, or spandrel, and the finish on the interior wall face does not continue up to close with the underside of the structural floor above, thus interrupting the fire-resistive integrity of the wall system, and a space would otherwise remain open between the interior face of the wall and the structural member, provide firestopping to continuously fill such open space.

B. Interior Walls and Partitions

1. Construction joints between top of fire rated walls and underside of floors above, shall be firestopped.

2. Firestop system installed shall have been tested by either UL or Omega Point, including exposure to hose stream test and including for use with steel fluted deck floor assemblies.

3. Firestop system used shall allow for deflection of floor above.

C. Penetrations

1. Penetrations include conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.

2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces in accordance with ASTM E 814.

3. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall of opening.

D. Provide firestopping to fill miscellaneous voids and openings in fire rated construction in a manner essentially the same as specified herein before.

3.4 INSTALLING THROUGH PENETRATION FIRESTOPS

A. General: Comply with the through penetrations firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through penetration firestop systems by proven techniques to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.5 INSTALLING FIRE RESISTIVE JOINT SEALANTS

A. General: Comply with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool no sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.6 INSTALLING FIRESAFING INSULATION

A. Install fire safing insulation utilizing welded or screw applied galvanized steel impaling pins and retaining clips; space clips or pins 24" o.c. maximum.

B. Completely fill voids in areas where safing insulation is required. At spandrel conditions/floor edges, depth of insulation top to bottom shall be at least four (4) inches.

C. Cover top of all safing insulation with firestop sealant or spray.

3.7 FIELD QUALITY CONTROL

A. Inspecting agency employed and paid by the Owner will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.

B. Inspecting agency will report observations promptly and in writing to Contractor, Owner and Architect.

C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.

D. Where deficiencies are found, Contractor must repair or replace firestopping so that it complies with requirements.

3.8 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to product firestopping complying with specified requirements.

END OF SECTION

SECTION 079200

JOINT SEALERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the joint sealers work as shown on the drawings and/or specified herein, including but not necessarily limited to the following:

1. Flashing reglets and retainers.

2. Coping joints.

3. Exterior wall joints not specified to be sealed in other Sections of work.

4. Interior wall joints not specified to be sealed in other Sections of work, including caulking to fill between architectural woodwork and any wall, floor and/or ceiling imperfections.

5. Control and expansion joints in walls.

6. Joints at wall penetrations.

7. Joints between items of equipment and other construction.

8. All other joints required to be sealed to provide a positive barrier against penetration of air and moisture.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Roofing - Division 7.

E. Firestop sealants – Section 078413.

F. Sealant at metal to metal components of curtain wall - Section 084413.

G. Glazing sealants - Section 088000.

H. Sealant within drywall construction - Section 092900.

I. Sealant at tile work - Section 093000 and 093310.

1.5 QUALITY ASSURANCE

A. Qualification of Installers: Use only personnel who are thoroughly familiar, skilled and specially trained in the techniques of sealant work, and who are completely familiar with the published recommendations of the sealant manufacturer.

B. Pre-Construction Field Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to project joint substrates according to the method in ASTM C 794 and C 1521 that is appropriate for the types of Project joints.

C. Perform testing per ASTM C 1248 on interior and exterior sealants to determine if sealants or primers will stain adjacent surfaces. No sealant work shall start until results of these tests have been submitted to the Architect and he has given his written approval to proceed with the work.

D. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable. Some applicable VOC limits are as follows:

   a. Firestop Sealants: 250 g/l less water.
   b. All Architectural Sealants: 250 g/l less water.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing all joint conditions, indicating relation of adjacent materials, all sealant materials (sealant, bond breakers, backing, primers, etc.), and method of installation.

1. Submit joint sizing calculations certifying that movement capability of sealant is not being exceeded.

B. Samples: Submit the following:

1. Color samples of sealants.

2. Sealant bond breaker and joint backing.

C. Product Data: Submit manufacturer's technical information and installation instructions for:

1. Sealant materials, indicating that material meets standards specified herein.

2. Backing rods.

D. Submit manufacturer's certification as required by Article 1.6 herein.

E. Submit results of testing required in Article 1.4 herein.

F. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 MANUFACTURER'S RESPONSIBILITY AND CERTIFICATION

A. Contractor shall require sealant manufacturer to review the Project joint conditions and details for this Section of the work. Contractor shall submit to the Architect written certification from the sealant manufacturer that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vaportight seals (as applicable), and that materials supplied meet specified performance requirements.

1.8 ENVIRONMENTAL CONDITIONS

A. Temperature: Install all work of this Section when air temperature is above forty (40) degrees F. and below eighty (80) degrees F., unless manufacturer submits written instructions permitting sealant use outside of this temperature range.

B. Moisture: Do not apply work of this Section on surfaces which are wet, damp, or have frost.

1.9 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section, before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

C. Storage

1. Store sealant materials and equipment under conditions recommended by their manufacturer.

2. Do not use materials stored for a period of time exceeding the maximum recommended shelf life of the material.

1.10 GUARANTEE

A. Provide a written, notarized guarantee from the manufacturer and the applicator stating that the applied sealants shall remain watertight for a period of ten (10) years.

B. Guarantee shall be in a form acceptable to the Owner and executed by an authorized individual.

C. Guarantee shall further state that installed sealant is guaranteed against:

1. Adhesive or cohesive failure of sealant joints.

2. Crazing greater than three (3) mils in depth developing on surface of material.

3. Staining of surfaces adjacent to joints by sealants or primer by migration through building materials in contact with them.

4. Chalking, or visible color change on surface of cured sealant.

5. Increase or decrease of "Shore A" durometer hardness (5 second reading) of sealant of more than thirty (30) percent of seven (7) day value of "Shore A" durometer hardness of sealant.

D. Include in guarantee provision, agreement to repair and/or replace, at Contractor's expense, sealant defects which develop during guarantee period, because of faulty labor and/or materials.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

A. Exterior Wall Sealant: Provide one (1) part non-sag sealant equal to No. 790 or 795 made by Dow Corning, "Silpruf SCS 2000" or "LM SCS 2700" made by G.E. or "Spectrem 1" or "Spectrem 3" made by Tremco or "Sonolastic 150" by Sonneborn conforming to the minimum standards of ASTM C 920, Type S, Grade NS, Class 50.

B. Interior Sealant: Provide a one (1) part acrylic based sealant conforming to ASTM C 834, equal to "AC-20+ Silicone" made by Pecora or equal made by Tremco.

C. Colors: Custom colors of sealants as selected by the Architect.

2.2 MISCELLANEOUS MATERIALS

A. Back-Up Materials: Provide back-up materials and preformed joint fillers, non-staining, non-absorbent, compatible with sealant and primer, and of a resilient nature, equal to "Sof-Rod" made by Nomaco Inc. or approved equal, twenty-five (25) percent wider than joint width. Materials impregnated with oil, bitumen or similar materials shall not be used. Provide back-up materials only as recommended by sealant manufacturer in writing.

B. Provide bond breakers, where required, of polyethylene tape as recommended by manufacturer of sealant.

C. Provide primers recommended by the sealant manufacturer for each material to receive sealant. Note that each exterior joint must be primed prior to sealing.

D. Provide solvent, cleaning agents and other accessory materials as recommended by the sealant manufacturer.

E. Materials shall be delivered to the job in sealed containers with manufacturer's original labels attached. Materials shall be used per manufacturer's printed instructions.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where joint sealers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions required by this Project where more stringent installation requirements are specified herein, such requirements shall apply.

B. Sample Section of Sealant

1. During sealant installation work in exterior wall, the manufacturer of sealant shall send his representative to the site, under whose supervision a section of the wall (used as "control section") shall be completed for purposes of determining performance characteristics of sealant in joints. Architect shall be informed of time and place of such installation of control section.

2. Control section shall be installed according to specification given herein and shall not be considered as acceptable until written acceptance is provided by the Architect.

3. Accepted control section shall be standard to which all other sealant work must conform.

C. Supervision: The Contractor shall submit to the Architect written certification from the sealant manufacturer that the applicators have been instructed in the proper application of their materials. The Contractor shall use only skilled and experienced workmen for installation of sealant.

D. Apply sealant under pressure with a hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed. Neatly point or tool joint to provide the contour as indicated on the drawings.

E. Preparation and Application

1. Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt and frost. Sealant must be applied to the base surface. Previously applied film must be entirely removed.

2. Stone, masonry and concrete surfaces to receive sealant shall be cleaned where necessary by grinding, water blast cleaning, mechanical abrading, or combination of these methods as required to provide a clean, sound base surface for sealant adhesion.

   a. Do not use any acid or other material which might stain surfaces.
   b. Remove laitance by grinding or mechanical abrading.
   c. Remove loose particles present or resulting from grinding, abrading, or blast cleaning by blowing out joints with compressed air, oil and water free, or vacuuming joints prior to application of primer or sealant.

3. Clean non-porous surfaces such as metal and glass chemically. Remove protective coatings on metallic surfaces by solvent that leaves no residue and is compatible with sealant. Use solvent and wipe dry with clean, dry lint free paper towels. Do not allow solvent to air dry without wiping. Clean joint areas protected with masking tape or strippable films as above after removal of tape film.

4. Do not seal joints until they are in compliance with drawings, or meet with the control section standard.

5. Joint Size and Sealant Size: Joints to receive sealant shall be at least 1/4" wide. In joint 1/4" to 3/8" wide, sealant shall be 1/4" deep. In joints wider than 3/8" and up to 1" wide, sealant depth shall be one half the joint width. For joints wider than 1", sealant depth shall be as recommended by the sealant manufacturer. Depth of joint is defined as distance from outside face of joint to closest point of the filler.

6. Primer: Thoroughly clean joints and apply primer to all surfaces that will receive sealant. Apply primer on clean, dry surfaces, and prior to installation of joint backing. Completely wet both inner faces of the joint with primer. Mask adjacent surfaces of joint with non-staining masking tape prior to priming.

7. Joint Backing: In joints where depth of joint exceeds required depth of sealant, install joint backing (after primer is dry) in joints to provide backing and proper joint shape for sealant. Proper shape for sealant is a very slight "hourglass" shape, with back and front face having slight concave curvature. Use special blunt T-shaped tool or roller to install joint backing to the proper and uniform depth required for the sealant. Joint backing shall be installed with approximately twenty-five (25) percent compressions. Do not stretch, twist, braid, puncture, or tear joint backing. Butt joint backing at intersections.

8. Bond Breaker: Install bond breaker smoothly over joint backing so that sealant adheres only to the sides of the joint and not backing.

9. Sealant Application: Apply sealant in accordance with the manufacturer's application manual and manufacturer's instructions, using hand guns or pressure equipment, on clean, dry, properly prepared substrates, completely filling joints to eliminate air pockets and voids. Mask adjacent surfaces of joint with non-staining masking tape. Force sealant into joint in front of the tip of the "caulking gun" (not pulled after it) and force sealant against sides to make uniform

contact with sides of joint and to prevent entrapped air or pulling of sealant off of sides. Fill sealant space solid with sealant.

10. Tooling: Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 5A in ASTM C 1193. Finished joints shall be straight, uniform, smooth and neatly finished. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Neatly remove any excess sealant from adjacent surfaces of joint, leaving the work in a neat, clean condition.

11. Replace sealant which is damaged during construction process.

END OF SECTION

SECTION 081000

DOOR SCHEDULE

Key To Abbreviations

DRMATL	DoorMaterial
DRTYPE	Door Type
FRMATL	Frame Material
FRTYPE	Frame Type
HDWE	Hardware
EHO	Electro-Magnetic Hold-Open
GAL	Galvanize

Materials:

HM:	Ptd. Hollow Metal
WD:	Wood
ST:	Steel
G:	Glass
SS:	Stainless Steel
AL:	Aluminum
SR:	Stile & Rail

Door Types:	See A7.51
Frame Types:	See A7.51
Threshold Types:	See A7.51

Notes

1. Hollow metal doors and frames are specified in Section 081113.
2. Stile and Rail Steel doors are specified in Section 081113/2.6.
3. Stainless Steel doors are specified in Section 081119.
4. Stile and Rail Wood Doors are specified in Section 081433.
5. Door Hardware is specified in Section 087100.
6. Glazing is specified in Section 088000.
7. Refer to drawings and details for Vestibule doors and walls.
8. Coordinate with electrical and security drawings and specs.
9. Refer to exterior details for all doors and frames in exterior walls.

DOOR SCHEDULE

Door No.	From Room: Name	From Room: Number	To Room: Name	To Room: Number	DOOR					FRAME		Door Hardware	Door Head	Door Jamb	Card Reader	Door Label	Door Hold Open	Automatic Door Opener	Remote Latch Retraction	REMARKS	REVISION
					Door Type	Door Material	Height	Width	Thickness	Frame Material	Frame Type										
B01.1	UTILITY TUNNEL CONNECTION	UT1			*	*	*	*	*	*		*			*					Floodproof Door - see details	
B01.3	MAIN EMERGENCY ELECTRICAL RM	B03	CORRIDOR	B07	F	HM	8' - 0"	3' - 0"	0' - 1 3/4"	HM	A	7									
B02.1	MAIN ELECTRICAL ROOM	B02	CORRIDOR	B07	G	HM	8' - 0"	6' - 0"	0' - 1 3/4"	HM	B	8									
B02.2	MAIN ELECTRICAL ROOM	B02	CORRIDOR	B07	G	HM	8' - 0"	8' - 0"	0' - 1 3/4"	HM	B	8									
B03.1	CORRIDOR	B07	MAIN EMERGENCY ELECTRICAL RM	B03	G	HM	8' - 0"	8' - 0"	0' - 1 3/4"	HM	B	8									
B04.1	MEP ROOM	B04	ELEVATOR LOBBY	B01	G	HM	8' - 0"	6' - 0"	0' - 1 3/4"	HM	B	6									
B04.2	MEP ROOM	B04	CORRIDOR	B07	G	HM	8' - 0"	8' - 0"	0' - 1 3/4"	HM	B	6									
B04A.1	AREAWAY	B04A	MEP ROOM	B04	G	HM	8' - 0"	8' - 0"	0' - 1 3/4"	HM	B	6B									
B04B.1	ENT FACILITY/CNTRL EQUIP RM	B04D	MEP ROOM	B04	G	HM	8' - 0"	6' - 0"	0' - 1 3/4"	HM	B	6									
B05.1	GENERAL MAINT. and TRADES STOR	B05	ELEVATOR LOBBY	B01	G	HM	8' - 0"	6' - 0"	0' - 1 3/4"	HM	B	6									
B06.1	UTILITY TUNNEL CONNECTION	UT1	MEP	B06	G	HM	8' - 0"	6' - 0"	0' - 1 3/4"	HM	B	6A									
B06.2	UTILITY TUNNEL CONNECTION	UT1	MEP	B06	F	HM	8' - 0"	3' - 0"	0' - 1 3/4"	HM	A	2A									
B09.1	ELEVATOR LOBBY	B01	TRASH AND RECYCLING	B09	G	HM	8' - 0"	6' - 0"	0' - 1 3/4"	HM	B	6A									
B10.1	CORRIDOR	B07	SUMP PUMP ROOM	B10	G	HM	8' - 0"	6' - 0"	0' - 1 3/4"	HM	B	2A									
B11.1	FURNITURE STORAGE	B11	ELEVATOR LOBBY	B01	G	HM	8' - 0"	6' - 0"	0' - 1 3/4"	HM	B	6A									
SBA.1	ELEVATOR LOBBY	B01	STAIR A	SBA	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	E3B			X	2 HR					
SBB.1	CORRIDOR	B07	STAIR B	SBB	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	E3			X	2 HR					
V1A.1	VESTIBULE A	V1A	EXTERIOR	exterior	see dwgs	SS-SR+G	see dwgs	see dwgs	see dwgs	see dwgs	see dwgs	E7			X			X			
V1A.2	LOBBY	C1A	VESTIBULE A	V1A	see dwgs	SS-SR+G	see dwgs	see dwgs	see dwgs	see dwgs	see dwgs	E5						X			
V1B.1	VESTIBULE B	V1B	EXTERIOR	exterior	see dwgs	SS-SR+G	see dwgs	see dwgs	see dwgs	see dwgs	see dwgs	E7			X			X			
V1B.2	LOBBY	C1A	VESTIBULE B	V1B	see dwgs	SS-SR+G	see dwgs	see dwgs	see dwgs	see dwgs	see dwgs	E5						X			
V01.1	LOBBY	C1A	VENDING	V01	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	D	5A									
V01A.1	VENDING	V01	PANTRY	V01A	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	D	3									
101A.1	LOBBY	C1A	SMART BUILDING OFFICE	101A	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	E1			X						
103.1	LOBBY	C1A	ELECTRICAL CLOSET	103	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2									
106.1	VIRTUAL REALITY SPACE	106	DRY LAB 1B	110	E	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	G	E1A			X						
106.2	VIRTUAL REALITY SPACE	106	DRY LAB 1B	110	E	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	G	E1A			X						
107.1	DRY LAB 1B	110	CYBERPHYSICS	107	E	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	G	E1A			X						
107.2	CYBERPHYSICS	107	DRY LAB 1B	110	E	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	G	E1A			X						
107.3	DRY LAB 1A	114	CYBERPHYSICS	107	E	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	G	E1A			X						
107.4	CYBERPHYSICS	107	DRY LAB 1A	114	E	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	G	E1A			X						
108.1	WATER LAB	108	DRY LAB 1B	110	J	SS-SR+G	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	SS	G	E1A			X					Frame and Finish shall be seamless	1
108.2	DRY LAB 1A	114	WATER LAB	108	K	SS-SR+G	7' - 1 1/2"	4' - 9 1/2"	0' - 1 3/4"	SS	G	E1A			X					Frame and Finish shall be seamless	1
110.1	DRY LAB 1B	110	LOBBY	C1A	B	WD-SR	7' - 1 1/2"	4' - 8 1/2"	0' - 1 3/4"	HM	D	E2A			X						
110A.1	DRY LAB 1B	110	ITAR CONTROLLED LAB	110A	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	E1A			X						
110B.1	DRY LAB 1B	110	MEETING ROOM	110B	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	1C									
112.1	ELECTRICAL CLOSET	112	CORRIDOR / INFORMAL STUDY	C1B	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	D	2C									
113.1	CORRIDOR	C1B	TECH OFFICE	113	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	D	1									
114.2	DRY LAB 1A	114	LOBBY	C1A	B	WD-SR	7' - 1 1/2"	4' - 8 1/2"	0' - 1 3/4"	HM	D	E2A			X						
114A.1	DRY LAB 1A	114	MEETING ROOM	114A	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	F	1C									
114B.1	DRY LAB 1A	114	ITAR CONTROLLED LAB	114B	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	E1A			X						
114C.1	MEETING ROOM	114C	DRY LAB 1A	114	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	1B									
116.1	LOADING DOCK VESTIBULE	116	LOBBY	C1A	G	HM	7' - 1 1/2"	6' - 0"	0' - 1 3/4"	HM	B	E2			X						
116.2	LOADING DOCK VESTIBULE	116	EXTERIOR	n/a	G	HM	8' - 0"	6' - 8"	0' - 1 3/4"	HM	B	E2			X						
116A.1	LOADING DOCK VESTIBULE	116	DATA CLOSET	116A	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	E1A			X						
116B.1	LOADING DOCK VESTIBULE	116	OFFICE	116B	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	1									
117.1	JANITOR	117	LOBBY	C1A	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2B									
121A.1	AV CLOSET	121A	GATHERING/DISPLAY SPACE	121	F	HM	*	*	*	*	*	11								SEE A709 DETAILS	
RR1A	LOBBY	C1A	WOMEN	RR1A	J	ST+G-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	10								OBSCURE WHITE INTERLAYER	
RR1B.1	LOBBY	C1A	MEN	RR1B	J	ST+G-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	10								OBSCURE WHITE INTERLAYER	
S1A.1	STAIR A	S1A	LOBBY	C1A	D	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	E	5				2 HR					
S1A.2	STAIR A	S1A	STAIR A	S1A	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	E	E3			X						
S1A.3	STAIR A	S1A	EXTERIOR	n/a	F	HM	8' -0 "	3' - 0"	0' - 1 3/4"	HM	E	7A									
S1B.1	CORRIDOR	C1B	STAIR B	S1B	D	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	E	E3B			X	2 HR					
S1B.2	STAIR B	S1B	EXTERIOR	n/a	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	E	E4			X						
S1B.3	STAIR B	S1B	STAIR B	S1B	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	E	E3			X						
C2B.1	CORRIDOR	C2B	ELEV LOBBY	C2A	B	WD-SR	7' - 1 1/2"	4' - 8 1/2"	1 3/4"	HM	F	E2B			X						
204.1	CORRIDOR	C2B	PANTRY / LUNCHROOM	204	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	1									
205.1	CONFERENCE ROOM	205	CORRIDOR	C2B	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	1D									
206A.1	OFFICE	206A	CORRIDOR	C2B	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	E1			X						
206B.1	OFFICE	206B	CORRIDOR	C2B	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	E1			X						
206C.1	CORRIDOR	C2B	OFFICE	206C	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	E1			X						

Conformed Set - May 29, 2015

DOOR SCHEDULE

Door No.	From Room: Name	From Room: Number	To Room: Name	To Room: Number	DOOR					FRAME		Door Hardware	Door Head	Door Jamb	Card Reader	Door Label	Door Hold Open	Automatic Door Opener	Remote Latch Retraction	REMARKS	REVISION
					Door Type	Door Material	Height	Width	Thickness	Frame Material	Frame Type										
206D.1	OFFICE	206D	CORRIDOR	C2B	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	E1			X						
206E.1	CORRIDOR	C2B	OFFICE	206E	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	E1			X						
206F.1	OFFICE	206F	CORRIDOR	C2B	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	E1A			X						
208.1	CORRIDOR	C2B	ELECTRICAL CLOSET	208	F	HM	7' - 1 1/2"	3' - 0"	1 3/4"	HM	C	2E									
209.1	WET LAB	209	CORRIDOR	C2B	A	WD-SR	7' - 1 1/2"	4' - 8 1/2"	1 3/4"	HM	D	9									
209C.1	WET LAB	209	LAB SUPPORT	209C	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
209D.1	WET LAB	209	TISSUE PREP / MICROTOME	209D	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1D			X					LIGHT SEALS, LIGHT-PROOF WHITE FILM ON GLASS	
209E.1	WET LAB	209	MICROSCOPE RM	209E	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
209F.2	TISSUE CULTURE	209G	FISH ROOM	209F	C	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	3A									
209FA.1	FISH ROOM	209F	FISH SUPPORT	209FA	C	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	1A									
209G.1	WET LAB	209	TISSUE CULTURE	209G	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
210B.1	EQUIPMENT RM	210	LAB SUPPORT	210B	C	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	E1A			X						
212A.1	EQUIPMENT RM	212	R.A.D. ROOM	212A	C	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	E1A			X						
214.1	ELECTRICAL CLOSET	214	CORRIDOR	C2C	F	HM	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	2									
216.1	WET LAB	216	ELEV LOBBY	C2A	B	WD-SR	7' - 1 1/2"	4' - 8 1/2"	1 3/4"	HM	D	E2A			X						
216.2	WORKSTATIONS	215	WET LAB	216	A	WD-SR	7' - 1 1/2"	4' - 8 1/2"	1 3/4"	HM	D	9									
217.1	JANITOR	217	ELEV LOBBY	C2A	F	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	2B									
220.1	DATA CLOSET	220	ELEV LOBBY	C2A	F	HM	7' - 1 1/2"	3' - 0"	1 3/4"	HM	C	E1A			X						
221.1	WC	221	ELEV LOBBY	C2A	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	4A									
222.1	STORAGE	222	ELEV LOBBY	C2A	G	HM	7' - 1 1/2"	4'-8"	1 3/4"	HM	A	6									
223.1	CO2 MANIFOLD CLOSET	223	ELEV LOBBY	C2A	G	HM	7' - 1 1/2"	5' - 0"	1 3/4"	HM	C	6									
215A.1	WORKSTATIONS	215	MEETING	215A	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	D	1									
216D.1	WET LAB	216	DARKROOM	216D	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1D			X					LIGHT SEALS, LIGHT-PROOF WHITE FILM ON GLASS	
216E.1	WET LAB	216	FLY ROOM	216E	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
216F.1	WET LAB	216	TISSUE CULTURE	216F	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
216G.1	WET LAB	216	DELTAVISION MICROSCOPE	216G	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1D			X					LIGHT SEALS, LIGHT-PROOF WHITE FILM ON GLASS	
216I.1	WET LAB	216	GLASS WASH	216I	C	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	E1A			X						
RR2A.1	ELEV LOBBY	C2A	WOMEN	RR2A	J	ST+G-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	10								OBSCURE WHITE INTERLAYER	
RR2B.1	ELEV LOBBY	C2A	MEN	RR2B	J	ST+G-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	10								OBSCURE WHITE INTERLAYER	
S2A.1	STAIR A	S2A	ELEV LOBBY	C2A	D	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	E	3				2 HR					
S2B.1	CORRIDOR	C2C	STAIR B	S2B	D	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	E	E3B			X	2 HR					
C3B.2	CORRIDOR	C3B	ELEV LOBBY	C3A	B	WD-SR	7' - 1 1/2"	4' - 8 1/2"	1 3/4"	HM	F	E2B			X						
304.1	CORRIDOR	C3B	CGI COMPUTATIONAL TRAINING	304	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	1D									
305.1	RECEPTION	305	CORRIDOR	C3B	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	5A									
305A.1	RECEPTION	305	OFFICE	305A	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	E	E1			X						
306A.1	OFFICE	306A	CORRIDOR	C3B	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	E1			X						
306B.1	OFFICE	306B	CORRIDOR	C3B	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	E1			X						
306C.1	CORRIDOR	C3B	OFFICE	306C	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	E1			X						
306D.1	OFFICE	306D	CORRIDOR	C3B	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	E1			X						
306E.1	CORRIDOR	C3B	OFFICE	306E	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	G	E1			X						
308.1	CORRIDOR	C3B	ELECTRICAL CLOSET	308	F	HM	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	2E									
309.1	WET LAB	309	CORRIDOR	C3B	A	WD-SR	7' - 1 1/2"	4' - 8 1/2"	1 3/4"	HM	D	9									
309B.1	SHARED SPACE	309B	WET LAB	309	C	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	E1			X						
309BB.1	SHARED SPACE	309B	OFFICE	309BB	C	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	E1			X						
309BC.1	SHARED SPACE	309B	OFFICE	309BC	C	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	E1			X						
309C.1	WET LAB	309	TISSUE CULTURE	309C	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
309D.1	WET LAB	309	CGI SEQUENCING	309D	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
309DA.1	CGI SEQUENCING	309D	PCR	309DA	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	1A									
309E.1	WET LAB	309	CGI AFFIMETRYX	309E	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
309EA.1	CGI AFFIMETRYX	309E	CGI SINGLE CELL	309EA	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	1A									
309F.1	WET LAB	309	TISSUE CULTURE	309N	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
309G.1	WET LAB	309	TISSUE CULTURE	309G	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
314.1	ELECTRICAL CLOSET	314	CORRIDOR	C3C	F	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	C	2									
315A.1	WORKSTATIONS	315	MEETING	315A	E	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	D	1									
316.1	WET LAB	316	ELEV LOBBY	C3A	B	WD-SR	7' - 1 1/2"	4' - 8 1/2"	1 3/4"	GW	GW	E2B			X						
316.2	WET LAB	316	WORKSTATIONS	315	A	WD-SR	7' - 1 1/2"	4' - 8 1/2"	1 3/4"	HM	D	9									
316D.1	WET LAB	316	TISSUE CULTURE	316D	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
316E.1	WET LAB	316	MICROSCOPE	316E	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1D			X					LIGHT SEALS, LIGHT-PROOF WHITE FILM ON GLASS	
316F.1	WET LAB	316	LAB SUPPORT	316F	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
316G.1	WET LAB	316	TISSUE CULTURE	316G	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						

Conformed Set - May 29, 2015

DOOR SCHEDULE

Door No.	From Room: Name	From Room: Number	To Room: Name	To Room: Number	DOOR					FRAME		Door Hardware	Door Head	Door Jamb	Card Reader	Door Label	Door Hold Open	Automatic Door Opener	Remote Latch Retraction	REMARKS	REVISION
					Door Type	Door Material	Height	Width	Thickness	Frame Material	Frame Type										
316I.1	WET LAB	316	GLASS WASH	316I	C	HM	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	E1A			X						
316M.1	WET LAB	316	LAB SUPPORT	309M	C	WD-SR	7' - 1 1/2"	3' - 6"	1 3/4"	HM	A	E1A			X						
317.1	JANITOR	317	ELEV LOBBY	C3A	F	HM	7' - 1 1/2"	3' - 0"	1 3/4"	HM	A	2B									
320.1	DATA CLOSET	320	ELEV LOBBY	C3A	F	HM	7' - 1 1/2"	3' - 0"	1 3/4"	HM	C	E1B			X						
322.1	CGI SERVER	322	ELEV LOBBY	C3A	F	HM	7' - 1 1/2"	3' - 0"	1 3/4"	HM	C	E1B			X						
324.1	CO2 MANIFOLD CLOSET	324	ELEV LOBBY	C3A	G	HM	7' - 1 1/2"	4' - 8"	1 3/4"	HM	C	6									
RR3A.1	ELEV LOBBY	C3A	WOMEN	RR3A	J	ST+G-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	10								OBSCURE WHITE INTERLAYER	
RR3B.1	ELEV LOBBY	C3A	MEN	RR3B	J	ST+G-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	10								OBSCURE WHITE INTERLAYER	
S3A.1	STAIR A	S3A	ELEV LOBBY	C3A	D	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	E	3				2 HR					
S3B.1	CORRIDOR	C3C	STAIR B	S3B	D	WD-SR	7' - 1 1/2"	3' - 0"	1 3/4"	HM	E	E3B			X	2 HR					
C4B.1	CORRIDOR	C4B	ELEV LOBBY	C4A	B	WD-SR	7' - 1 1/2"	4' - 8 1/2"	1 3/4"	HM	F	E2B			X						
403.1	CORRIDOR	C4B	TECH OFFICE / STORAGE	403	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	1									
404.1	CORRIDOR	C4B	PANTRY / WORKROOM	404	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	1									
405.1	MEETING/BREAKOUT	405	CORRIDOR	C4B	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	1D									
406.1	CORRIDOR	C4B	DRY LAB	406	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	E1A			X						
407.1	CORRIDOR	C4B	DRY LAB	407	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	E1A			X						
408.1	CORRIDOR	C4B	ELECTRICAL CLOSET	408	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2D									
409.1	WET LAB	409	CORRIDOR	C4B	A	WD-SR	7' - 1 1/2"	4' - 8 1/2"	0' - 1 3/4"	HM	D	9									
409A.1	CYLINDER STORAGE	409A	WET LAB	409	F	HM	7' - 1 1/2"	**2' - 4"**	0' - 1 3/4"	HM	A	**2E**									**2**
409B.1	WET LAB	409	TISSUE CULTURE	409B	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1			X						
409D.1	WET LAB	409	LAB SUPPORT	409D	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1A			X						
409E.1	WET LAB	409	BACTERIAL TISSUE CULTURE	409E	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1A			X						
409F.1	WET LAB	409	LAB SUPPORT	409F	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1A			X						
409H.1	CYLINDER STORAGE	409H	WET LAB	409	F	HM	7' - 1 1/2"	**2' - 4"**	0' - 1 3/4"	HM	A	**2E**									**2**
409I.1	WET LAB	409	TISSUE CULTURE	409I	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1			X						
410B.1	MICROSCOPE ROOM	410B	SHARED EQUIPMENT ROOM	410	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	1E								LIGHT SEALS, LIGHT-PROOF WHITE FILM ON GLASS	
411.1	WET LAB	416	IMAGING / OPTICAL LAB	411	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1D			X					LIGHT SEALS, LIGHT-PROOF WHITE FILM ON GLASS	
411.2	WET LAB	409	IMAGING / OPTICAL LAB	411	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1D			X					LIGHT SEALS, LIGHT-PROOF WHITE FILM ON GLASS	
412B.1	INSTRUMENT RM	412A	SHARED EQUIPMENT ROOM	412	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	1A									
414.1	ELECTRICAL CLOSET	414	WET LAB	416	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2C									
415.1	WET LAB	416	DRY LAB	415	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	E1A			X						
416.2	WET LAB	416	CORRIDOR & INFORMAL STUDY	C4A	B	WD-SR	7' - 1 1/2"	4' - 8 1/2"	0' - 1 3/4"	HM	D	E2A			X						
416A.1	CYLINDER STORAGE	416A	WET LAB	416	F	HM	7' - 1 1/2"	**2' - 4"**	0' - 1 3/4"	HM	A	2									**2**
416B.1	WET LAB	416	TISSUE CULTURE	416B	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1			X						
416D.1	WET LAB	416	LAB SUPPORT	416D	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1A			X						
416E.1	WET LAB	416	CONFOCAL	416E	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1D			X					LIGHT SEALS, LIGHT-PROOF WHITE FILM ON GLASS	
416F.1	WET LAB	416	LAB SUPPORT	416F	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1			X						
416H.1	WET LAB	416	GLASS WASH	416H	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1			X						
416I.1	WET LAB	416	TISSUE CULTURE	416I	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1			X						
416J.1	CYLINDER STORAGE	416J	WET LAB	416	F	HM	7' - 1 1/2"	**2' - 4"**	0' - 1 3/4"	HM	A	**2E**									**2**
417.1	JANITOR	417	CORRIDOR & INFORMAL STUDY	C4A	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2B									
420.1	DATA CLOSET	420	CORRIDOR & INFORMAL STUDY	C4A	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	E1A			X						
421A.1	BUILDING STORAGE	421A	ELEV LOBBY	C4A	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	1A									
421B.1	MOTHERS' RM	421B	ELEV LOBBY	C4A	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	4A									
RR4A.1	ELEV LOBBY	C4A	WOMEN	RR4A	J	ST+G-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	10								OBSCURE WHITE INTERLAYER	
RR4B.1	ELEV LOBBY	C4A	MEN	RR4B	J	ST+G-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	10								OBSCURE WHITE INTERLAYER	
S4A.1	STAIR A	S4A	CORRIDOR & INFORMAL STUDY	C4A	D	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	E	3				2 HR					
S4B.1	WET LAB	416	STAIR B	S4B	D	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	E	E3			X	2 HR					
C5B.1	CORRIDOR	C5A	CORRIDOR	C5B	B	WD-SR	7' - 1 1/2"	4' - 8 1/2"	0' - 1 3/4"	HM	D	E2B			X						
503.1	CORRIDOR	C5B	TECH OFFICE / STORAGE	503	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	1									
504.1	CORRIDOR	C5B	PANTRY / WORKROOM	504	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	1									
505.1	MEETING/BREAKOUT SPACE	505	CORRIDOR	C5B	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	1D									
506.1	CORRIDOR	C5B	DRY LAB	506	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	E1A			X						
507.1	CORRIDOR	C5B	DRY LAB	507	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	E1A			X						
508.1	CORRIDOR	C5B	ELECTRICAL CLOSET	508	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2									
509.1	OPEN WET LAB	509	CORRIDOR	C5B	A	WD-SR	7' - 1 1/2"	4' - 8 1/2"	0' - 1 3/4"	HM	D	9									
509A.1	CYLINDER STO	509A	OPEN WET LAB	509	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	**2E**									**2**
509B.1	CYL STO	509B	OPEN WET LAB	509	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	**2E**									**2**
509C.1	OPEN WET LAB	509	NON-FLAMMABLE CHEMICAL STOR	509C	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1A			X						

Conformed Set - May 29, 2015

DOOR SCHEDULE

Door No.	From Room: Name	From Room: Number	To Room: Name	To Room: Number	DOOR					FRAME		Door Hardware	Door Head	Door Jamb	Card Reader	Door Label	Door Hold Open	Automatic Door Opener	Remote Latch Retraction	REMARKS	REVISION
					Door Type	Door Material	Height	Width	Thickness	Frame Material	Frame Type										
509D.1	CYLINDER STO	509D	OPEN WET LAB	509	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	**2E**									**2**
511.1	OPEN WET LAB	509	LAB SUPPORT	511	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1A			X						
511.2	OPEN WET LAB	517	LAB SUPPORT	511	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1A			X						
512.1	OPEN WET LAB	509	LAB SUPPORT	512	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1A			X						
512.2	OPEN WET LAB	517	LAB SUPPORT	512	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	E1A			X						
513A.1	SUPPORT	513A	SHARED EQUIPMENT RM	513	C	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	1A									
515.1	ELECTRICAL CLOSET	515	CORRIDOR / INFORMAL STUDY	C5C	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2C									
516.1	OPEN WET LAB	517	DRY LAB	516	E	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	G	E1A			X						
517.2	OPEN WET LAB	517	CORRIDOR & INFORMAL STUDY	C5A	B	WD-SR	7' - 1 1/2"	4' - 8 1/2"	0' - 1 3/4"	HM	D	E2A			X						
517A.1	CYLINDER STO	517A	OPEN WET LAB	517	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	**2E**									**2**
517B.1	OPEN WET LAB	517	NON-FLAMMABLE CHEMICAL STOR	517B	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	1A									
517C.1	CYLINDER STO	517C	OPEN WET LAB	517	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	**2E**									**2**
517D.1	LAB SUPPORT	517D	OPEN WET LAB	517	C	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	1									
517E.1	CYL STO	517E	OPEN WET LAB	517	C	WD-SR	7' - 1 1/2"	3' - 6"	0' - 1 3/4"	HM	A	**2E**									**2**
518.1	JANITOR	518	CORRIDOR & INFORMAL STUDY	C5A	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2B									
521.1	DATA CLOSET	521	CORRIDOR & INFORMAL STUDY	C5A	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	E1B			X						
522.1	BUILDING STORAGE	522	CORRIDOR & INFORMAL STUDY	C5A	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2E									
RR5A.1	ELEV LOBBY	C5A	WOMEN	RR5A	J	ST+G-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	10								OBSCURE WHITE INTERLAYER	
RR5B.1	ELEV LOBBY	C5A	MEN	RR5B	J	ST+G-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	10								OBSCURE WHITE INTERLAYER	
S5A.1	STAIR A	S5A	CORRIDOR & INFORMAL STUDY	C5A	D	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	E	3				2 HR					
S5A.2	STAIR A	S5A	STAIR A	S5A	H	ST+G-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	E3			X						1
S5B.1	CORRIDOR	C5C	STAIR B	S5B	D	WD-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	E	E3			X	2 HR					
S5B.2	STAIR B	S5B	STAIR B	S5B	H	ST+G-SR	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	E3			X						
E6C.1	MECHANICAL PENTHOUSE	PH1	ELEVATOR CONTROLLER RM	E6C	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2F				2 HR					
PH1.1	MECHANICAL PENTHOUSE	PH1	ROOF	n/a	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2G									
PH1.2	MECHANICAL PENTHOUSE	PH1	ROOF	n/a	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2G									
PH2.1	MECHANICAL ROOM	PH2	MECHANICAL PENTHOUSE	PH1	G	HM	7' - 1 1/2"	6' - 0"	0' - 1 3/4"	HM	B	6									
PH2.2	MECHANICAL ROOM	PH2	MECHANICAL PENTHOUSE	PH1	G	HM	7' - 1 1/2"	6' - 0"	0' - 1 3/4"	HM	B	6									
PH2.3	MECHANICAL ROOM	PH2	MECHANICAL PENTHOUSE	PH1	G	HM	7' - 1 1/2"	6' - 0"	0' - 1 3/4"	HM	B	6									
PH5.1	EQUIP	PH5	MECHANICAL PENTHOUSE	PH1	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2									
PH6.1	EQUIP	PH6	MECHANICAL PENTHOUSE	PH1	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2									
VPHA.1	MECHANICAL PENTHOUSE	PH1	VESTIBULE A	VPHA	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2G				2 HR					
VPHB.1	MECHANICAL PENTHOUSE	PH1	VESTIBULE B	VPHB	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	2G				2 HR					
S6A.1	VESTIBULE A	VPHA	STAIR A	S6A	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	E	E3			X	2 HR					
S6B.1	VESTIBULE B	VPHB	STAIR B	S6B	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	E	E3			X	2 HR					
S7A.1	STAIR A	S7A	ROOF	n/a	F	HM	7' - 1 1/2"	3' - 0"	0' - 1 3/4"	HM	A	E3A			X						

REVISIONS

ADD-01	20-Mar-15	1
ADD-06	**08-May-15**	**2**

Conformed Set - May 29, 2015

SECTION 081113

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the steel doors and frames work as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Interior and exterior hollow metal doors and frames for fire rated and unrated door openings.

2. True stile and rail steel doors at all locations as indicated on door schedule and on the drawings.

3. Trimmed openings.

4. Interior hollow metal vision panels.

5. Fully and partially glazed doors.

6. Preparation of metal doors and frames to receive finish hardware, including reinforcements, drilling and tapping necessary.

7. Preparation of hollow metal doors to receive glazing where required.

8. Furnishing anchors for building into masonry and drywall.

9. Factory prime painting of work of this Section.

10. Doors which are furnished by partition manufacturer will have a finish to match partition frames.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Unit Masonry - Section 042000.

E. Installation of doors and frames - Section 062000.

F. Wood Doors - Section 081416.

G. Finish hardware - Section 087100.

H. Glass and glazing - Section 088000.

I. Gypsum drywall - Section 092900.

J. Painting - Section 099000.

K. Partition system - Section 102219.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, compliance with standards referenced herein, sound and fire-resistance ratings, and finishes for each type of door and frame specified.

B. Shop Drawings: Show fabrication and installation of doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, reinforcement for surface applied hardware, dimensions of profiles and hardware preparation, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessories.

C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Drawings.

1. Coordinate glazing frames and stops with glass and glazing requirements.

D. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency acceptable to authorities having jurisdiction that each door and frame assembly has

been constructed to comply with design, materials, and construction equivalent to requirements for labeled construction.

E. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing custom steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain custom steel doors and frames through one source from a single manufacturer.

D. Fire-Rated Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.

1. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40" or less above the sill.

2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-protection-rated door assemblies except for size.

3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 250 deg. F. (or greater if required by Code) maximum in 30 minutes of fire exposure.

E. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

F. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

G. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and Project site storage. Do not use nonvented plastic.

B. Inspect doors and frames, on delivery, for damage. Minor damage may be repaired provided refinished items match new work and are approved by Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames under cover at building site. Conform to the requirements of ANSI A 250-11-2001 for site storage unless more stringent requirements are noted herein. Place units on minimum 4-inch high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

PART 2 PRODUCTS

2.1 FABRICATION - GENERAL

A. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Metallic filler to conceal manufacturing defects is not acceptable.

B. Unless otherwise indicated, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.

C. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with Finish Hardware Schedule and templates provided by hardware suppliers. Comply with applicable requirements of ANSI A115 "Specifications for Door and Frame Preparation for Hardware."

D. Locate finish hardware as shown on final shop drawings in accordance with locations noted herein.

2.2 MANUFACTURERS

A. Provide products manufactured by Steelcraft, Curries, Ceco Door Products, or approved equal meeting these specifications.

2.3 FRAMES

A. Materials

1. Frames for exterior openings and at interior locations as designated on the door schedule or on the drawings shall be made of commercial grade cold-rolled steel conforming to ASTM A 1008, Type B not less than 14 ga., and shall have a hot dipped galvannealed coating conforming to ASTM A 924 and A 653 with A60 coating. The zinc-alloy coating shall be a dull matte surface treated for paint adhesion.

2. Frames for interior openings shall be either commercial grade cold-rolled steel conforming to ASTM A 1008, Type B or commercial grade hot-rolled steel conforming to ASTM A 1011, Commercial Steel, Type B. Metal thickness shall be not less than sixteen (16) ga. for frames in openings 4'-0" or less in width; not less than fourteen (14) ga. for frames in openings over 4'-0" in width.

B. Design and Construction

1. All frames shall be welded units with integral trim, of the sizes and shapes shown on approved shop drawings. Knock-down frames are not permitted.

2. All finished work shall be strong and rigid, neat in appearance, square, true and free of defects, warp or buckle. Molded members shall be clean cut, straight and of uniform profile throughout their lengths.

3. Jamb depths, trim, profile and backbends shall be as shown on drawings.

   a. Frames shall be formed to shapes as shown on the architectural drawings.

4. Welded frames shall have corners mitered and reinforced and faces of welded frames shall be continuously back welded full depth and width of frame conforming to NAAMM Standard HMMA-820; face joints shall be inconspicuous.

5. Minimum depth of stops shall be 5/8".

6. Frames for multiple or special openings shall have mullion and/or rail members which are closed tubular shapes having no visible seams or joints. All joints between faces of abutting members shall be securely welded and finished smooth.

   a. Mullions shall have 16 ga. internal steel stiffeners welded not less than 4" o.c.
   b. Frames for multiple openings shall be sent to the site in single piece units.
   c. Where frames cannot be delivered in a single piece due to overall length, joints between the sections shall be welded inconspicuously and ground smooth with no visible joint.

7. Hardware Reinforcements

   a. Frames shall be mortised, reinforced, drilled and tapped at the factory for fully-templated mortised hardware only, in accordance with approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates.

   b. Minimum thickness of hardware reinforcing plates shall be as follows:
      1). Hinge and pivot reinforcements - seven (7) ga., 1-1/4" x 10" minimum size.
      2). Strike reinforcements - twelve (12) gauge
      3). Flush bolt reinforcements - twelve (12) gauge
      4). Closer reinforcements - twelve (12) gauge
      5). Reinforcements for surface mounted hardware - twelve (12) gauge.

8. Floor Anchors

   a. Provide adjustable floor anchors, providing not less than two (2) inch height adjustment.

b. Minimum thickness of floor anchors shall be fourteen (14) gauge.

9. Jamb Anchors

   a. Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the wire type. Anchors shall be not less than 0.156" diameter steel wire. The number of anchors provided on each jamb shall be as follows:
      1). Frames up to 7'-6" height - three (3) anchors.
      2). Frames 7'-6" to 8'-0" height - four (4) anchors.
      3). Frames over 8'-0" height - one (1) anchor for each 2'-0" or fraction thereof in height.
   b. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, not less than eighteen (18) gauge thickness, securely welded inside each jamb as follows:
      1). Frames up to 7'-6" height - four (4) anchors.
      2). Frames 7'-6" to 8'-0" height - five (5) anchors.
      3). Frames over 8'-0" height - five (5) anchors plus one additional for each 2'-0" or fraction thereof over 8'-0".
   c. Frames to be anchored to previously placed concrete or masonry shall be provided with minimum 3/8" concealed bolts set into expansion shields or inserts at six (6) inches from top and bottom and twenty-four (24) inches o.c. Reinforce frames at anchor locations with sixteen (16) gauge sheet steel stiffeners welded to frame at each anchor.

10. Anchors in exterior frames and in masonry walls shall be hot dip galvanized per ASTM A 153.

11. Frames for installation in masonry wall openings more than 4'-0" in width shall have an angle or channel stiffener factory welded into the head. Such stiffeners shall be not less than twelve (12) gauge steel and not longer than the opening width, and shall not be used as lintels or load bearing members.

12. Dust cover boxes (or mortar guards) of not thinner than twenty-six (26) gauge steel shall be provided at all hardware mortises on frames to be set in masonry or plaster partitions.

13. Ceiling Struts: Minimum 3/8" thick x 2" wide steel.

14. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling.

15. Loose glazing stops shall be of cold rolled steel, not less than twenty (20) gauge thickness, butted at corner joints and secured to the frame with countersunk cadmium-or zinc-plated screws. Interior frames may be provided with snap-on glazing stops.

16. Except on weatherstripped frames, drill stops to receive three (3) silencers on strike jambs of single door frames and two (2) silencers on heads of double-door frames.

C. Finish: After fabrication, all tool marks and surface imperfections shall be removed, and exposed faces of all welded joints shall be dressed smooth. Frames shall then be chemically treated to insure maximum paint adhesion and shall be coated on all surfaces with one coat of rust-inhibitive baked-on alkyd primer standard with the manufacturer which is fully cured before shipment to a dry film thickness of 2.0 mils.

1. Frames set in masonry walls shall be grouted in as described in Section 042000, "Unit Masonry." These frames shall have surfaces in contact with grout shop coated with epoxy coating equal to Series 27 FC Typoxy made by Tnemec or approved equal spray applied at 4 to 6 mils, passing NFPA 101, Class A for smoke and flame spread, tested per ASTM E 84.

2.4 HOLLOW METAL DOORS

A. Materials: Doors shall be made of commercial quality, level, cold rolled steel conforming to ASTM A 1008, Commercial Steel, Type B and free of scale, pitting or other surface defects. Face sheets for interior doors shall be not less than eighteen (18) gauge. Face sheets for exterior doors, and for interior doors where indicated on the door schedule or on the drawings, shall be not less than sixteen (16) gauge and shall have a hot dipped galvannealed coating conforming to ASTM A 924 and ASTM A 653, A60 coating. The zinc alloy coating shall be a dull matte surface treated for paint adhesion. Doors to be installed into partition walls will be finished to match partition frames by the manufacturer.

B. Design and Construction

1. All doors shall be of the types and sizes shown on the approved shop drawings, and shall be fully welded seamless construction with no visible seams or joints on their faces or vertical edges. Minimum door thickness shall be 1-3/4".

2. All doors shall be strong, rigid and neat in appearance, free from warpage or buckles. Corner bends shall be true and straight and of minimum radius for the gauge of metal used.

3. Face sheets shall be stiffened by continuous vertical formed steel sections spanning the full thickness of the interior space between door faces. These stiffeners shall be not less than twenty two (22) gauge spaced not more than six (6) inches apart and securely attached to face sheets by spot welds not more than five (5) inches o.c. Spaces between stiffeners shall be sound deadened and thermal insulated the full height of the door with an inorganic non-combustible batt type material.

4. Door faces shall be joined at their vertical edges by a continuous weld extending the full height of the door. All such welds shall be ground, filled and dressed smooth to make them invisible and provide a smooth flush surface.

5. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not less than fourteen (14) gauge, extending the full width of the door and spot welded to both faces. Exterior doors shall have an additional flush closing channel at their top edges and, where required for attachment of weatherstripping, a flush closure also at their bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.

6. Edge profiles shall be provided on both vertical edges of doors as follows:

   a. Single-acting swing doors - beveled 1/8" in two (2) inches.
   b. Double acting swing doors - rounded on 2-1/8" radius.
   c. No square edge doors permitted.

7. Hardware Reinforcements

   a. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only in accord with the approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware (or hardware, the interrelation of which is to be adjusted upon installation - such as top and bottom pivots, floor closers, etc.) is to be applied, doors shall have reinforcing plates.
   b. Minimum gauges for hardware reinforcing plates shall be as follows:
      1). Hinge and pivot reinforcement - seven (7) gauge.
      2). Reinforcement for lock face, flush bolts, concealed holders, concealed or surface mounted closers - twelve (12) gauge.
      3). Reinforcements for all other surface mounted hardware - sixteen (16) gauge.

8. Glass Moldings and Stops

   a. Where specified or scheduled, doors shall be provided with hollow metal moldings to secure glazing by others in accordance with glass opening sizes shown on drawings. Single rabbeted frames shall have integral stops.
   b. Fixed moldings shall be securely welded to the door on the security side.
   c. Loose stops shall be not less than twenty (20) gauge steel, with mitered corner joints, secured to the framed opening by cadmium or zinc-coated countersunk screws spaced eight (8) inches o.c. Snap-on attachments will not be permitted. Stops shall be flush with face of door.

C. Finish: After fabrication, all tool marks and surface imperfections shall be dressed, filled and sanded as required to make all faces and vertical edges smooth, level and free of all irregularities. Doors shall then be chemically treated to insure maximum paint adhesion and shall be coated, on all exposed surfaces, with manufacturer's standard rust-inhibitive alkyd primer as specified for frames which shall be fully cured before shipment.

   1. Steel doors and frames will be finished with a 3-coat paint finish system, ScuffMaster Coatings. See Painting Schedule for additional information.

D. Flatness: Doors shall maintain a flatness tolerance of 1/16" maximum, in any direction, including in a diagonal direction.

2.5 LABELED DOORS AND FRAMES

A. Labeled doors and frames shall be provided for those openings requiring fire protection ratings as scheduled on drawings. Such doors and frames shall be labeled by Underwriters' Laboratories or other nationally recognized agency having a factory inspection service.

B. If any door or frame specified by the Architect to be fire-rated cannot qualify for appropriate labeling because of its design, size, hardware or any other reason, the Architect shall be so advised before fabricating work on that item is started.

2.6 TRUE STILE AND RAIL STEEL DOORS

A. The Steel Doors are based on Stiles Custom Metal, Inc. Model: True Stile and Rail; Ceco, or approved equal.

B. Construction

1. Doors and frames shall be prepared to receive 3-coat paint system with compatible prefinishing. Refer to Section 099000.

2. Stile and Rail doors shall be unitized, true tube type construction with joints continuously welded and ground smooth.

3. Door Core: Polystyrene, rigid, extruded, closed cell board, 1 pound per cubic foot density min., conforming to ASTM C 578, Type 1 shall fill void in stile and rails. Core shall be laminated to the inside of the door skins with contact adhesive achieving 100% bond.

4. Vertical Edges: Door face sheets shall be joined at center of vertical edges and continuously welded full height of the door with no visible seams on their faces or vertical edges. Welds shall be finished smooth. Single acting doors - beveled 1/8" in 2" profile. Double acting doors - rounded on 2-1/8" radius. All hardware furnished by the hardware contractor for single acting doors shall be designed for beveled edges as specified herein.

5. Integral Astragal: Where required astragals shall be formed as an integral part of the doors skin with corresponding recessed area formed into adjacent door. Surface mounted flat plate or "Z" shaped astragals shall not be accepted.

6. Door thickness shall be 1-3/4". Doors shall be neat in appearance and free from warp or buckle. Edge bends shall be true and straight and of minimum radius for the gauge of metal used.

7. Materials: Doors shall be made of commercial quality, cold-rolled steel per ASTM A 1008. Stile and rails shall be 0.053" (16 gauge) min. thickness with zinc coating A60 at exterior, and at interior locations as designated in the door schedule or on the drawings.

8. The top and bottom edges shall be closed with a continuous channel, 16 gauge minimum, spot welded to both face sheets maximum 4" o.c. Top of exterior doors shall be fitted with an additional flush closing channel and sealed water-tight.

9. Door opening tag number shall be permanently engraved into the center hinge reinforcement using a programmable engraver. The engraving shall be deep enough to be read after the hinge reinforcement bar is painted. The use of paper stickers only is not acceptable.

10. Glass Moldings and Stops: Where specified, fixed molding stop shall be a formed integral of the door skin to secure glazing in accordance with glass sizes and thickness shown on approved submittal drawings. Removable glass channel stops shall be butted at corner joints, secured to the door with concealed, #8, sheet metal screws. Exposed fasteners shall not be accepted. Door lights that are cut out of the door after the door is built are not acceptable. Externally mounted lite kits that protrude from the door face are not acceptable.

11. Finish: After fabrication, all tool marks and surface imperfections shall be removed, and exposed faces of all welded joints shall be dressed smooth.

2.7 HARDWARE LOCATIONS

A. The location of hardware on doors and frames shall be as noted in "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames" of the Door Hardware Institute unless otherwise required by prevailing Handicapped Codes.

2.8 CLEARANCES

A. Fabricate doors and frames to meet edge clearances as follows:

1. Jambs and Head: 1/8" plus or minus 1/16".

2. Meeting Edges, Pairs of Doors: 1/8" plus or minus 1/16".

3. Bottom: 1/4"; or 1/8" at threshold.

B. Fire rated doors shall have clearances no greater than required by NFPA 80.

2.9 MANUFACTURING TOLERANCES

A. Manufacturing tolerance shall be maintained within the following limits:

1. Frames for Single Door or Pair of Doors

a. Width, Measured Between Rabbets at the Head
   1). Nominal opening width +1/16", -1/32"
b. Height (total length of jamb rabbet):
   1). Nominal opening height + 3/64"
c. Cross Sectional Profile Dimensions
   1). Face: + 1/32"
   2). Stop: + 1/32"

3). Rabbet: + 1/64"
4). Depth: + 1/32"
5). Throat: + 1/16". Frames overlapping walls to have throat dimension 1/8" greater than dimensioned wall thickness to accommodate irregularities in wall construction.

2. Doors

a. Width: + 3/64"
b. Height: + 3/64"
c. Thickness: + 1/16"
d. Hardware Cutout Dimensions
1). Template dimensions +0.015", -0"
e. Hardware Location: + 1/32"

2.10 PREPARATION FOR FINISH HARDWARE

A. Prepare door and frames to receive hardware:

1. Hardware supplier shall furnish hollow metal manufacturer approved hardware schedule, hardware templates, and samples of physical hardware where necessary to insure correct fitting and installation.

2. Preparation includes sinkages and cut-outs for mortise and concealed hardware.

B. Provide reinforcements for both concealed and surface applied hardware:

1. Drill and tap mortise reinforcements at factory, using templates.

2. Install reinforcements with concealed connections designed to develop full strength of reinforcements.

2.11 REJECTION

A. Hollow metal frames or doors which are defective, have hardware cutouts of improper size or location, or which prevent proper installation of doors, hardware or work of other trades, shall be removed and replaced with new at no cost.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where steel doors and frames are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Refer to Section 062000 for installation procedures for all work of this Section.

END OF SECTION

SECTION 081119

STAINLESS STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the stainless steel door and frame work as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Stainless steel doors and frames.

2. Preparation of doors and frames to receive finish hardware.

3. Furnishing anchors.

4. Installation of doors and frames.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Concrete Work – Section 033000.

E. Unit Masonry – Section 042000.

F. Steel Doors and Frames – Section 081113.

G. Glazed aluminum curtain walls – Section 084413.

H. Finish Hardware – Section 087100.

I. Glass and glazing – Section 088000.

1.5 QUALITY ASSURANCE

A. Codes and Standards: In addition to complying with all pertinent codes and regulations:

1. Shop drawings, shall comply with nomenclature established in American National Standards Institute publication A123.1, latest edition, "Nomenclature for Steel Doors and Steel Door Frames."

a. ANSI A115 "Door and Frame Preparation for Door Locks and Flush Bolts," American National Standards Institute.
b. ANSI A123.1 "Nomenclature for Steel Doors and Steel Door Frames," American National Standards Institute.
c. Steel doors and frames shall comply with the Specifications for Custom Hollow Metal Doors and Frames, National Association of Architectural Metal Manufacturers (NAAMM) Standard CHM 174.
d. Builders' Hardware Manufacturers Association.

B. All stainless steel shall conform to ASTM A 666, Type 316.

C. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Shop Drawings

1. Shop drawings shall indicate at large scale, profiles, gauges, sizes and reinforcing and anchorage devices, for securing to adjacent construction.

a. Indicate glazing frames and stops for coordination with "Glass and Glazing" section.

2. Shop drawings shall include schedules, listing the qualities of each kind and type of buck, frame, trim and door, size of doors and frames, clearances, undercuts, location and label requirements.

a. Schedule of doors and frames shall use same reference numbers for details and openings as those on the Contract Documents.

B. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Provide material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING

A. Deliver doors and frames and other work of this Section properly tagged and identified.

B. Protection

1. Deliver, store and handle all metal doors and frames in a manner to prevent damage and deterioration.

2. Provide packaging, separators, banding, spreaders, and individual wrappings as required to completely protect all metal doors and frames during transportation and storage.

3. Store doors upright, in a protected dry area, at least one (1) inch off the ground and with at least 1/4" air space between individual pieces; protect all surfaces as required.

PART 2 PRODUCTS

2.1 FABRICATION - GENERAL

A. Stainless steel doors and frames shall be rigid, neat in appearance and free from defects, warp, or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously, grind, dress, and make smooth, flush, and invisible.

B. Unless otherwise indicated, provide countersunk flat stainless steel Phillips or Jackson heads for exposed screws and bolts.

C. Prepare stainless steel doors and frames to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with final Finish Hardware Schedule and templates provided by hardware suppliers. Comply with applicable requirements of ANSI A115 "Specifications for Door and Frame Preparation for Hardware."

D. Locate finish hardware as shown on final shop drawings in accordance with locations noted herein.

2.2 MANUFACTURERS

A. Provide products manufactured by Next Door Company, Karpen Steel Custom Doors & Frames, or approved equal meeting these specifications.

2.3 STAINLESS STEEL FRAMES

A. Materials: Frames shall be stainless steel conforming to ASTM A 666, Type 316. Metal thickness shall be not less than sixteen (16) gauge for openings 4'-0" or less in width; not less than fourteen (14) gauge for frames in openings over 4'-0" in width.

B. Design and Construction

1. All frames shall be custom made welded units with integral trim, of the sizes and shapes shown on approved shop drawings.

2. Molded members shall be clean cut, straight and of uniform profile throughout their lengths.

3. Jamb depths, trim, profile and backbends shall be as shown on drawings.

4. Corner joints shall have all contact edges closed tight, with trim faces mitered and continuously welded, and stops mitered. The use of gussets will not be permitted.

5. Minimum depth of stops shall be 5/8" with acoustic seals and gaskets.

6. Hardware Reinforcements: Frames shall be mortised, reinforced, drilled and tapped at the factory for fully templated mortised hardware only, in accord with approved finish hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware is to be applied, frames shall have stainless steel reinforcing plates as follows:

   a. Hinges: Seven (7) gauge, 1-1/4" x 10" minimum size.
   b. Strikes: Twelve (12) gauge.
   c. Closers: Twelve (12) gauge.
   d. Surface Mounted Hardware: Twelve (12) gauge.

7. Floor Anchors

   a. Floor anchors shall be securely welded inside each jamb for floor anchorage.
   b. Where required, provide adjustable floor anchors, providing not less than two (2) inch height adjustment.
   c. Minimum thickness of floor anchors shall be fourteen (14) gauge stainless steel.

8. Jamb Anchors

   a. Frames for installation in masonry walls shall have three (3) anchors adjustable jamb anchors of the T-strap or stirrup and strap type. Anchors shall be not less than sixteen (16) gauge stainless steel or 0.156" diameter stainless steel wire. Stirrup straps shall be not less than 2" x 10" in size, corrugated and/or perforated stainless steel.
   b. Frames for installation in stud partitions shall have four (4) stainless steel anchors of suitable design, not less than eighteen (18) gauge thickness, securely welded inside each jamb.

9. Dust cover boxes (or mortar guards) of not thinner than twenty-six (26) gauge stainless steel shall be provided at all hardware mortises on frames to be set in masonry partitions.

10. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling.

11. Removable glazing stops shall be of stainless steel, not less than twenty (20) gauge thickness, butted at corner joints and secured to the frame with countersunk stainless steel screws.

12. Frames shall be packed with unfaced acoustic insulation equal to "Acoustic Thermafiber," 3 lb. density, made by U.S. Gypsum Co. or approved equal.

C. Finish: No. 6 finish; long grain vertical pattern.

2.4 STAINLESS STEEL DOORS

A. Materials: Doors shall be made of commercial quality, level, rolled stainless steel conforming to ASTM A 666, Type 316, and free of scale, pitting or other surface defects. Face sheets for doors shall be not less than eighteen (18) gauge.

B. Design and Construction

1. All doors shall be custom made, of the types and sizes shown on the approved shop drawings, and shall be fully welded seamless construction with no visible seams or joints on their faces or vertical edges. Minimum door thickness shall be 1-3/4".

2. All doors shall be strong, rigid and neat in appearance, free from warpage or buckles. Corner bends shall be true and straight and of minimum radius for the gauge of metal used.

3. Face sheets shall be stiffened by continuous vertical formed stainless steel sections spanning the full thickness of the interior space between door faces. These stiffeners shall be not less than twenty-two (22) gauge spaced not more than six (6) inches apart and securely attached to face sheets by spot welds not more than five (5) inches o.c. Spaces between stiffeners shall be sound-deadened the full height of the door with an inorganic non-combustible batt type acoustic insulation material.

4. Door faces shall be joined at their vertical edges by a continuous weld extending the full height of the door. All such welds shall be ground, filled and dressed smooth to make them invisible and provide a smooth flush surface.

5. Top and bottom edges of all doors shall be closed with a continuous recessed stainless steel channel not less than sixteen (16) gauge, extending the full width of the door and spot welded to both faces. Exterior doors shall have an additional flush closing channel at their top edges and a flush closure at bottom for attachment of weatherstripping. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.

6. Edge profiles shall be beveled 1/8" in two (2) inches.

7. Hardware Reinforcements

a. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only in accordance with the approved finish hardware schedule and templates provided by the hardware supplier.

b. Steel doors shall have the following minimum gauge reinforcing plates:

1). Hinges: Seven (7) gauge.

2). Lock Faces and Closers: Twelve (12) gauge.

3). Surface Mounted Hardware: Sixteen (16) gauge, unless otherwise indicated.

C. Finish: As specified for frames.

D. Flatness: Doors shall maintain a flatness tolerance of 1/16" maximum, in every direction.

E. Louvers, where indicated, shall be fabricated of 0.050" stainless steel sheet (ASTM A 240, Type 316), stationary type, closely spaced inverted "V" blade design, flush with face sheets of door, integral with and welded to door. Fifty (50) percent free area, unless indicated otherwise on drawings.

2.5 HARDWARE LOCATIONS

A. The location of finish hardware items, specified in "Finish Hardware" section shall be as indicated in "Recommended Locations for Builders Hardware" as published by the Door and Hardware Institute, unless otherwise indicated.

2.6 CLEARANCES

A. Edge clearances shall be provided as follows, unless otherwise indicated:

1. Heads and Jambs: 1/8".

2. Door Sills (where no threshold is used): 1/4" maximum above finished floor.

3. Door Sills (where threshold is used): 3/4" maximum above finished floor.

B. Finished floor is defined as the top surface of the floor.

2.7 PREPARATION FOR FINISH HARDWARE

A. Finish hardware supplier shall furnish hollow metal manufacturer approved hardware schedule, hardware templates, and samples of physical hardware where necessary to insure correct fitting and installation.

B. Preparation includes sinkages and cut-outs for mortise and concealed hardware.

C. Provide reinforcements for both concealed and surface applied hardware.

1. Drill and tap mortise reinforcements at factory, using templates.

2. Install reinforcements with concealed connections designed to develop full strength of reinforcements.

PART 3 EXECUTION

3.1 FRAME INSTALLATION

A. Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames."

B. Where possible, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

C. In stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In closed steel stud partitions, attach wall anchors to studs with tapping screws.

3.2 DOOR INSTALLATION

A. Fit hollow metal doors accurately in frames, within clearances specified herein.

B. Inspect work after installation and repair damaged items equal to new work, or remove and replace damaged items.

END OF SECTION

SECTION 081433

STILE AND RAIL WOOD DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the wood doors as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Interior stile and rail wood doors.

2. Fire-rated stile and rail wood doors.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Installation of wood doors - Section 062000.

E. Architectural Woodwork - Section 064023.

F. Finish Hardware - Section 087100.

G. Glass and Glazing - Section 088000.

1.5 SUBMITTALS

A. Product Data: Submit door manufacturer's product data, specifications and installation instructions for each type of wood door.

1. Include details of core and edge construction and trim for openings.

2. Include factory finish specifications.

3. Include certifications to show compliance with specifications.

4. Include certification to show compliance with WDMA TM-7 test for 1 million slams.

B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, requirements for finishing and other pertinent data.

1. Include requirements for veneer matching.

C. Samples: Corner sections of stile and rail doors, approximately 8 by 10 inches, with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required.

D. Submit: Factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

E. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify that no added urea formaldehyde is present in any composite wood materials, agrifiber material, or adhesive.

4. Documentation for all new wood products, including FSC Certified. Provide vendor invoices for all permanently installed wood products, FSC Certified or not.

Each wood product must be identified on a line-item basis. FSC products must be identified as such on a line item basis. The dollar value of each line item must be shown. The vendor's Chain-of-Custody certificate number must be shown on any invoice that includes FSC products.

5. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

6. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated"; latest edition "Premium" grade.

1. Only manufacturers that are certified and listed by AWI to be QCP qualified are acceptable for this project.

2. Provide letter of licensing for Project indicating that doors comply with requirements of grade specified.

C. Fire Rated Wood Doors: Doors complying with Category A, Positive Pressure or Neutral Pressure testing standards per UBC 7-2-1997 and UL 10-C (UBC 7-2-1994 and UL 10B) that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated on Door Schedule, based on testing according to NFPA 252.

1. Conform to prevailing Code requirements to determine which pressure standard (Positive or Neutral) is required.

D. LEED Building Performance Requirements

1. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

2. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

3. Engineered wood, not including salvaged wood, shall contain a minimum of 10% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification

of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, medium density fiberboard) to be permanently installed on the interior of project shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI). Certification of these products shall be in accordance with the LEED Building Submittal Requirements of this Section.

5. Adhesives used for work in this section, including plastic laminating adhesives, shall contain no added Urea Formaldehyde.

6. Wood Materials manufactured, fabricated, and/or harvested within 500 miles (by air) of the project site shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

7. Solid wood materials shall be FSC-certified by the Forest Stewardship Council as sustainably harvested. Documentation of FSC certification shall be in accordance with the LEED Building Submittal requirements of this Section.

8. Adhesives, sealants, paints and coatings used for work in this section shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable. VOC Limits include, but are not limited to the following:

Clear Wood Varnish	350 g/l
Clear Wood Lacquer	550 g/
Wood Stains	250 g/l
Sanding Sealers	275 g/l
Clear Shellac	730 g/l
Pigmented Shellac	550 g/l

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) in excess of permitted standard noted in Article 2.2 herein, or show telegraphing of core construction in face veneers.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

2. Warranty shall be in effect for five years, commencing from date of Substantial Completion:

PART 2 PRODUCTS

2.1 STILE AND RAIL WOOD DOORS

A. Provide custom stile and rail wood doors conforming to AWI "Premium" grade standards as manufactured by Harring Doors, The Maiman Co., Eggers Hardwood Products Corp, or an approved equal acceptable to the Architect.

B. Interior Non-Rated Doors

1. Stiles and rails shall be constructed of LSL core material laminated with a minimum ¾" solid hardwood edge and a minimum 1/16" 'A' grade veneer.

2. Cope and stick joinery of stiles and rails using ½" x 4" dowels.

3. Pressure fit joints using Type 2 water-resistant glue.

4. Panels shall be manufactured using a 5-ply construction with 1/16" cross banded face veneer.

5. Raised panels shall have a minimum thickness of 1-1/8".

6. Panel raise shall be constructed of solid lumber (matching face veneer) and rim banded with mitered corners.

C. Wood Species: Select grade, veneer and solid stock for doors to receive transparent finish.

1. Veneers shall match the veneer to be used on all other veneered panels, flush wood doors, casework and miscellaneous cabinetry used in the Project.

2. Veneers shall be supplied for door manufacturer's use from the Architectural Woodwork contractor, in the thickness required by the door manufacturer.

a. Veneers for stiles and rails to be VTEC Quartered Teak, 1.5mm thick material No. 32230-FSC-NF-1.5 (M. Bohlke Veneer Corp.).
b. Veneers for inset panels to be VTEC Quartered Teak, 1.5mm thick material No. 32230-FSC-NF-1.5 (M. Bohlke Veneer Corp.).

3. Veneer shall come from the same flitch used on other veneered finishes in the area where the doors are located, and match in color, grain, and finish.

D. Glazing: Where glazing is indicated, provide ½" thick tempered glass meeting requirements of Section 088000.

E. Transparent Finish: Finish in the shop with clear satin catalyzed lacquer finish conforming to AWI System TR-6, Premium grade. Finish system for doors shall match the finish system indicated for wood casework as specified in Section 064023, "Architectural Woodwork." Finishing must be per veneer supplier's approved methods.

F. Fire-Rated Stile and Rail Wood Doors: Provide 90-minute fire-rated wood doors conforming to AWI "Premium" grade standards, 1-3/4" thick, edged and veneered non-combustible core stiles and rails complying with requirements indicated for interior doors, as manufactured by Harring Doors, The Maiman Company, Eggers Hardwood Products Corp.or an approved equal acceptable to the Architect.

1. Core: For rating indicated.

2. Refer to the drawings for sticking and panel profiles.

3. Install in Fire-Rated Framing System per spec 088813.

4. Construction shall conform to the following:

a. Interior core material to be constructed of 2 pieces of 48 pound density MDF laminated with PVC adhesive or 1/8" MDF over LVL.
b. Stiles are to be constructed for improved screw holding by use of hardwood wedge or edge to extend the entire height of door.

2.2 FABRICATION

A. Prefit and premachine wood doors at the factory.

B. Comply with the tolerance requirements specified herein. Machine doors for hardware requiring cutting of doors. Comply with final hardware scheduled and door frame shop drawings, and with hardware templates and other essential information required to ensure proper fit of doors and hardware.

C. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in the factory.

D. Doors shall be factory sized to door opening so that trimming and fitting are not required in the field.

E. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances unless otherwise indicated.

1. Three degree bevel or bevel to suit frame sizes indicated, with 3/16" prefit in width, +0/-1/32" tolerances. Prefit top of door 1/8" + 1/16"/-0" and undercut as required by floor condition. Undercut shall not exceed 3/8" from bottom of door to top of finished floor; where threshold occurs undercut shall not exceed 3/8" from bottom of door to top of threshold.

2. Comply with requirements in NFPA 80 for fire-rated doors.

F. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3 unless otherwise noted. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2. Prepare doors as required by the hardware specifications for recessed closers, electric hinges, electric mortised locks with concealed wire channels, and concealed vertical rods.

G. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kinds of doors required.

2.3 SOURCE QUALITY CONTROL

A. Once installed, maximum allowable warp, bow, cut or twist in doors shall be 1/16" as measured by the 1/16 inch feeler gauge and a straight-edge extending from corner to corner of the door face at stiles, top and bottom rails and along both diagonals.

PART 3 EXECUTION

3.1 INSTALLATION

A. Refer to Section 062000 for installation of wood doors.

END OF SECTION

SECTION 083113

ACCESS DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the access doors as indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Framed flush panel access doors at masonry and tile walls.

2. GFRG access panels at drywall ceilings.

3. Provide access doors and frames for access from occupied spaces to the following, where indicated on the architectural drawings. (Review locations of access doors required by mechanical and electrical trades with the Architect prior to installation.)

a. All shutoff or balancing valves.
b. Fire dampers, as required.
c. Points of duct access.
d. Pull boxes.
e. Controls of mechanical and electrical items.
f. Masonry shafts for pipes and conduits, as required.
g. Pipe spaces, if required.

h. Inlets of fans.
i. Fusible link and splitter damper at filter bank.
j. Automatic damper and motor.
k. Equipment not otherwise accessible.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Masonry - Section 042000.

E. Drywall - Section 092900.

F. Tile - Section 093000.

G. Valves and connections - Division 22.

1.5 QUALITY ASSURANCE

A. For actual installation of the work of this Section, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the skills required.

B. Fire-Resistance Ratings: Wherever a fire-resistance classification is shown, or for construction where access doors are installed, provide required access door assembly with panel door, frame, hinge and latch from manufacturers listed in Underwriters' Laboratories, Inc. "Classified Building Materials Index" for the rating shown.

1. Provide UL label on each access panel.

2. Provide flush, key operated cylinder lock.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes shown or scheduled.

D. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Before any materials of this Section are delivered to the job site, submit complete manufacturer's literature to the Architect. Submit plans and schedules showing size and location of each and every access door for Architect's acceptance prior to installation.

B. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 GFRG ACCESS PANELS

A. For use in drywall ceilings, provide access panels made from glass fiber reinforced gypsum (GFRG) as manufactured by Castle Access Panels and Forms Inc., or equivalent product of Wind-Lock, Formglas, IntexForms, or approved equal.

1. Provide access panels architecturally designed to blend seamlessly with drywall ceiling and wall construction. Coordinate work with Section 092900, "Gypsum Drywall."

2. Panels shall be Class A rated, with a flame spread and smoke developed index of 0 in accordance with ASTM E 84.

2.2 METAL ACCESS PANELS

A. Provide access door assembly manufactured by Milcor Inc, or equal made by Nystrom Inc., Karp Associates, Inc. or approved equal. Assembly shall be an integral unit complete with all parts and ready for installation.

B. Fabricate units of continuous welded steel construction. Grind welds smooth and flush with adjacent surfaces. Provide attachment devices and fasteners of the type required to secure access panels to the types of supports shown.

C. Frames for Masonry and Tile Wall Only (Flush Panel Units)

1. Fabricate frame from sixteen (16) gauge steel. Provide frame with exposed flange not less than one (1) inch wide around perimeter of frame for the following construction:

a. Exposed masonry.
b. Tile finish.

2. For installation in masonry construction, provide frames with adjustable metal masonry anchors.

D. Frameless Units for Drywall Surfaces (Recessed Panel Units): Provide access doors without exposed frames for drywall adhered to recessed panel.

E. Panels: Fabricate from fourteen (14) gauge steel, with concealed spring hinges set to open to 175 degrees. Provide removable pin type hinges of the quantity required to support the access panel sizes used in the work. Finish with manufacturer's factory applied baked enamel prime coat applied over phosphate protective coating on steel.

2.3 ACCESSORIES

A. Locking Devices

1. For non-rated access doors, provide flush, screwdriver operated cam locks of number required to hold door in flush, smooth plane when closed.

2. For fire rated doors, provide locks as described in paragraph 1.4, B. herein.

B. Inserts and Anchorage: Furnish inserts and anchoring devices which must be built into masonry for the installation of access panels. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where access doors are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 COORDINATION

A. Coordinate all work with the mechanical trades to insure proper locations and in a timely manner to permit orderly progress of the total work.

B. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

C. Adjust hardware and panels after installation for proper operation.

D. Remove and replace panels or frames which are warped, bowed, or otherwise damaged.

END OF SECTION

DIVISION 08 44 13

CURTAIN WALLS, STOREFRONTS AND ENTRANCES (CWSE)

PART 1 GENERAL

1.01 CONTRACT DOCUMENTS, MEASUREMENTS AND SUBSTITUTIONS

A. Contract Documents

1. All work of this Section shall comply with the requirements of the Main Contract, including General Conditions, Special Conditions, applicable provisions of Division 1 Sections, with the Drawings, and with all other Contract Documents.

B. Substitutions

1. The term "or approved equal" shall be deemed to have been inserted after all standards, references, products, materials, and equipment referred to in the Specification or on the Drawings for work of this Section.

C. Existing Conditions

1. Prior to submission of bids, the CWSE Contractor for the work of this Section shall be held to have visited the site, examined the premises, and determined the state of the existing conditions and the required equipment and facilities for the performance of the work, and all matters which may in any way affect the work.

2. Information regarding existing construction or conditions is based on available record drawings which may or may not truly reflect the existing conditions. The CWSE Contractor Sfor the work of this Section shall be responsible for verifying all conditions.

3. The CWSE Contractor shall accept the condition of the site and structures as found. The Architect and the Owner assume no responsibility for the condition of the site or structures nor the continuation of the condition existing at the time of bidding or thereafter.

D. Discrepancies

1. Should any discrepancy or divergence occur in or between any of the Contract Documents as to the precise extent or nature of the work to be carried out by the CWSE Contractor, he shall immediately give notice to the Architect and Owner so that an Architect's direction or instruction may be given as to the work in fact required of the CWSE Contractor.

1.02 WORK INCLUDED

A. General

1. The CWSE Contractor shall design, engineer, test, fabricate, deliver, install, and guarantee all construction necessary to provide for the Curtain Walls, Storefronts, and Entrances (CWSE) shall for the complete airtight and watertight enclosure of the building. CWSE

shall be complete in every respect, including all measures that may be required to that end, notwithstanding any omissions or inadequacies of Drawings and/or Specifications.

2. The CWSE shall incorporate a pressure-equalized dual-sealed system throughout, including all perimeter conditions and connections to adjacent construction.

3. The CWSE shall incorporate a continuous vapor barrier system throughout, including all perimeter conditions and connections to adjacent construction.

B. The Work of this Section shall include, but is not limited to the following:

1. WT-1: Aluminum and Glass Unitized Curtain Wall System:

System consists of insulating glass units with low iron outer and inner lites, high performance low-e coating on no. 2 surface and standard pattern ceramic frit where indicated [GL-1 and GL-2]. Glass units are two-side structural silicone glazed into unitized thermally broken frames of standard profile extruded aluminum at vertical joints. Glass units are captured at horizontal joints. Units are anchored at floor slabs and additionally braced for wind at under slab steel kickers.

Where indicated on Architectural Drawings, system incorporates

- Projecting spandrel elements with integral framing
- Painted aluminum panels with formed edges and stiffeners as required
- Extruded aluminum exterior caps
- Steel reinforcing as required for structural performance
- Spandrel glass [GL-1] areas with custom color painted aluminum shadowbox and integral foil faced insulation
- Vertical decorative Dichroic Glass [GL-3] fins including support brackets
- Extruded aluminum sunshades including support brackets
- Extruded aluminum interior sill covers, reinforced as required
- Aluminum soffit and coping assemblies

Finish of all aluminum exposed to the exterior shall be two-coat mica custom color PVDF (70% Kynar). Finish of all aluminum exposed to the interior shall be custom color high performance one coat thermal- set acrylic resin.

2. WT-2: Aluminum and Glass Storefront System:

System consists of insulating glass units with low iron outer and inner lites, high performance low-e coating on no. 2 surface and standard pattern ceramic frit where indicated [GL-1 and GL-2]. Glass units are conventionally glazed into stick built thermally broken frames of standard profile extruded aluminum.

Where indicated on Architectural Drawings, system incorporates

- Two side structural silicone glazed vertical joints
- Painted aluminum panels with formed edges and stiffeners as required
- Vertical decorative Dichroic Glass [GL-3] fins including support brackets
- Extruded aluminum exterior caps
- Stainless steel and glass swing doors

Finish of all aluminum exposed to the exterior shall be two-coat mica custom color PVDF (70% Kynar). Finish of all aluminum exposed to the interior shall be custom color high performance one coat thermal-set acrylic resin.

3. WT-3: Aluminum and Glass Infill Window System

System consists of insulating glass units with low iron outer and inner lites and high performance low-e coating on no. 2 surface. Glass units are four-side captured into frames of standard profile extruded aluminum. System incorporates continuous air seal closure/ flashing to perimeter substrate.

Where indicated on Architectural Drawings, system incorporates

- Two-side structurally glazed vertical joints
- Extruded aluminum exterior caps
- Extruded aluminum sunshades including support brackets
- Extruded aluminum interior sill covers, reinforced as required

Finish of all aluminum exposed to the exterior shall be two-coat mica custom color PVDF (70% Kynar). Finish of all aluminum exposed to the interior shall be custom color high performance one coat thermal-set acrylic resin.

C. Elements of the Work

1. Curtain wall, storefronts and infill windows as described above.
2. Entrance stainless steel swing doors including all hardware required for a complete and operable assembly. Refer to Specification Section 08 11 19.
3. Parapets, copings, soffits and shadowboxes.
4. All anchors, attachments and reinforcements, except those specifically indicated as being provided by others.
5. Glass and glazing.
6. All thermal insulation attached to or within the CWSE including supports, backing and reinforcements.
7. All firesafing insulation and smoke seals attached to the CWSE including supports, backing and reinforcements.

8. Mullion wrap fire-rated insulation at all spandrel areas.
9. Sound deadening at all horizontal surfaces.
10. All gaskets, sealants, elastomeric and metal flashing including sealing at all junctions with roofing and ground floor waterproofing.
11. End closure at all horizontal and vertical caps and projections.
12. Finishes, protective coatings and treatments.
13. Electric bonding of all metal curtain wall components.
14. Provisions for electrical outlets and cutouts for lighting, conduits, heat tracing cable, and other electrical work.
15. Provisions for plumbing fixtures, including hosebibs.
16. Design engineering, shop drawings, calculations, engineering data, and test reports.
17. Field measurements of adjacent and/or supporting construction and verification of existing conditions where feasible.
18. Scheduling and monitoring of the Work.
19. Material samples, trial installation mock-ups, and test assembly.
20. Mock-up drawings, test procedures, testing and verification of design, components, and total assembly.
21. On site testing of embeds and field water testing.
22. Coordination with the work of other trades.
23. Storage, handling, protection, and cleaning prior to Acceptance.
24. Guarantees, warranties and indemnities.
25. All final exterior and interior cleaning of the CWSE.

D. Related Work Specified Elsewhere

1. Section 04 20 20 Unit Masonry
2. Section 04 28 00 Terra Cotta Assembly
3. Section 05 12 00 Structural Steel
4. Section 05 12 50 Architecturally Exposed Structural Steel
5. Section 05 30 00 Metal Decking
6. Section 05 77 00 Structural Glass Canopy
7. Section 07 13 26 Sheet Membrane Waterproofing
8. Section 07 21 00 Thermal Insulation

9. Section 07 27 00 Air and Vapor Barrier Membrane
10. Section 07 42 13 Aluminum Composite Panels
11. Section 07 56 25 Fluid Applied Roofing System
12. Section 07 62 00 Sheet Metal Work
13. Section 07 84 13 Firestops and Smokeseals
14. Section 07 92 00 Joint Sealers
15. Section 08 11 19 Stainless Steel Doors and Frames
16. Section 08 90 00 Louvers and Vents
17. Section 12 24 13 Window Shades

1.03 REGULATIONS AND STANDARDS

A. General

1. All Work of this Section shall comply with the minimum requirements of the 2003 International Building Code, 2005 State Building Code of Connecticut with 2009 and 2013 Amendments, and all local, state, and county regulations, and all amendments of the Codes at the date of this Specification
2. All standards and codes referenced in this Specification shall be those editions including amendments current at the date of this Specification unless otherwise required by governing code.
3. In case of any conflict between referenced codes and standards and/or the Drawings and Specifications, the document having the more stringent requirements shall govern.

B. Standards

1. The specified documents of the American Society of Civil Engineers (ASCE).
2. Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings issued by the American Institute of Steel Construction (AISC).
3. Steel designation issued by the American Iron and Steel Institute (AISI).
4. The Code for Welding in Building Construction issued by the American Welding Society (AWS).
5. Specification for Structures of Aluminum Alloys issued by the Aluminum Association (AA).
6. The specified documents of the American Society for Testing and Materials (ASTM).
7. The specified documents of the American National Standards Institute (ANSI).
8. The specified documents of the American Architectural Manufacturers Association (AAMA).

9. Guidelines of the Flat Glass Marketing Association Glazing Manual (FGMA).
10. Guidelines of the Glass Association of North America (GANA).
11. The specified documents of the Consumer Products Safety Commission (CPSC).
12. Guidelines of the Architectural Spray Coaters Association (ASCA).
13. Guidelines published by the Structural Steel Painting Council (SSPC).
14. The hardware finish designations of the Building Hardware Manufacturers Association (BHMA).
15. The specified documents of the Occupational Safety Hazard Association (OSHA).

1.04 PERFORMANCE CRITERIA

A. General

1. Individual and aggregate components of the Work of this Section shall be designed, fabricated, assembled, transported, installed and protected so that the Work meets the following Performance Requirements and otherwise be free from damage or other defects when subject to the Loads and Conditions specified herein.
2. Performance criteria must be achieved without increasing the mullion dimensions indicated on the drawings.

B. Performance Requirements

1. Deflections shall be limited as follows:
   a. Vertical Members spanning floor to floor or sill to head:
      (1) Deflection normal to the plane of construction shall be limited to L/175 of the clear span between structural supports, or 3/4 inch [19.1 mm], whichever is less, and L/240+1/4" at spans over 13'-0". Wherever infill members combine to form a continuous member spanning floor to floor, the Deflection Criteria shall be as that for a monolithic member.
   b. Cantilevered Members:
      (1) Deflection normal to the plane of construction shall be limited to 2L/240 of the span beyond the structural support, or 3/8 inch [9.5 mm], whichever is less. When cantilever members comprise a part of a continuous mullion system, the Deflection Criteria of the composite member shall not exceed limitations specified in Part 1.04 B. 1. a Vertical Members, or Part 1.04 B. 1. c Transverse Members.
   c. Transverse Members:
      (1) Deflection normal to the plane of construction shall be limited to L/240 of the clear span. Deflection in the plane of construction shall be limited to L/360 of the span between supports, or 1/8 inch [3.2 mm], whichever is less.

d. Center Deflection of 4-side supported Glass Lites:

(1) Deflection of glass at the center of the lite shall not exceeded L/254t for the loaded lite (where L is the short span of the lite, in inches, and t is the thickness, in inches, of the loaded glass lite), or 3/4 inch [19.1 mm], whichever is less.

e. Center Deflection of Metal Panels:

(1) Center deflection of metal panels shall not exceed L/175 or 3/4 inch [19.1 mm], where L is either the short dimension of the panel, or the clear span of the face material between supporting (stiffening) members, whichever is less.

f. Center Deflection of Vertical Decorative Glass Fins:

(1) Center deflection of vertical decorative glass fins shall not exceed L/100 or 3/4 inch [19.1 mm], where L is the clear span of the glass fins between supporting members, whichever is less.

2. Air Infiltration and Exfiltration

a. Air infiltration and exfiltration, averaged over the frontal area of exterior surfaces having fixed components, shall not exceed 0.06 CFM per square foot of frontage when subjected to 6.24 PSF of positive pressure.

3. Water Infiltration

a. Any leakage and / or condensation which might take place within the CWSE shall be drained within the CWSE and discharged to the exterior face of the CWSE.

b. Water infiltration shall be defined as any uncontrolled water, exclusive of condensation, that appears on the interior side of the CWSE.

c. Water temporarily contained within the CWSE without ill effect, and that does not penetrate to the interior side of the Work, will not be considered water infiltration.

d. Water infiltration shall not occur when the completed Work is subjected to the following inward pressures acting normal to the surface, for the specified time periods, using a water spray discharge rate of 5 gallons water per hour per square foot of surface frontal area:

(1) Static Pressure of 10 pounds per square foot for a time of 15 minutes.

(2) Dynamic pressure of 10 pounds per square foot for a time of 15 minutes.

4. Condensation Resistance

a. Condensation is defined as water, ice or frost occurring on more than 5 percent of the interior surface of any one component or water that is not collected and positively drained to the exterior through the condensation drainage gutter.

b. The CWSE shall be designed to prevent condensation on the interior under the following conditions:

(1) Outdoor ambient air temperature of 3° F, with 11 MPH mean wind speed.

(2) Indoor ambient air temperature of 70° F and 30% relative humidity, which has a corresponding dew point of 37° F.

c. Condensation Resistance within glass spandrel cavities (shadowboxes)

(1) The venting design of glass spandrel cavities shall ensure that no condensation occurs within shadowbox construction throughout yearly climatic conditions.

(2) The venting design shall be proposed by CWSE Contractor based on the CWSE Contractor 's proposed system and the project location.

5. Thermal and Solar Performance

a. Maximum System U-values and Glass SHGC Values, to be coordinated with Building Energy Model, should be as follows for individual wall systems:

(1) WT-1, WT-2 and WT-3:

System Winter U-value (vision): 0.39 Btu / h sf °F

System Winter U-value (spandrel): 0.16 Btu / h sf °F

SHGC: 0.39

C. Loads on glass and components

1. All materials shall be designed to withstand the greater of the following pressures, or combinations thereof, acting normal to the surface without deflections in excess of those specified. Load combinations shall be as per the requirements of the International Building Code.

a. Wind pressures and / or suctions of ± 35 psf (pounds per square foot) at the field, + 35 psf and ~~60 psf~~ **-62.2 psf** at edge zones. Edge zones shall be considered as 10% of horizontal dimension of each elevation but not less than 10 feet.

b. **Wind pressures and / or suctions of +90 /-100 psf (pounds per square foot) at the field parapet zones, +90 /-130 psf at edge parapet zones.**

c. Human impact loads at all glazing for which a portion is less than 42 inches above finished floor, of 50 plf linear load and 200 lb concentrated load and/or as required by governing code for handrails. Loads shall not be applied concurrently.

d. Thermal stress induced by solar heat gain or other sources.

e. Environmental pressures due to elevation, weather, and temperature.

f. Seismic loading in accordance with the International Building Code and corresponding sections of ASCE 7.

g. Ice loading in accordance with the International Building Code and corresponding sections of ASCE 7.

h. Uniform live load on Horizontal Aluminum Panels in accordance with ASCE 7.

i. Point live loads on sloped components of 250 pounds acting over an area of 1.0 square

feet.

j. Uniform snow loads on sloped components of 27 pounds per square foot (for flat areas)

k. A concentrated load of 10 pounds at any point, over one (1) square inch, on snap-engaged components.

l. Static load of 250 lbs from Window Washing Procedures (due to a single operator of a Bosun's chair) on all exterior projecting elements

2. Allowable glass stress shall be determined based upon ASTM E 1300 and the following design factors:

a. Fully-tempered Glass (Type FT) 1.4

b. Heat-strengthened Glass (Type HS) 1.6

c. Annealed Glass (Type AN) 2.5

d. These shall be based upon destructive testing conducted in accordance with ASTM C158-02 in which glass, representative of that described in the Drawings and Specifications, is exposed to uniform static loads held for one minute per 1/8 inch increment of center point deflection until destruction. The statistical distribution of such test results shall be normal and the coefficient of variation shall not exceed 25 percent.

e. In the event that probabilities of breakage and safety factors specified herein yield conflicting results, the most stringent requirement shall be used.

D. Conditions

1. Thermal Movement

a. The CWSE shall be designed for differential thermal movement (expansion and contraction) resulting from an exterior surface temperature range of 5° F to 150° F, and a building interior temperature range of 60° F to 80° F. Surface temperature range may be adjusted for specific conditions based on surface location and orientation, subject to approval by the Architect.

2. Structural Movement

a. Provisions shall be made in the design of the CWSE to accommodate differential structural movements, deflections, interstory drift and thermal movement of the building structure(s) due to gravity loads, wind loads, seismic loads and temperature.

b. Assume the following differential movements at typical 15'-0" floor to floor spans:

(1) Perimeter beam deflection due to surface live load 0.7" max

(2) Perimeter beam deflection due to curtain wall dead load 0.5" max

(3) Interstory lateral drift design displacement for wind 0.45" max

(4) Interstory lateral drift design displacement for seismic movement 1" max at Penthouse and below and 1.25" max at roof.

c. Notwithstanding the above limitations, it is the responsibility of the Contractor to refer to the appropriate specifications of Cast-In-Place Concrete and Structural Steel for the full description of structural movements

3. Construction Tolerances of Building Structure:

a. Provision shall be made in the design of the CWSE for the erection tolerances of the building structure:

(1) Steel: AISC tolerances.

(2) Concrete: ACI tolerances.

b. It is the responsibility of the Contractor to refer to the appropriate specifications of Cast-In-Place Concrete and Structural Steel, and to confirm building structural tolerances with the building Structural Engineer.

E. Fire Separation

a. The CWSE shall be designed to include continuous fire safing and smoke seal capable of preventing the passage of flames and smoke between floors as required by section 713.4 of the 2003 International Building Code.

b. Comply with the requirements of the local authority having jurisdiction, including testing and certification requirements.

F. Analysis

1. All requirements specified herein shall be analytically and mathematically proven, except for those requirements called for to be proven by physical testing methods. Calculations and related data, and their application in engineering, fabrication assembly and installation shall be the responsibility of the CWSE Contractor ’s registered Professional Engineer.

G. LEED Building General Requirements

1. Implement practices and procedures to meet the project’s environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

2. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.05 TESTING AND MOCKUPS

A. Visual Mock-ups

1. Full scale glass samples for each glass type mock-ups shall be provided for Architect's review and comments at the outset of the project. This mock-up is intended to include several frit patterns to enable a final choice, and to evaluate glass flatness, color, quench patterns, and roller wave distortion.
2. Full scale visual mock-ups of the following wall types shall be provided:
3. a. WT-1: Aluminum and Glass Unitized Curtain Wall System. Refer to the architectural drawings for extent. Include several (three minimum) shadowbox color samples to enable a final choice.

B. Performance Mock-up Testing

1. General
   a. Full scale portions of the Work of this Section as described in the Architectural Drawings shall be tested for compliance with Part 1.04 Performance Criteria at the following locations:

      (1) WT-1: Aluminum and Glass Unitized Curtain Wall System: 2 stories high with 3 typical bays and inclusive of projected spandrel. Refer to Part 4 of this specification for diagrams.

   b. The test assembly shall be of the materials, profiles, finishes, colors and design approved for the finished Work complete in all respects including glass and glazing. The test assembly shall serve as a visual representation of the Work.
   c. Tests shall be conducted at an independent accredited test facility proposed by the Contractor and approved by the Architect and the Owner. The CWSE Contractor shall provide the test assembly and all associated work.
   d. No pre-testing of the test assembly shall be allowed except by express written consent from the Architect and the Owner.
   e. The test assembly shall be erected under supervision of the same personnel that will supervise installation of the CWSE at the project site.
   f. CWSE Contractor shall provide at least one extra lite for each glass type and size on the test assembly for use in the event of breakage. Repeated glass failure shall constitute failure.
   g. Mock-ups may include representations of job condition interior shades and integral sill extensions as per direction of Architect.
   h. Thermal insulation required for thermal cycling shall be installed following static and dynamic water testing.
2. Performance Mock-Up Testing Sequence

   The following tests shall be conducted in the order listed and conform to the following

requirements:

a. Preload

(1) Load the test assembly to 0.5 times the specified design wind pressure and inspect the Assembly for detrimental effects.

b. Static Air Infiltration and Exfiltration

(1) ASTM E 283 Standard Test Method for Rate of Air Leakage Through Exterior Skylights, Curtain Walls, and Doors.
(2) Test pressure shall conform to the requirements of Part 1.04. B.2

c. Static Water Penetration

(1) ASTM E 331 Standard Test Method for Water Penetration of Exterior Skylights, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
(2) Test pressures shall conform to the requirements of Part 1.04. B.3.d.

d. Dynamic Water Penetration

(1) AAMA 501.1 Standard Test Method for Exterior Skylights, Curtain Walls and Doors for Water Penetration Using Dynamic Pressure.
(2) Test pressures shall conform to the requirements of Part 1.04. B.3.d.

e. Structural Performance

(1) ASTM E 330 Structural Performance of Exterior Skylights, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
(2) Deflection shall not exceed the specified deflection ratio or limit at a structural test load equal to the specified design wind pressures and suctions for edge zones. No glass breakage or deflections in excess of those limits specified shall be permitted. Test pressures/suctions shall each be held for a period of ten (10) seconds each.

f. Repeat Static Air Infiltration (Part 1.05.B.2.b)

g. Repeat Static Water Penetration (Part 1.05.B.2.c)

h. Thermal Cycling

(1) AAMA 501.5-98 Test Method for Thermal Cycling of Exterior Walls.
(2) Test temperatures shall conform to the requirements of Part 1.04. B.4.b.

i. Condensation Resistance

(1) AAMA 501.5 Test Method for Thermal Cycling of Exterior Walls - Modified. At conclusion of Thermal Cycling, hold low temperature condition for a minimum of 4 hours of thermal stability and record interior surface temperatures. Mockup chamber humidity level shall be less than specified interior humidity.

All surface temperatures shall remain above the dew point temperature

specified in Part 1.04.B.4.b.(2).

j. Repeat Static Air Infiltration (Part 1.05.B.2.b)

k. Repeat Static Water Penetration (Part 1.05.B.2.c)

l. Lateral Interstory Movement (In plane of Construction)

(1) AAMA 501.4 Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts.

(2) Test for interstory drift performance by applying a horizontal load to the frame supporting the mock-up specimen, so as to induce a displacement in the mock-up equivalent to the specified wind interstory drift design displacement (Part 1.04.D.2.b.(3)). The load shall be applied and released through 3 full cycles. Visually inspect the specimen at each displacement.

m. Repeat Static Air Infiltration (Part 1.05.B.2.b)

n. Repeat Static Water Penetration (Part 1.05.B.2.c)

o. Horizontal Interstory Movement (Normal to Construction)

(1) AAMA 501.4 Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts.

(2) Test for interstory drift performance by applying a horizontal load to the frame supporting the mock-up specimen, so as to induce a deflection in the mock-up equivalent to the specified wind interstory drift design displacement (Part 1.04.D.2.b.(3)). The load shall be applied and released through 3 full cycles. Visually inspect the specimen at each displacement.

p. Repeat Static Air Infiltration (Part 1.05.B.2.b)

q. Repeat Static Water Penetration (Part 1.05.B.2.c)

r. Vertical Interstory Movement (Differential Deflection)

(1) Test for live load deflection by applying a vertical load to the frame supporting the mock-up specimen, so as to induce a deflection in the mock-up equivalent to the specified live load deflection (Part 1.04.D.2.b.(1)). The load shall be applied and released through 3 full cycles. Visually inspect the specimen at each displacement.

s. Repeat Static Air Infiltration (Part 1.05.B.2.b)

t. Repeat Static Water Penetration (Part 1.05.B.2.c)

u. Structural Performance (Proof Load)

(1) ASTM E 330 Structural Performance of Exterior Skylights, Curtain Walls, and Doors by Uniform Static Air Pressure Difference (Proof Load).

(2) No glass breakage, permanent damage to panels, fasteners or anchors shall occur and permanent deformation to wall framing members shall not exceed

0.2 percent of their clear spans (L/500) at a structural test load equal to 1.5 times the specified design wind pressures and suctions for edge zones. Test pressures/suctions shall each be held for a period of ten (10) seconds each.

v. Concentrated Load Testing. Window Washing Operation Loads on Exterior Projecting Elements:

(1) On one of the sunshade assembly test the following:
i. Apply a force of 250 lbs via a disk of 4" diameter downward for 10 seconds at the center of an outermost sunshade pipe
ii. Apply a force of 250 lbs via a disk of 4" diameter downward for 10 second at the center of a typical sunshade blade
iii. The central deflection shall be monitored during the loading period. There shall be no permanent deformation or damage to the tested elements.

(2) On one of the projecting spandrel assembly test the following:
i. Apply a force of 250 lbs via a disk of 4" diameter downward for 10 seconds at the center of a typical projecting spandrel top closure panel.
ii. The central deflection shall be monitored during the loading period. There shall be no permanent deformation or damage to the tested elements.

w. Soft Body Impact Testing on outermost sunshade pipe.

(1) On the same sunshade assembly tested for the Concentrated Load listed above test the following:
i. Apply an impact energy force of 500 lbs at the center of an outermost sunshade pipe. A spherical/ conical bag filled with 3 mm diameter glass spheres weighting 150 lbs shall be dropped from a height of 40" onto the top surface of the pipe.
ii. Test shall cause attachment of the pipe to fail at one end and remain intact at the other end. The pipe shall remain attached to the building.

x. Interstory Movement – Lateral & Horizontal (Proof Load: 1.5 X design load)

(1) AAMA 501.4 Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts (Proof Load).

(2) Test for interstory drift performance by applying a horizontal load to the frame supporting the mock-up specimen, so as to induce a deflection in the mock-up equivalent to 1.5 times the greater of specified wind or seismic interstory drift deflection. The load shall be applied and released through 3 full cycles. Visually inspect the specimen at each displacement.

(3) Test specimen shall be considered passing if all glass is retained completely in the glazed opening without glass fallout and no components fall off.

y. Shadowbox Condensation/Ventilation Testing:

(1) Monitor condensation performance of the shadow box assemblies of the Performance Mockup during the duration of Performance Mockup Testing for

a minimum of 3 weeks. Both flat shadowbox and projected shadow box shall be tested. Contractor to submit proposed procedures and monitoring locations for review by architect. Procedure to include:

i. Monitoring of surface temperatures, air temperature and dew point temperature (humidity) inside the shadow box.

ii. Monitoring of air temperature and dew point temperature (humidity) for exterior conditions.

iii. Monitoring of air temperature and dew point temperature (humidity) for interior mock-up conditions.

Pass/Fail Criteria: No condensation should occur, and surface temperatures should remain above the measured dew point within the shadowbox at all time points.

(2) At completion of the above, perform confirmation of water evacuation test:

i. Introduce water into the shadow box cavity and monitor (minimum daily) to determine length of time for water to dissipate by drainage or evaporation.

Pass/Fail Criteria: Water shall dissipate in 7 days or less.

z. Approval of the test assembly and the test results rests with the Architect and the Owner.

C. Trial Installations / Site Mockups

1. Prior to general installation of any given typical portion or system of the Work, the CWSE Contractor shall install a representative trial installation for the Architect's and the Owner's approval at designated locations on the building (actual location).
2. The CWSE Contractor shall propose the scope and location of trial installations for the Architect's and the Owner's approval.
3. The CWSE Contractor shall notify the Architect and the Owner well in advance of each such trial installation. If approved, this portion of the work may become part of the final installation.

D. Structural Silicone Testing

1. Silicone joint(s) proposed for structural silicone glazing application shall be tested for performance in tension, in shear, and tension and shear combined.
2. Test specimens shall be approximately 2 inches in length, full dimension in width and depth, and be composed of the specified materials, colors and finishes.
3. Ten specimens for each condition shall be tested and the values for elongation-to-failure vs. stress recorded for each specimen, and the mean and standard deviation calculated for each condition.
4. Tests shall be performed by the sealant manufacturer(s) whose product(s) are being

considered for the structural silicone joint(s).

5. In addition to the above, production test samples and testing shall be performed at regular intervals during assembly of the Work, in accordance with the recommendations of the sealant manufacturer.

6. Completed glazed units shall be periodically de-glazed to confirm the homogeneity and integrity of the structural seal. De-glazing shall be performed at a rate of 1 out of the first 10 frames, followed by 1 out of the next 50 frames and 1 out of each 100 frames for the remainder of the project.

E. Field Testing

1. Embedded Anchor Testing:

   a. Representatives of each anchor type embedded into concrete or reinforced masonry shall be site tested.

   b. Testing shall be conducted at each floor, prior to installation of curtain wall units.

   c. Each anchor type shall be tested for shear, tension, and shear and tension combined to 1.5 times the design load.

   d. Testing shall comply with ASTM E 488, Test Method for Strength of Anchors in Concrete and Masonry Elements.

   e. A minimum of 1 percent but no less than 5 anchors of each anchor type shall be tested.

   f. Where anomalies in the construction are detected during visual inspections or there are failures during embed testing, a minimum of 5 percent but no less than 5 anchors of each anchor type shall be tested for that floor.

   g. There shall be no failure or permanent deformation to the anchor or the concrete or reinforced masonry.

   h. Tests shall be arranged by the CWSE Contractor and be carried out and reported by an approved independent testing authority. Approval of all test areas, test procedures, remediation measures (if required) and test results rests with the Architect and the Owner.

2. Field Water Tests

   a. Representative portions of the constructed CWSE shall be physically tested in accordance with the requirements of AAMA 501.2.

   b. Test areas shall be equal in scope to the test mock-up described in Part 1.05.B.1

   c. Typical and non-typical areas (such as corners) shall be tested for each wall type.

   d. Wherever possible, test area shall incorporate interface conditions with adjacent curtain wall systems.

   e. Interior side of test area shall be left open and unobstructed, permitting the full length of all joints to be examined from the indoor side.

f. Initial testing shall be performed as soon as an area equal to a bay in width and two stories in height is installed.

g. At least three (3) "initially successful" water tests shall be performed at different stages of installation on each system.

3. Field Chamber Tests

a. **Representative portions of the constructed CW-3 shall be physically tested in accordance with AAMA 503-03, "Voluntary Specification for Field Testing of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems".**

b. **Test area shall include perimeter flashing and seal to adjacent construction.**

c. **Water infiltration criteria shall conform to the requirements of Part 1.04.B.3.**

d. **Air infiltration criteria shall conform to the requirements of Part 1.04.B.2.**

e. **Testing shall be conducted on the first CW-3 units installed.**

f. **CWSE Contractor is responsible for providing access to the test areas and ensuring adequate water supply and pressure to meet the requirements of the referenced test standard.**

g. **The amount and extent of retesting and remediation work required due to failure shall be to the approval of the Architect and the Owner. Remediation and re-testing of failed areas are the responsibility of the CWSE Contractor.**

4. Field Adhesion Testing of Sealants:

a. Field installed sealant joints shall be periodically tested to confirm the adhesion of the sealant to the substrate.

b. Perform ten tests for the first 1000 feet of joint length for each type of sealant and joint substrate.

c. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation for each type of sealant and joint substrate.

d. Tests shall be performed by the sealant manufacturer(s) whose product(s) are being supplied for the sealant joint(s).

e. Testing shall comply with ASTM C1193, Test Method to Determine Sealant Adhesion Characteristics In-Situ **and ASTM C 794, Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.**

5. Weld Testing:

a. Representative welds at structurally critical conditions shall be tested.

b. CWSE Contractor shall propose test methods and intervals for approval.

c. Any welds which do not pass visual inspection shall be tested.

d. Tests shall be arranged by the CWSE Contractor and be carried out and reported by an approved independent testing authority. Approval of all test areas, test procedures,

remediation measures (if required) and test results rests with the Architect and the Owner.

1.06 SUBMITTALS

A. General

1. Submit shop drawings, samples and engineering calculations for the Architect's approval before proceeding with the Work of this Section. In addition to submission requirements as described in Section 01 33 00, the CWSE Contractor shall, within ten (10) days after date of written authorization to proceed, submit a completed copy of the shop drawing log and a list of major products proposed to be furnished, including manufacturer's data. CWSE Contractor is hereby advised that submissions shall be made according to a schedule that allows for review and approval by the Owner and the Architect as stated in the General Conditions. The CWSE Contractor shall be considered solely liable for any delays resulting from failure to allow review time as stipulated by the Contract Documents.

2. Submissions shall be complete and comprehensive and include all shop drawings, samples, material data submissions, and engineering calculations for the part of the CWSE addressed. All work shall be coordinated by the CWSE Contractor prior to submission. Incomplete, non-conforming, or uncoordinated submissions shall be subject to rejection or return without action by the Architect. Any work executed which deviates from the approved shop drawings and submittals shall be subject to rejection.

B. Shop Drawings

1. Shop Drawings shall clearly illustrate all aspects of the CWSE including:

   a. The relationship of the Work to the building structure, mechanical systems, roofs, and other related work.

   b. The arrangement of components.

   c. The sequence and details of fabrication, assembly and erection.

   d. Full size details, including isometric drawings of sealing, flashing and jointing.

   e. All dimensions and thicknesses, materials and finishes.

   f. Material, type, size, location, and spacing of screws, bolts, welds, anchoring devices, and accessories.

2. Shop drawings shall include details of all connections to contiguous work as approved by the Subcontractor for the work adjacent.

3. Provide isometric details or three dimensional graphics of any condition as requested by the Architect.

4. Clearly indicate all revisions to shop drawings on resubmissions.

5. Shop drawing must be submitted concurrently with engineering calculations. Shop drawings submitted without calculations shall be returned unreviewed.

6. All shop drawing sheets shall be of one size and shall bear the seal of a Professional

Engineer licensed in the State of Connecticut.

C. Glass Schedule

1. Contractor shall submit a complete glass schedule / location reference identifying all thicknesses, heat treatments, make-ups, and safety glazing designations in accordance with specifications and code requirements.
2. Schedule to be submitted in conjunction with glass strength calculations.

D. Samples

1. Submit samples of all materials and finishes. Include:
   a. Samples matching the appearance, color, texture, and other characteristics of each finish required;
   b. Range samples showing the complete range of variation in color, texture, and other characteristics resulting from the carefully controlled manufacture, finishing, fabricating, delivery, assembly, installation and cleaning processes;
   c. Finished samples of major extrusions;
   d. Finished samples of each sheet in thickness and type required;
   e. Samples showing finishes over welds and over materials welded.
2. Sample submissions shall include three identical pieces of each sample required. In addition, the CWSE Contractor shall have available an adequate quantity of matching samples, approved by the Architect, in order to coordinate the construction and finishes of other trades.
3. Samples of production materials shall be the following sizes:
   a. Anchor Extrusion: Each Type.
   b. Color Samples: 12 inch x 12 inch, each color.
   c. Finish Samples:12 inch x 12 inch, each type and finish.
   d. Finished Sheet or Plate: 12 inch x 12 inch, each type.
   e. Stud or Plug Welds to Sheet: 12 inch x 12 inch, each type.
   f. Finished Extrusions: 12 inches in length, each type.
   g. Glass: 12 inch x 12 inch, each type and edge finish.
   h. Glass: Full scale visual mock up as described in Part 1.05.A.1.
   i. Fastening Devices: Each type
   j. Flashing: 12 inches x 12 inches, each type. Include lap and splice joining.
   k. Gaskets: 12 inches long, each type, and12 inch x 12 inch at each corner.
   l. Sealants: Cured sample - 12 inches long, each type.

m. Typical Joinery and Connections: Approx. 24 inch x 24 inch Typical 4-way stack joint / vertical joint intersection for WT-1.Two (2) sample copies per each wall type.

n. Finish Hardware: Each type.

E. Engineering Calculations

1. Submit engineering calculations as described hereinafter and in the General Conditions.

2. Engineering calculations shall be submitted concurrently with the corresponding shop drawings.

3. All calculations shall bear the stamp of a professional engineer registered in the State of Connecticut.

F. Thermal Analysis

1. Submit thermal analysis for each wall type verifying compliance with Performance Criteria in Part 1.04.B.4 and 5. Report shall indicate all material and boundary condition assumptions.

G. Certifications

1. NFRC Certification for Fenestration Products

a. U-factors of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and labeled and certified by the manufacturer CWSE Contractor.

b. SHGC of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer CWSE Contractor.

c. For custom products, U-factors and SHGC may be represented by U-factor and SHGC ratings generated for a similar stock individual product made of the same product type and materials. Provide a simulation analysis from an NFRC-certified simulator employed by an NFRC accredited simulation laboratory, confirming that the custom product's U-factor and SHGC are equal to or lower than the stock product.

2. Product Certifications

a. The CWSE Contractor shall submit all shop drawings to following manufacturers for their review, and provide written confirmation from them that the manufacturer's products are appropriate for the proposed use and are being used in accordance with the manufacturer's recommendations.

(1) Glass
(2) Sealant
(3) Metal Panels

H. Fire Resistance Rating

1. Submit certification for fire resistance rating of each perimeter fire safing assembly in accordance with paragraph 1.04.E and section 703.3 of 2003 International Building Code.

I. Test Reports

1. Submit test reports for all tests described herein.
2. Test reports shall be submitted in a timely manner and well before execution of any related component of the CWSE.
3. All test reports are subject to approval by the Architect and the Owner.

J. Mock-ups

1. Provide test mock-ups as described in Parts 4.01 and 1.05.B
2. Provide visual mock-up as described in Part 1.05.A
3. Provide field mock-ups as described in Part 1.05.E.

K. Record Shop Drawings

1. At the completion of the Project, provide five (5) bound sets of reduced (half-size) photocopies of all final approved shop drawings.

L. Maintenance Manual

1. At the completion of the Project, submit five (5) bound copies of a maintenance manual describing the various materials, equipment, and procedures for cleaning and maintaining the work of this Section. Include manufacturer's data for all components of the CWSE.

1.07 MANUFACTURERS, FABRICATORS, SUPPLIERS AND SUB-CONTRACTORS

A. General

1. The Work of this Section shall be the responsibility of one Contractor.
2. The Contractor and the Sub-Contractor(s) of the Work of this Section shall have proven achievement and experience in design and installation of structural silicone glazed unitized curtain walls for at least ten (10) years and are subject to final approval by the Owner and the Architect.
3. Manufacturers, Fabricators and Suppliers of all materials and components of the Work of this Section shall have proven achievement and experience in similar work for at least ten (10) years, and are subject to approval by the Architect.
4. Acceptable Curtain Wall Fabricators
   a. United Architectural Metals
   b. Wausau
   c. YKK/Erie

1.08 ENGINEERING DESIGN AND DEVELOPMENT

A. General

1. Engineering design development, materials and methods of construction other than that

indicated or implied by the Contract Documents may be employed when such materials and methods conform to all of the following:

a. The design intent

b. The performance criteria

c. All applicable codes and standards

d. Approval by the Architect

B. CWSE Contractor's Professional Engineer

1. The CWSE Contractor shall retain an experienced Professional Engineer, registered in the State of Connecticut, acceptable to the Owner and Architect.

2. The CWSE Contractor's Professional Engineer shall prepare and endorse complete engineering design and calculations and shall check and monitor the preparation of all shop drawings for conformance with the engineering design and calculations, and for compliance with the Contract Documents.

3. Structural calculations shall be submitted for all components of the CWSE (Mock-up and Project) and shall indicate ultimate factors of safety.

4. As evidence of conformance to these requirements, each shop drawing and calculation sheet shall bear the seal and self-written signature of the CWSE Contractor's Professional Engineer.

1.09 QUALITY CONTROL (QC)

A. General

1. Prior to the start of fabrication, the Contractor shall submit a comprehensive Quality Control Program covering all phases of the CWSE including, but not necessarily limited, to the following:

a. Procurement of materials including quality assurance programs of major suppliers

b. Fabrication of components

c. Final assembly of components

d. Installation and site quality control

2. The QC Programs submitted are subject to review and approval by the Architect, the Owner, and the Consultant Team.

3. All QC Programs shall allow for a sufficient sampling to ensure 95 percent statistical certainty of conformance with the Contract Documents.

4. The Architect and Owner shall be allowed access to the CWSE Contractor's facilities and those of the major suppliers to monitor QC procedures. The CWSE Contractor shall make available all QC Program records upon request.

5. The CWSE Contractor shall submit all shop drawings to glass and sealant manufacturer for their review, and provide written confirmation that their products are being used in accordance with manufacturer's recommendations.

1.10 WARRANTIES

A. General Warranty

1. The CWSE Contractor shall agree to indemnify the Owner and Architect against any defects in the design, workmanship, quality of materials, watertightness or performance of the Work of this Section and to repair or replace defective design, workmanship or materials of the CWSE during the warranty period(s). Defective materials and workmanship include:

   a. Abnormal deterioration, aging and weathering of the CWSE

   b. Leakage of water or air exceeding specified limits

   c. Structural failure of components resulting from exposure to pressures and forces within specified limits

   d. Failure of operating parts to function normally

   e. Deterioration/discoloration of finishes in excess of normal weathering and aging

   f. Glass breakage

   g. Edge separation or any other deterioration whatsoever of laminated glass

   h. Failure of the CWSE to meet any other specified performance requirements

2. The warranty does not cover damage caused by vandalism, or natural conditions exceeding the performance requirements.

3. The general warranty period is the five (5) year period after the date stipulated in the Certificate of Substantial Completion, except only that warranties for insulating glass, laminated glass, coating(s) on glass, coating(s) on aluminum shall each be for a period of ten (10) years after the date stipulated in the Certificate for Substantial Completion and cohesion/adhesion of structural silicone shall be for a period of twenty (20) years after the date stipulated in the Certificate for Substantial Completion.

4. Warranty to include all material and labor cost for replacement of defective components.

1.11 ATTIC STOCK

1. At the completion of the project, provide the following attic stock:

   a. A minimum of one percent, but not less than two lites, of each typical size for each glass type.

2. Attic stock is intended for use in the event of damage after completion of the project and shall not be used to replace materials damaged during construction.

PART 2 PRODUCTS, MATERIALS, PROCESSES AND FINISHES

2.01 MATERIALS

A. General

1. Materials and components used shall be as specified or shall be suitable equivalents as approved by the Architect.
2. Materials not specified shall be of the best quality and suitable for the purpose intended and as approved by the Architect.
3. All materials shall be new and free from any defect in material or workmanship that may impair the strength, functioning, durability, or appearance of the Work of this Section or of adjacent construction.

2.02 METALS

A. General

1. It shall be the responsibility of the CWSE Contractor to select the alloy, degree of alloy control, homogeneity, temper, metallurgical quality, degree of hardness or softness, mill tolerances, cutting tolerances and flatness, required to achieve the requirements of design, quality, and color matching of finish set forth in Specifications and Drawings.

B. Aluminum

1. Plate and Sheet
   a. Painted Finish: AA 3003 H14, ASTM B 209
   b. All sheet shall be stretcher-leveled and stress-relieved.
2. Extrusions
   a. AA 6063-T5 or T6; ASTM B 221

C. Carbon Steel

1. Rolled shapes, plates and bars: ASTM A 36, ASTM A 108, ASTM A 500.
2. Cold rolled sheet: ASTM A 1008.
3. Fasteners:
   a. Bolts and Screws: ASTM A 307 or A 325.
   b. Nuts: ASTM A 563.

D. Stainless Steel

1. For shapes, plates, bars and strip(exposed): AISI Type 316, ASTM A 666.
2. For shapes, plates, bars and strip(concealed): AISI Type 304, ASTM A 666.
3. Fasteners: AISI Type 303, 304 or 316 non-magnetic.
   a. Bolts and screws: ASTM F 593, Alloy Groups 1 and 2.

b. Nuts: ASTM F 594, Alloy Groups 1 and 2.

4. All stainless steel shall be cleaned and passivated after fabrication per the recommendations of ASTM A 380.

2.03 PROTECTIVE TREATMENT FOR METALS

A. Galvanizing Carbon Steel (Hot Dip)

1. For shapes, plates, bars and strip: ASTM A 123 (2 oz / sq ft minimum coating thickness).
2. For fasteners and hardware: ASTM A 153.
3. For sheet: ASTM A 653 (coating weight 2 oz./ sq ft).
4. For protection against hydrogen embrittlement: ASTM A 143.
5. For repair of damage to HDG coatings: ASTM A 780.

B. Zinc-rich Coating

1. Surface preparation: SSPC-SP6 Commercial Blast Cleaning.
2. Painting system: SSPC-PS12 Zinc-Rich Coating System (2 coats).
3. Primer: SSPC-Paint 20 Zinc-Rich Primer (Type II).
4. Acceptable products are:
   a. 90-97 Tneme-Zinc as manufactured by Tnemec Company, Inc (2.5 - 3.5 mils DFT per coat).
   b. Carboline 858 as manufactured by Carboline (2.0 - 4.0 mils DFT per coat).

C. Bituminous Paint; in addition to the above where in damp or below grade conditions

1. SSPC-Paint 12, 30 mil minimum thickness.

D. Surface Preparation

1. SSPC-SP6, as a minimum, and as required by the manufacturer of protection material.

E. Surface Protection Film

1. Colored, clear, strippable PVC film specifically intended for the temporary protection of metal.
2. Film thickness shall be a minimum of 0.03 mil.

2.04 FINISHES OF ALUMINUM

A. General

1. The following aluminum finishes are used for the Work of this Section. The finish designation given is for general information only, final finishes to be selected by the Architect from actual samples to be submitted by the CWSE Contractor .

a. Curtain Wall extrusions exterior: PVDF, 2-coat system, mica custom color

b. Curtain Wall extrusions interior: 1 coat thermal set acrylic resin, custom color

c. Metal panels within curtain wall assemblies PVDF, 2-coat system, mica color to match exterior extrusions

2. All surfaces shall be finished; no mill finish aluminum shall be permitted.
3. Surfaces shall match the appearance, color and texture of samples submitted to and approved by the Architect.
4. All surfaces not exposed to the exterior or the interior shall receive the chemical conversion coat pretreatment associated with organic coating. Acceptable coatings are:
   a. Alodine as manufactured by Amchem Products, Inc.
   b. Bonderite as manufactured by The Parker Company.
5. All conversion coatings shall meet the minimum requirements of ASTM B 449.
6. Material shall not be shipped, delivered or supplied when the finish of such material:
   a. has not been inspected and tested in the manner and by the means prescribed hereinafter and as approved;
   b. does not meet all the specifications for the finishes set forth in the alloy manufacturer's instructions;
   c. does not fall within the color and tonality range approved by the Architect;
   d. has been rejected by the Architect or the Owner;
   e. has not otherwise been processed in accordance with these instructions.
7. The Architect shall have final authority to accept or reject any or all material that does not conform to these finishing standards or any of the other requirements of the drawings and specifications.

B. Organic Coating, Two-Coat Mica (PVDF)

1. Surfaces shall receive a thermally-cured, pigmented, polyvinylidene fluoride resin (PVDF) coating system, containing not less than 70 percent of the fluoropolymer resin Kynar 500 or Hylar 5000.
2. The coating system shall be spray applied under factory conditions to pretreated base metal in a two-coat process in strict accordance with the coating system manufacturers recommendations, and to the minimum standards of AAMA 2605 "Voluntary Specification, Performance Requirements, and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels".
3. Two-coat PVDF finish system thickness shall be a minimum of 1.25 mils DFT.
4. Prior to production coating, the CWSE Contractor shall present for approval full-size sample

panels representative of the maximum proposed range of color and tonality to be expected in the finished work. Samples shall be properly mounted, facing north, for viewing from various distances and angles.

5. Provide and furnish a compatible field touch-up PVDF coating system formulated for air-drying at ambient temperature, based on the Kynar ADS fluoropolymer resin, in color to match the factory applied finish. Submit samples of the air dry system as well as samples of actual touch-up work to factory applied coating system, subject to sample approval procedures described herein.

6. An acceptable organic coating is PPG Industries Duranar Sunstorm

7. Warrant that the organic coating shall not peel, check, crack, chalk or change color for a period of ten (10) years from the Completion Date stipulated in the Certificate of Substantial Completion and that the finish exceeds or meets the standards set out in AAMA 2605-98 which include, but are not limited to the following:

   a. Color change shall not exceed 5 NBS color units, or 5E units on a Hunter Color Difference Meter, when measured in accordance with ASTM D 2244-85 after 10 years of 45 degree South Florida exposure or equivalent.

   b. Chalking shall not exceed a No. 8 rating measured in accordance with ASTM D 659 after 10 years of 45 degree South Florida exposure or equivalent.

C. One-Coat Thermal-Set Acrylic Coating

1. At all surfaces exposed to the interior and wherever else indicated on Drawings, aluminum surfaces shall receive an acrylic coating meeting the minimum requirements of AAMA 2603 "Specification for High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels".

2. The coating shall be spray-applied under factory conditions to pretreated base metals in strict accordance with the coating system manufacturer's recommendations.

3. The coating system shall be applied by an applicator licensed by the coating system manufacturer. The applicator shall propose a quality control program of records and samples for the entire coating production for approval by the Architect and the Owner.

4. An acceptable coating is PPG Duracron

5. Provide and furnish a compatible field touch-up system formulated for air drying at ambient temperature, to match the factory applied finish. The system shall meet the minimum requirements of AAMA 2603.

2.05 FINISHES OF CARBON STEEL

1. All surfaces of steel members incorporated in Curtain Walls, Stonework, and Entrances shall be finished.

2. If concealed from view, individual and aggregate members shall be hot-dip galvanized or receive a zinc-rich coating system per Part 2.03.

2.06 FINISHES OF STAINLESS STEEL

A. General

1. Finish shall be uniform and free from blemishes, scratches, and other defects.
2. If exposed to view, finish for stainless steel shall be as follows:
   a. AISI No. 4 satin directional finish
3. All stainless steel shall be cleaned and passivated as per the recommendations of ASTM A 380.

2.07 LOW FRICTION MATERIALS

A. General

1. Wherever materials are subject by design to relative movement, provide suitable low friction material(s), such as:
   a. Teflon strip, 0.03 inch thick; and Teflon tape, 0.005 inch thick.
   b. High-impact polystyrene or Nylatron equal to Eel-Slip pads as manufactured by Scan-Pac.
2. Low friction materials shall be impervious to moisture.

2.08 SEALANTS AND SEAL BACKING MATERIAL

A. Cellular Glazing Tapes

1. All Cellular Glazing Tapes shall be open cell, semi-rigid, adhesive-backed foam backer tape.
2. The following are acceptable Cellular Glazing Tape products:
   a. Norton Thermalbond V2100 for structural silicone glazing applications.
   b. Norton Thermalbond V2200
   c. Norton Norseal V-780 for captured glazing applications.

B. Structural Silicone Compounds

1. All Structural Silicone Compounds shall be neutral cure, medium or high modulus, non-staining, matte finish, color to match architects sample, and specifically intended for use specified.
2. Multi-component: ASTM C 920, Type M.
3. The following are acceptable Structural Silicone Compound products:
   a. DC 983 as manufactured by Dow Corning Corporation.
   b. SSG4600 Ultraglaze as manufactured by Momentive.

C. Weatherseal

1. All Weatherseal shall be neutral cure, low or medium modulus, non-staining, matte finish, in gray color, and specifically intended for use specified.

2. Single-component: ASTM C 920, Type S, Grade NS, Class 25, Use A, G, and O.
3. The following are acceptable Weatherseal products:
   a. DC 795 as manufactured by Dow Corning
   b. SCS2000 Silpruf as manufactured by Momentive.

D. Sealant Backing Materials

1. Preformed foam plastics and synthetic rubbers, compressible, non-gassing, non staining, and compatible with sealants and as recommended by sealant manufacturers. Backing shall be of the sizes and shapes to suit the various conditions and shall be a color different than the sealant color. Backer rods shall be 25 percent wider than the joint width.
2. Open/closed cell extruded polyolefin backer rod: SOF-ROD by Nomaco Inc. or equal.
3. Extruded silicone rubber: same as 2.09, C
4. Cellular glazing tape shall conform to specifications laid out in Part 2.08, A (Cellular Glazing Tapes).

E. Bond Breaker Tape

1. Bond Breaker Tape: 3M Company Lithographer Tape.

F. Weep Hole Filter

1. PVC-coated reticulated open cell polyurethane foam, 30 to 40 pores per 1 linear inch sized for installation at 30-50 percent compression.

2.09 PREFORMED SYNTHETICS

A. General

1. The particular alloy, compound, etc. shall be appropriate to the intended function of the preformed synthetic and is subject to approval by the Architect.
2. Base gasket material manufacturers and gasket extruders are subject to approval by the Architect.
3. All material shall be non-staining, UV stabilized, and ozone-resistant.
4. All corners of weather-stripping shall be vulcanized, heat-welded, or injection-molded to form a continuous seal around the panel.
5. Color to be custom color as selected by the Architect.

B. Glazing Gaskets and Accessories (NOT in contact with Silicone)

1. Interior closed cell sponge gaskets
   a. Neoprene (polychloroprene) or EPDM (ethylene propylene diene terpolymer) gaskets: ASTM C 509 (60 ±5 Shore A durometer).
2. Exterior non-cellular dense wedge gaskets
   a. Non-cellular Neoprene (polychloroprene), EPDM (ethylene propylene diene

terpolymer), or Santoprene (EPDM-polypropylene alloy) gaskets: ASTM C 864 (70 ±5 Shore A durometer).

3. Setting blocks

   a. Non-cellular (dense) extruded Neoprene (polychloroprene) or EPDM (ethylene propylene-diene terpolymer): ASTM C 864 (90 ±5 Shore A durometer).

4. Face spacers and jamb blocks

   a. Non-cellular (dense) extruded Neoprene (polychloroprene) or EPDM: ASTM C 864 (60 ±5 Shore A durometer hardness).

C. Glazing Gaskets and Accessories (in contact with silicone)

1. Setting blocks

   a. Non-cellular (dense) extruded silicone: ASTM C 1115 Type C (90 ±5 Shore A durometer hardness).

   b. Non-cellular (dense) extruded Alcryn (silicone compatible rubber): ASTM C 864 (90 ±5 Shore A durometer hardness).

2. Face spacers and jamb blocks:

   a. Non-cellular (dense) extruded silicone: ASTM C 1115 (60 ±5 Shore A durometer hardness).

   b. Non-cellular (dense) extruded Alcryn (silicone compatible rubber): ASTM C 864 (60 ±5 Shore A durometer hardness).

   c. Where structural silicone is to be gray in color, spacer shall be extruded silicone to match.

D. Thermal Isolators:

   a. Rigid polyvinylchloride: ASTM 4216.

   b. Extruded polyamide: ASTM D6779-08a

2.10 ELASTOMERIC SHEET MATERIAL

A. Elastomeric Sheet shall be a complete engineered membrane system, consisting principally of:

1. Cured Neoprene (polychloroprene) or EPDM (ethylene-propylene-diene terpolymer) sheet: ASTM D 4637, Class SR(60 mil. thick).

2. Uncured Neoprene (polychloroprene) or EPDM (ethylene-propylene-diene terpolymer) sheet flashing: ASTM D 4811.

3. Bonding and splicing adhesives, primers, putty, sealants and all other materials as recommended by the manufacturer.

4. Sheet Neoprene (polychloroprene) or EPDM (ethylene-propylene-diene terpolymer) shall comply to ASTM D 4637, Class SR.

B. Acceptable elastomeric membrane and flashing systems are:

1. Rubbergard system as manufactured by Firestone.
2. Bituthene as manufactured by W.R. Grace.

2.11 INSULATION, FIRESAFING AND SOUND DEADENING

A. High-density Semi-rigid Mineral Fiber Board

1. Semi-rigid mineral wool fiberboard with water-resistant binders conforming to the following requirements:
   a. ASTM C 612, Type III.
   b. ASTM C 518, thermal conductivity of 'k' = 0.23 BTU-in/hr ft^2 at 75°F.
   c. Nominal density of 8 lbs/ft3.
   d. ASTM E 84, flame spread 25, smoke developed 5.
   e. Provide sizes to fit specific panel applications. Install foil tape around perimeter of foil-facing to adjacent metal framing to achieve positive vapor barrier. Thickness to be 4 inches minimum unless indicated otherwise.
2. Acceptable products are:
   a. Thermafiber Firespan 90
   b. Roxul Rockboard 80

B. Mineral Fiber Firesafing:

1. Mineral wool fiber blanket with water-resistant binders conforming to the following requirements:
   a. ASTM C 612, Type II.
   b. ASTM C 518, thermal conductivity k = 0.25 BTU-in/hr ft^2 at 75°F.
   c. ASTM E 84; flame spread 25, smoke-developed 5.
   d. Nominal density of 4 lbs/ft^3.
   e. Provide sizes to fit specific safing applications and galvanized steel impaling clips. Thickness to be 4 inches minimum unless indicated otherwise.
2. An acceptable product is Thermafiber Firespan 40.

C. Insulation

1. All insulation shall comply with ASTM E-84; E-2307 (2 hours); E-136.

D. Smoke Seal Compound:

1. Flexible coating specifically intended for inhibiting the passage of smoke and conforming to the following requirements:
   a. ASTM E 84; flame spread 5, smoke-developed 0.
   b. An acceptable product is 3M Firedam Spray 200.

E. Sound-deadening:

1. Acoustical board, thickness and density as required by design, non-combustible waterproof type, to Architect's approval.
2. Adhesive-backed, bitumen compound sheet membrane, thickness as required by design, to Architect's approval.

2.12 GLASS

A. General

1. All glass of the same type shall be the manufactured product of one company.

B. Annealed Glass:

1. ASTM C 1036; Type I, Class I, Glazing Select q^3.

C. Heat Strengthened and Fully Tempered Safety Glass:

1. ASTM C 1048; Type I, Class I, Glazing Select q^3, Kind HS, Kind FT Coated and Uncoated Glass.
2. All fully tempered glass shall be heat-soaked in accordance with EN 14179-1 at a glass surface temperature of 550°F±50°F for a two hour dwell time.
3. All heat-strengthening and tempering shall be by the horizontal process, and processed in such a manner as to have all roller wave distortion in a horizontal direction when installed on the building. Roller distortion and/or ripples shall run in the same direction for the entire job. All glass shall be heat-treated through the horizontal tempering process.
4. All heat-strengthened glass shall conform to the flatness requirements for local bow and overall bow as specified in European Standard EN-1863-1:
   a. Overall bow: 0.3% of the least dimension of the glass.
   b. Local bow: 0.1% (0.3 mm) per 300 mm length measured across the surface of the glass at any angle or location.
5. All fully-tempered glass shall conform to the flatness requirements for local bow and overall bow as specified in European Standard EN-12150-1:
   a. Overall bow: 0.3% of the least dimension of the glass.
   b. Local bow: 0.167% (0.5 mm) per 300 mm length measured across the surface of the glass at any angle or location.
6. Roller wave distortion for all heat-treated glass shall be limited to a maximum peak to valley roller wave dimensions of 0.003" in the central area, and 0.008" within 10.5 inches of the leading and trailing edge.
7. Ensure that the heat-treatment process does not produce iridescence, distortion, roller wave or ripples in the glass that is unacceptable to the Architect and the Owner. Provide full size samples as specified in Part 1.05.A to demonstrate the extent of such anticipated

imperfection for the Architect's review and approval, prior to commencing production of the glass.

8. Heat strengthening shall be achieved by heat treating for a surface compressive stress of not less than 3500 psi nor more than 7000 psi. The level of pre-stress shall be such to resist wind and thermally induced forces. Throughout production, the manufacturer shall maintain a quality control program of destructive testing to ensure that allowable maximum stresses have not been exceeded. The CWSE Contractor shall submit this program for the Architect's and the Owner's approval.

D. Safety Glass:

1. Glass in locations designated as hazardous locations by Section 2406.3 of the 2003 International Building Code shall be safety glass in accordance with the requirements of CPSC 16 CFR 1201.

E. Insulating Glass:

1. Insulating glass units shall be fabricated using the dual-seal system, consisting of two lites of glass (primary seal of polyisobutylene specifically intended for primary insulating glass seals and secondary seal of silicone insulating glass sealant). Edge seals to be gray in color unless indicated otherwise.
2. Spacer frame shall be fabricated of stainless steel, with sealed corners, welded, soldered or formed by bending. Care shall be taken to produce corners free from pinholes, gaps and other defects to ensure water vapor-tight construction. Desiccant used within spacer shall be of type and quantity to ensure proper performance of the unit. Spacer to be black unless indicated otherwise.
   a. Allowable splices to be established based upon maximum unit size and maximum spacer length available to glass fabricator and quantified prior to start of glass fabrication.
3. Insulating glass units shall be constructed to include a minimum PIB dimension of 1/8" at the entire perimeter of the unit, including corners with no skips or voids.
   a. Glass Fabricator to employ testing regiment to ensure proper adhesion of PIB to spacer and glass surfaces.
4. Airspace dimension at time of fabrication to be no more than ± 1/16" from target dimension, or as measured in approved full size benchmark samples, whichever is less.
5. Airspace to contain a minimum of 95% Argon fill. Gas fill to be measure in accordance with ASTM E2649 using a Spark Emission Spectroscopy instrument. Proof of gas content is to be in accordance with TGMA/IGCC testing as specified.
6. Insulating Glass units shall be certified by the Insulating Glass Certification Council and shall be tested in accordance with ASTM E 2190 "Standard Specification for Insulating glass Unit Performance and Evaluation per the following test methods:
   a. E 2188 Standard Test Method for Insulating Glass Unit Performance

b. E 2189 Standard Test Method for Testing Resistance to Fogging in Insulation Glass Unit

c. Insulating glass shall meet these tests considering the climatic conditions of the location of manufacture as well as the location of the installation.

7. Insulating Glass units shall be covered by manufacturer's warranty for ten (10) years.

F. Low Iron Float Glass

1. Minimum 91% visible light transmission and minimum Solar Heat Gain Coefficient of 0.87.

2. Acceptable low iron products include:

a. PPG Starphire

G. Reflective and Low-e Coated Glass:

1. Reflective and Low-emissivity (low-e) coating(s) shall be neutral in transmitted and reflected color, and otherwise exhibit the visual and performance characteristics of the products specified.

2. Transmitted and reflected color for all coated glass shall be consistent and fall on the same side of the neutral axis of the color spectrum as defined in ASTM D2244.

3. The coating shall be as approved by the Architect.

4. Visual Quality Control acceptance criteria of the coating shall be consistent with industry guidelines, subject to approval by the Architect and the Owner.

a. Pinholes with diameters in excess of 1/16 inches are not acceptable.

b. Clusters of pinholes are not acceptable.

c. Scratches no longer than 3 inches in length are acceptable provided that they occur within 3 inches of an edge.

5. Edge deletion of reflective and low-e coatings shall be provided at all insulating glass and structural silicone glazing unless manufacturer submits test data acceptable to the Architect indicating that edge deletion is not required. Width of edge deleted zone shall be sufficient to prevent coating corrosion due to vapor migration through secondary edge seal.

6. Manufacturer shall warrant that coating shall not peel, crack, fade or deteriorate for a period of ten (10) years. Manufacturer shall warrant that any glass that is not edge deleted will not develop loss of adhesion with insulating glass or structural silicone glazing sealants for a period of ten (10) years.

H. Laminated Glass:

1. Ionoplast interlayer:

a. Two lites of glass bonded to a .060" clear plastic, puncture resistant, ionoplast interlayer conforming to the requirements of ANSI Z97.1, ASTM C 1172, and CPSC standard 16 CFR 1201 Category II.

b. Interlayer shall be compatible with all glazing sealants.

c. Acceptable Products:

(1) *SentryGlas* as manufactured by E.I. Dupont de Nemours & Co., Inc.

d. Manufacturer shall warrant that laminated glass will not develop discoloration, edge separation or other defects which may obstruct vision through the glass or otherwise compromise the requirements of the glass for a period of ten (10) years.

I. Ceramic Frit Coated Glass:

1. All ceramic frit coated glass shall be heat-strengthened (Kind HS) and meet the requirements specified herein, but in no case less than the minimum requirements of ASTM C 1048.

2. Ceramic frit color shall be as follows:

a. An acceptable white ceramic frit product is V175 "High Opacity White" as manufactured by Viracon

b. Notwithstanding the above, ceramic frit color is subject to approval by the Architect.

3. Ceramic frit pattern at GL-2 shall be standard 40% coverage lines.

4. Visual Quality Control acceptance criteria of the ceramic fritted surface shall be consistent with industry guidelines, subject to approval by the Architect.

a. Patterns shall be located not more than 1/16 inch off parallel from the locating glass edge.

b. Frit shall be evenly applied and consistent in tone.

5. Manufacturer shall warrant that ceramic fritted glass shall not develop any defects which may affect the appearance of the glass or may otherwise compromise the requirements of the glass for a period of ten (10) years.

J. Glass Edges:

1. Structurally glazed glass edges shall be seamed.

2. Butt glass edges shall be seamed and ground (matte finish).

3. Exposed edges, such as at corners and fins, shall be arrised and polished.

4. All glass edges shall conform to the following requirements:

a. Shark teeth shall not penetrate more than half the glass thickness.

b. Serration hackle shall not penetrate more than 10 percent of the glass thickness.

c. Flare shall not exceed 1/16 inch as measured perpendicular to the glass surface at edge.

d. Bevel shall not exceed 1/16 inch.

e. Flake chips shall not exceed 1/16 inch in length or 1/4 inch in diameter.

f. Rough chips exceeding the dimensions listed in Item e above shall not be permitted.

K. Glass Products:

1. Vision glass

   a. Performance characteristics for a 3/8 inch minimum thickness low iron outer lite with high performance low-e coating on the no. 2 surface - ½ inch argon fill with stainless steel spacer - 1/4 inch minimum thickness low iron inner lite. Insulating glass unit shall be equal to or better than the following:

      (1) Light Transmittance of 73 percent

      (2) U-Value(Summer) 0.21 BTU/hr ft^2 °F

      (3) U-Value(Winter) 0.25 BTU/hr ft^2 °F

      (4) Solar Heat Gain Coefficient: 0.39

   b. Acceptable coatings are:

      (1) Viracon VE -2M.

2. Spandrel glass:

   a. Spandrel glass shall consist of 5/16" (3/8" where required) minimum thickness low iron lite with high performance low-e coating on no. 2 surface – ½" argon filled air space with stainless steel spacer – ¼" inch minimum thickness low iron inner lite.

   b. Acceptable coatings are:

      (1) Viracon VE -2M.

3. The following are approved glass vision and spandrel fabricators. Alternate glass fabricators are subject to approval:

   a. Viracon

4. Dichroic glass

   a. Acceptable Products

      (1) Narima as manufactured by Schott Glass

L. Glass Schedule:

1. General: all thicknesses are minimum thicknesses and vary with glass lite sizes

2. Typical Vision Glass and spandrel glass [GL-1]

   1-1/16"+/- 1/16" insulating glass units:

   - 5/16" low-iron outer lite with low-e coating on no. 2 surface (3/8" where required)
   - 1/2" argon airspace with gray edge seals
   - 1/4" low-iron inner lite.

3. Typical Vision Glass with ceramic frit [GL-2]

   1-1/16”+/- 1/16" insulating glass units:

   - 5/16" low-iron outer lite with low-e coating on no. 2 surface and 40% standard pattern ceramic frit coverage on no. 2 surface (3/8" thick outer lite where required)
   - 1/2" argon airspace with gray edge seals
   - 1/4" low-iron inner lite.

4. Typical dichroic glass fin [GL-3]

   3/8”-3/8” Monolithic laminated glass with ionoplast interlayer, dichroic coating and polished edges

5. All glass to be heat strengthened or fully tempered as required by design or by code. All fully tempered glass shall be heat soaked.

6. Dichroic coated glass to be annealed.

2.13 COMPONENTS

A. Metal Panels

1. Metal panels shall be fabricated from the specified alloys of aluminum.
2. Metal panels and extruded aluminum edge frames shall follow the profiles indicated on the Contract Documents.
3. At formed metal panels, the perimeter arris to panels (i.e. the arris between the face plane and the edge plane) shall be consistent throughout the work. Panel sheet shall be scored and back-cut to achieve a sharp arris with a design radius not exceeding 1/16 inch.
4. Panels shall be fabricated to ensure that the grain of all panels are oriented in the same direction upon installation.
5. Panel support construction shall result in a panel visual flatness acceptable to the Architect.
6. Aluminum sheet thickness shall be a minimum of 3/16 inch (4 mm).
7. Horizontal panels shall be reinforced with corrugated sheet, extruded stiffeners, etc. as required to meet the load requirements specified in Part 1.04 (Performance Criteria), above.
8. Extruded aluminum stiffeners or any alternate panel stiffening devices shall be designed to prevent “telegraphing” or “read through” of the stiffening device on the exposed face of the panel.
9. At horizontal panels, panel construction shall be capable of providing a sound barrier to rain impact noise. Sound deadening material shall be impervious to moisture.
10. Panels subject to human impact, within six feet of any walking surface, and wherever else indicated on the Drawings shall be reinforced with galvanized steel or alternate suitable devices to the Architect’s approval.
11. Panel anchorage shall be designed to permit ease of replacement without disturbing

contiguous work.

12. All corners of formed sheet shall be welded to inhibit water infiltration.
13. Flatness of Metal Panels:
    a. All exposed flat exterior metal panels of the curtain wall shall be designed, fabricated, and installed in such a manner that they are visually flat when viewed from any angle. Any short length distortions, ripples, waves, oil canning, or telegraphing of fasteners shall not be permitted. Provisions shall be made to allow for differential thermal expansion between framing members and the exposed metal of the CWSE without noise and without distortion of the exposed face.
    b. In the event that metal flatness requires interpretation by measurement, this shall be done by measuring and calculating the deviation between edges or any two points on the exposed surface. Total deviation (d) from flatness shall not exceed 0.003 times the length (L), and 0.004 times the width (W), and 0.0035 times any chord of at least 12 inches.
    c. Notwithstanding the foregoing, however, visual flatness shall be to the approval of the Architect.
14. **Coping panels shall be engineered to withstand uplift as required to meet the load requirements specified in Part 1.04 C 1.b (Performance Criteria), above.**

B. Glass Spandrel Cavity Construction

1. Maintain a minimum clear dimension of two inches from the back surface of the glass.
2. Aluminum sheet thickness for shadowbox back pans to be a minimum of 1/8”.

C. Embeds

1. Embeds shall be hot-dipped galvanized steel.
2. An acceptable manufacturer is Halfen.

D. Extruded painted aluminum sunshade blades

1. In order to prevent splitting and falling of large pieces to the ground, the outermost sunshade pipe shall be designed to break safely under impact energy load of 500 ft lbs and higher caused by Window Washing Operations.
2. Attachment pin on one end of the outermost sunshade pipe shall shear off before failure of the sunshade element itself. Tether to the building shall be provided by oversized attachment at the other end or by other effective means.

E. Stainless Steel and Glass Entrance Doors

1. Supply and install all doors for CWSE in accordance with the requirements of Section 08 11 19 – Stainless Steel Doors and Frames.

PART 3 EXECUTION

3.01 FABRICATION AND ASSEMBLY

A. General

1. Use no materials, equipment or practices that may adversely affect the functioning, appearance or durability of the completed CWSE and related construction.
2. The CWSE shall be accomplished in compliance with the specified criteria without buckling, opening of joints, undue stress on fasteners, sealants and gaskets, opening of welds, cracking of glass, leakage, noises or other harmful effects.
3. Conform strictly to the materials, finishes, shapes, profiles, sizes, thickness, and joint locations required by the Drawings and Specifications.
4. Match all materials to produce continuity of line, texture and color.
5. All work shall be of the highest quality, in accordance with the best trade practices, and performed by skilled workmen. All work shall be accomplished to the satisfaction of the Architect and Owner.
6. To the fullest extent practicable, fabrication and assembly shall be executed in the shop. All Work that is not shop-assembled shall be shop-fitted.
7. To the extent possible, all fabrication shall be done prior to finishing. Any exposed mill finish edges shall be finished to match adjacent construction.
8. All components exposed in the finished work shall be free from warping and oil-canning effects, the telegraphing of welds, studs, and other fasteners, and streaks, tool and die marks.
9. Exposed metal edges shall be finished to match typical finished surfaces.
10. CWSE design shall typically incorporate an outside weatherseal and an inside air-seal, and provide a pressure-equalized drainage system.

B. Fabrication and Assembly

1. The design of the CWSE shall endeavor to keep site operations to a minimum. Manufacturing, finishing, and assembly processes shall, wherever possible, be carried out off-site and under controlled environmental conditions.
2. Assembly procedures to be carried out on site shall be simple to execute and capable of execution within the time(s) allowed in the Master Construction Program.

C. Manufacturer's Standards

1. Materials, components and systems incorporated in the Work shall be mixed, applied, installed and otherwise used in strict accordance with the recommended standards and procedures of the respective manufacturers.

D. Storage and Handling

1. Materials shall be stored in a dry, well ventilated location. Handling of materials shall be kept to a minimum, and all materials shall be carefully protected from soiling and from condensation and other harmful moisture.

E. Jointing and Reinforcing

1. Accurately fit and firmly secure all exposed metal joints with metal to metal hairline contacts.
2. All fastenings shall be installed at an approved spacing. Fasteners shall not penetrate gutters and drainage systems.
3. All screws and bolts up to and including 5/16 inch diameter, and all screws and bolts that are drilled and/or tapped into aluminum, shall be 300 series stainless steel.
4. All bolts 3/8 inch diameter and heavier shall be stainless steel or hot-dip galvanized.
5. No self-drilling fasteners shall be allowed outboard of the air-seal line.
6. All jointing and splicing of members shall be concealed.
7. Exposed fasteners shall occur only where expressly permitted by the Architect. Where exposed in finished surfaces, screw heads shall be Phillips oval-head countersunk type, finish to match adjacent surfaces.
8. Conceal all joint sealants except as noted on the drawings.
9. All work shall be properly reinforced to resist all loads imposed upon them by all doors, hardware, anchors, and other attachments.

F. Welding

1. All welding of steel shall be in accordance with the recommendations of the American Welding Society.
2. All welding shall be done by skilled mechanics qualified by test in the last 12 months as prescribed in the American Welding Society Code and as applicable to the material thickness and type of welded joint on which the welders will be employed.
3. All welding shall be done with electrodes and/or methods recommended by the suppliers of the metals being welded. The type, size, and spacing of welds shall be as shown on the approved shop drawings. Welding materials and methods shall be such as not to cause distortion, discoloration, or result in any other adverse effect on the required profiles and finishes of visible surfaces of the CWSE.
4. Welding of aluminum alloys and the qualifications of aluminum welders shall conform to the requirements of the Aluminum Association "Specifications for Structures of Aluminum Alloys, Aluminum Construction Manual".
5. Welding of Stainless Steel shall be by TIG welding or other methods subject to approval. Use double bevel butt welds, backing bars to remove heat, jigging, tack welds and any other measures necessary to minimize distortion.
6. Weld splatter and welding oxides on exposed surfaces shall be removed. All exposed welds shall be finished to match and blend with adjacent parent metal prior to final finish application.
7. Stud welding shall be done by mechanics trained by the manufacturer of the stud setting system. The manufacturer shall develop specific programs and instructions in cooperation with the fabricator to suit the needs of the specific details. The fabricator shall exercise

particular care that all recommendations of the manufacturer are closely followed.

8. Visible marks (telegraphing) on finished surfaces due to welding of studs shall not be acceptable.
9. Welded joints shall typically be confined to concealed locations. Any exposed joints shall be ground-off.

G. Sealant and Gasket Application

1. Sealing mechanisms (sealants and gaskets) shall be provided where shown on the drawing, or required for a permanently weather-tight installation. The sealing mechanism for each location and use shall be as indicated on drawings. In those locations where a mechanism is necessary but is not indicated, it shall be of a type recommended by the Contractor and approved by the Architect.
2. The design of all sealed joints shall be in accordance with the recommendation of the sealant and/or gasket manufacturer.
3. Specific alloys, compounds, etc. of gasket materials shall be appropriate for the function intended and are subject to approval by the Architect. Gasket manufacturers/suppliers are subject to approval by the Architect.
4. Submit test samples of all substrate materials to the sealant manufacturer for compatibility and peel adhesion testing.
5. Protect all adjoining surfaces not to receive sealants against staining by masking and/or other methods. Sealant joints shall be concealed from view to the extent possible.
6. Joints and joint surfaces shall be clean, dry, and free of any materials that may have an adverse effect on the performance of the sealant and gasket materials.
7. Apply sealants and gaskets under the climatic conditions recommended by the manufacturer(s). Sealant shall not be installed when substrates are wet. All surfaces to receive sealants shall be treated (cleaned, primed or unprimed) in accordance with the recommendations of the sealant manufacturer. Use no sealant that has started to set in its container, or any sealant that has exceeded the shelf life published by the manufacturer.
8. All glazing gaskets shall be vulcanized, injection molded or heat-welded at the corners to form a continuous closure.
9. Fill all joints continuously and completely with sealant, forming a neat, uniform, concave bead. Finish the material flush with adjoining surface unless otherwise shown on the Drawings. All sealant surfaces shall be tooled smooth. Upon completion of tooling, immediately remove masking tape from adjacent surfaces.
10. Color of sealant shall be gray, unless otherwise noted or requested by the Architect.

H. Glass and Glazing

1. Glazing shall be performed by skilled workmen in accordance with the best trade practices, and without springing or forcing. All instructions of the glass and glazing materials manufacturers shall be followed.

2. Tong marks shall be concealed within sill rabbet.
3. Glass and glazing materials shall be compatible with each other and adequate for their intended purpose. Each material type shall be as per details and approved Shop Drawings.
4. Prior to glazing, all structural silicone glazed glass shall receive a continuous 1 inch wide skim coat of matte gray silicone at the perimeter of the lite to conceal sealant and glazing accessories.
5. Protect all adjoining surfaces not to receive glazing materials against staining or damage of any kind.
6. Glazing rabbets shall be clean, dry, and free of any materials that might adversely affect the bond and seal of the glazing materials or the drainage of the rabbet.
7. Install glass and glazing materials under the climatic conditions recommended by the fabricator.
8. Prime all surfaces to receive glazing materials, unless recommended otherwise, in writing, by the manufacturers and approved by the Architect.
9. Use no sealant that has started to set in its container, nor a sealant that has exceeded the shelf life published by the manufacturer.
10. Sealant color shall be as selected by the Architect.
11. Exposed sealants shall be installed so that the top surfaces of the sealant beads are sloped to drain water away from the glass. Exposed sealant surfaces shall be tooled smooth.
12. Setting blocks shall be extruded silicone rubber or Alcryn, at least 1/4 inch in thickness, full width of the rabbet, and placed at the glass quarter points. They shall be of a length recommended by the glass manufacturer and be configured in such a way as not to impede water drainage of the glazing rabbet.
13. Jamb blocks shall be used on each glass unit supported on four sides. The blocks shall be extruded silicone rubber or Alcryn, and shall be placed at the top and bottom of the rabbet, 1/8 inches clear of the glass edge.
14. Face spacers shall be extruded silicone rubber or Alcryn, applied around the perimeter of each glazed opening on both inside and outside faces.
15. Glass shall be centered in each opening to provide the purchases and clearances recommended by the glass manufacturer and approved by the Architect.
16. Apply no tapes, ribbons or markings to the glass.

I. Structural silicone glazing

1. Structural silicone glazing shall utilize medium or high modulus silicone sealant.
2. Sealant shall be of the configuration and dimensions necessary to provide the following allowable stresses and attendant safety factors when the CWSE are subject to the requirements of Part 1.04 (Performance Criteria), above.

Stress Type	Allowable Stress	Safety Factor

	(Maximum)	(Minimum)
Tension	20 psi	5
Compression	20 psi	5
Shear	20 psi	5
Dead Load Shear	1 psi	5

3. Structural silicone glazing shall conform to the specific requirements of Part 3.01.H (Glass and Glazing), above.
4. Structural silicone shall not be used for primary dead load support.
5. Wherever possible, silicone glazing design shall permit glazing to the major framing members in the factory.
6. All substrate framing extrusions for structural silicone glazing shall provide for an aluminum insert with a finish approved for adhesion of structural silicone glazing sealant by the sealant manufacturer.
7. The Contractor shall provide test samples of all substrate materials to the sealant manufacturer for peel adhesion and accelerated weathering testing, and shall submit the results of all tests. All testing shall be with materials and finishes identical in every respect to approved production materials and finishes.
8. The Contractor shall provide all information and test results required by applicable governmental authorities to obtain approval of two-sided and four-sided structural silicone glazed curtain wall systems.
9. Completed glazed units shall be periodically de-glazed in accordance with Part 1.05.D.6.
10. Prior to undertaking any structural silicone glazing, the Contractor shall submit complete structural silicone glazing procedures, including permissible conditions, temperatures, cure times, temporary restraint design, surface preparation and all other procedures, including quality control inspection program that may be employed to properly undertake the CWSE.

3.02 INSTALLATION

A. General

1. Prior to start of installation, inspect the building and verify all conditions and dimensions as being acceptable to receive the Work of this Section.
2. Should any conditions be found that may prohibit proper execution of the Work, the Contractor shall immediately notify the Architect in writing of these conditions. Installation shall not proceed until remedial action, acceptable to the Architect, has been executed.
3. CWSE shall be erected plumb, square, level, and correctly aligned within the following limitations:
   a. Offset from true horizontal, vertical, and design location shall not exceed ± 1/8 inch per 12 feet nor ± 1/2 inch over any one length or part thereof the building.

b. Maximum offset from true alignment between abutting components or components separated by less than 3 inches shall not exceed 1/32 inch.

c. All tolerances are non-cumulative.

d. Provide a minimum slope of ¼ inch per foot at all horizontal surfaces for positive drainage.

B. Anchors and Connections

1. Anchors and connections shall be provided to fully satisfy their required purpose of adjustability, movement and load transfer.

2. Connections between different materials shall be designed to allow for the differential thermal movement of the respected materials.

3. Anchors and connections that do not provide for movement shall prevent such movement by appropriate means.

4. All anchors, connections and fixings outboard of the air-seal shall be 300 series stainless steel.

C. Corrosion Protection

1. Isolation of dissimilar metal surfaces to prevent electrolytic action shall be accomplished by materials which are impervious to moisture and non-absorptive.

2. All steel parts shall receive a protective treatment commensurate with their respective functions and locations. The treatment shall be one or more of those described above, and as approved by the Architect

3. Where used to the exterior of air-seals, or in any location vulnerable to moisture, steel shall be hot-dip galvanized after fabrication.

4. Field welds on galvanized steel shall be treated with an approved field cold galvanizing process(e.g. ZRC). Remediation of finish of galvanized steel shall be as per the requirements of ASTM A 780.

5. Aluminum surfaces in contact with mortar, concrete, fireproofing, plaster, masonry, or absorptive materials of any kind shall be coated with an anti-galvanic material, impervious to moisture. Materials shall conform to paragraph 2.03, items B and C.

D. Lightning Protection

1. All metal cladding components, including panels, glazing frames, mullions, transoms, fixings and support structures shall be fully bonded electrically to ensure electrical continuity of the building envelope.

2. Provide for the installation of lightning arrestors, air terminals and the like by others without electrical bonding to the metal cladding components.

E. Flashings

1. Where required or indicated on the Drawings, all copings parapets, sills, offsets and setbacks to have continuous through wall flashing to direct water penetration and seepage back to the

exterior, unless otherwise noted. Flashing shall be formed from appropriate thickness of stainless steel. Stainless steel flashing shall be no thinner than 22 gauge.

2. Where indicated on the Drawings and where required to accommodate movement, an elastomeric flashing system shall be used.
3. Elastomeric or metal flashing connecting to work of other Sections shall be provided by the Contractor for the work of this Section, including the attachment to his Work and to other work.
4. Where elastomeric or metal flashing connects to roofing and waterproofing work provide 8 inches of flashing beyond the point of attachment to the Work of this Section.
5. Elastomeric flashing exposed to view shall be carefully bonded to the substrates without blistering; joints shall be neat and as infrequent as possible.
6. Elastomeric flashing not supported by substrate material shall receive another layer of 60 mil flashing for reinforcement, fully bonded to the finish layer and the substrate and extending at least 1 inch beyond the unsupported area.

3.03 PROTECTION, CLEANING AND ACCEPTANCE

A. Protection and Cleaning

1. The CWSE Contractor shall be responsible for providing the completed Work in a clean and undamaged condition at the time of Acceptance of the Work.
2. Throughout fabrication, shipping, storage, installation, and construction, protect the CWSE from any material, equipment, or practices that may impair the functioning, appearance, or durability of the CWSE.
3. Package and store the CWSE in such a manner that shall prevent damage, contamination, distortion, breakage or structural weakening.
4. Pre-glazed units shall be stored upright or shall be crated and packaged with a rigid protection board top to prevent damage from ponding water, or by the work of other trades.
5. The CWSE shall not be staged more than one week in advance of installation in order to avoid damage by other trades. Units shall not be uncrated more than one day in advance of installation.
6. Replace any material damaged during fabrication, shipping, storage, or installation.
7. Provide protection material on CWSE as required to protect from damage during shipping, installation, and construction prior to Acceptance of the Work.
   a. Protection material, such as plastic membrane tapes and adhesive sheeting, shall be suitable for the intended protection application and protection period.
   b. Protection materials shall be installed in a manner that will not trap harmful moisture or otherwise contaminate the Work in any way.
   c. The Contractor shall submit samples and manufacturer's performance data, as well as

application and removal procedures, for all protection materials.

8. Immediately prior to Acceptance of the Work, clean interior and exterior surfaces of the CWSE as required for the purpose of visual inspection and confirmation that the Work is undamaged.

B. Acceptance

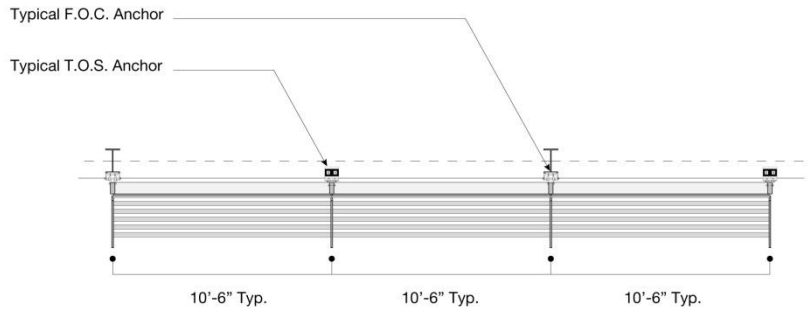
1. Acceptance of the completed installation of the CWSE requires the installation be sound, watertight and free from defects of material and workmanship.
2. Final Acceptance of the Work shall rest with the Architect and the Owner.

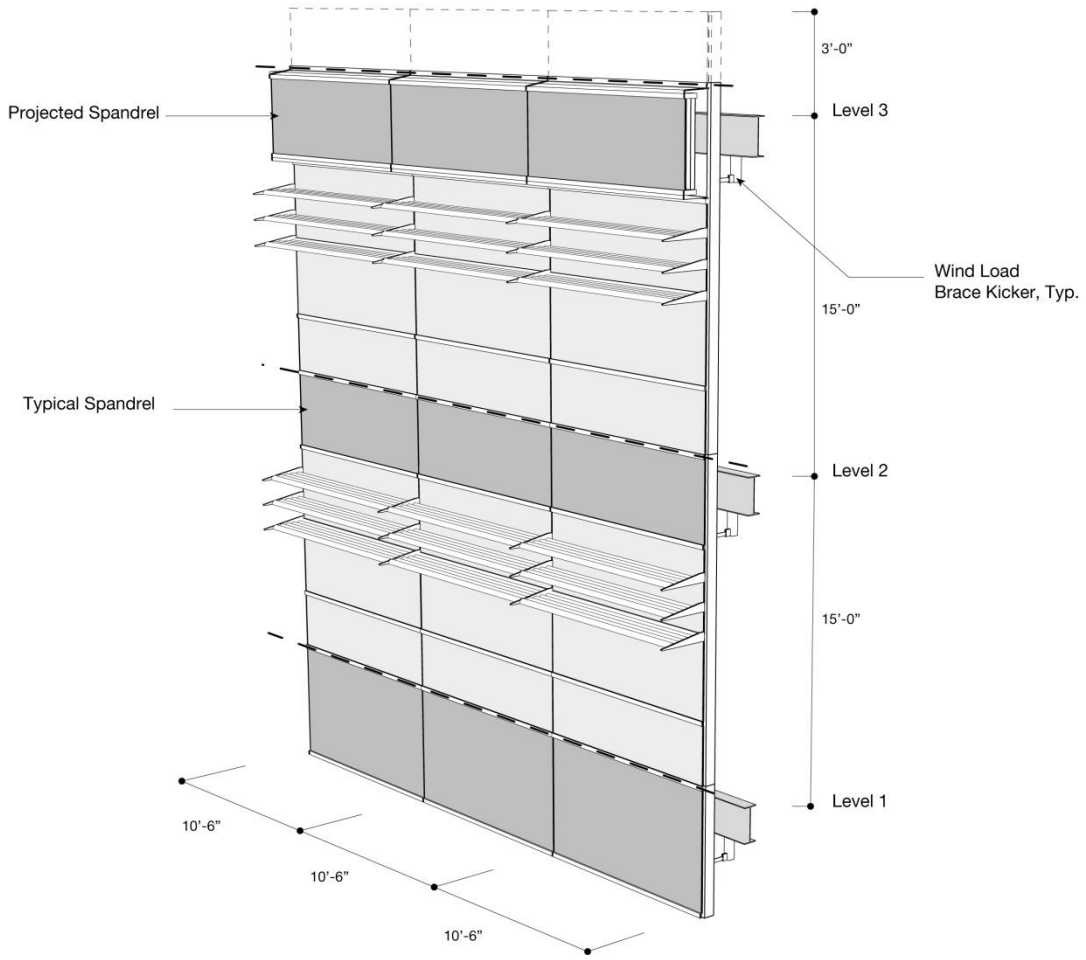
C. Final Cleaning

1. Immediately prior to final completion of the Work, completely clean the entire CWSE as follows:
   a. Clean all components of the Work as per the recommendations of the specific product manufacturer.
   b. Clean the CWSE from the topmost levels down in order to avoid staining of the cleaned surfaces from cleaning solution residue and run-off.
   c. Clean glass with approved glass cleaning solutions only, and ensure that said cleaning solution is completely removed from the surface after cleaning.

PART 4 APPENDICES TO THE SPECIFICATION

4.01 PERFORMANCE MOCK-UP TEST DIAGRAM





END OF SECTION

SECTION 084510

INTERIOR GLAZED WALLS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the all glass partitions, as shown on the drawings, and/or specified herein, as needed for a complete and proper installation, including the following:

1. Clear laminated glass partitions at entry vestibules.

1.3 RELATED SECTIONS

A. Curtain Walls, Storefronts and Entrances (CWSE) – Section 084413.

B. Finish hardware - Section 087100.

C. Glazing - Section 088000.

1.4 QUALITY ASSURANCE

A. Qualifications of Installers: For actual installation of partitions and doors, use only personnel who are thoroughly trained and experienced in installation of the selected products and who are completely familiar with the requirements of this work.

1.5 SUBMITTALS

A. Product Data: For each type of product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings; Show details of fabrication and installation, including the following:

1. Plans, elevations, and sections.

2. Hardware: Quantities, locations, and installation requirements.

3. Anchorages and reinforcement.

4. Glazing details.

C. Samples for Verification: Of size indicated below and of same thickness and material indicated for Work. Show the full range of color and texture variations expected.

1. Metal Finishes: 6-inch long sections of metal items.

2. Glass: 6 inches square, showing exposed-edge finish.

1.6 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify opening dimensions of glass partitions by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Submit a written warranty executed by the manufacturer agreeing to repair or replace components of glass partitions that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures.

2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

3. Failure of operating components to function normally.

B. Warranty Period: 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PRODUCT

A. Provide components from Blumcraft 1301 system sidelite glazing, ¾" rail. Stainless steel. Coordinate with CWSE aluminum door frame members and stainless steel doors.

2.2 MATERIALS

A. Laminated Glass: Complying with ANSI Z97.1 performance requirements for safety glass, consisting of two lights of 3mm annealed clear float glass bonded to 0.060" polyvinyl butyl interlayer. Float glass shall comply with ASTM C 1036 requirements for Type 1, Q3. Curved and straight glass to be the following types:

1. Clear laminated, low iron.

2.3 COMPONENTS

A. Fittings: Provide fittings and accessories for glass partitions and doors, of configurations shown on drawings, fabricated of stainless steel.

B. Anchors and Fastenings: Manufacturer's standard concealed anchors and fastening.

2.4 FABRICATION

A. General: Fabricate glass partition components in sizes, profiles, and configurations indicated.

1. Provide holes and cutouts in glass to receive hardware, fittings, rails, and accessories.

2. Factory assemble components and factory install hardware to greatest extent possible.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where glass partitions are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install glass partitions and associated components according to manufacturer's written instructions; coordinate installation with glass wall fabricator.

B. Set units level and plumb.

C. Maintain uniform clearances between adjacent components.

D. Lubricate hardware and other moving parts according to manufacturer's written instructions.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware to provide tight fit at contact points and smooth operation.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer that ensure glass partitions are without damage or deterioration at the time of Final Acceptance.

END OF SECTION

SECTION 087100

FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. The required hardware items for doors are indicated in hardware sets shown herein. Should any opening be omitted, hardware shall be provided as specified for other doors of similar locations, function, quality and design.

1.02 RELATED SECTIONS

A. Section 081113: Steel doors and frames.

B. Section 081416: Wood doors.

C. Section 081119: Stainless Steel Doors and Frames.

D. Section 084413: Glazed Aluminum Curtain Walls.

1.03 SUBMITTALS

A. General: Submit the following in accordance with the provisions of the general contract documents.

B. Product Data: Submit two (2) copies of the manufacturer's data for each item of hardware. Include whatever information may be necessary to show compliance with requirements.

C. Hardware Schedule: Submit three (3) copies of the hardware schedule. Follow Door and Hardware Institute (DHI) guidelines for scheduling. At the end of the schedule list each door number with appropriate heading number and hardware set number. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of other work. Furnish final schedule after samples, manufacturer's data sheets have been approved.

D. Keying Schedule: A key schedule showing all key numbers and spaces to which each permits entry, shall be provided. Consult with OWNER before submitting final key schedule. After final approval has been received, the schedule along with the key gathering envelopes containing keys for each lock endorsed with lock number and space designation shall be turned over to the OWNERS.

E. Samples: Prior to submittal of the final hardware schedule and prior to delivery of hardware, submit one (1) sample of each exposed hardware unit. Sample will be reviewed by the ARCHITECT for design, color and texture only. Compliance with other requirements is the exclusive responsibility of the CONTRACTOR.

Samples approved by the ARCHITECT shall be turned over to the OWNER to be used as attic stock.

1.04 QUALITY ASSURANCE

A. Standards: All finish hardware shall conform to one or all the following standards:

1. Testing Laboratories: Underwriters Laboratory (UL) and or Warnock Hersey Fire Laboratories Division: All fire rated doors shall have hardware assemblies approved by one of the listed laboratories.

2. National Fire Protection Association: NFPA 80 and NFPA 101.

3. Builders Hardware Manufacturers Association (BHMA).

4. American National Standards Institute (ANSI).

5. American Disabilities Act (ADA).

B. Supplier: Finish hardware shall be furnished by those having a minimum of 5 years of builders hardware experience and shall have in their employ at least one certified Architectural Hardware Consultants (AHC) to correctly interpret the plans, detailed drawings and specifications. It is imperative that all Finish Hardware items be furnished by a factory authorized contract hardware distributor for each of the specified products.

1.05 PRODUCT HANDLING

A. Handle, store, distribute, protect and install in accordance with the manufacture's instructions. Deliver packaged material in original containers with seals unbroken and labels intact. Deliver assemblies completely identified and with adequate protection for storage, handling and installation.

B. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control the handling and installation of hardware which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses; both before and after installation.

1.06 PROJECT CONDITIONS

A. Coordinate hardware with other work. Tag each item or package separately, with identification related to the final hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated and as necessary for proper installation and function. Deliver packaged hardware items to the proper locations for installation.

B. Furnish hardware templates to each fabricator of doors, frames and other work to be factory prepared for the installation of hardware.

1.07 WARRANTIES

A. The hardware manufacturers shall provide full replacement warranty as listed below. Replacement warranty shall not include any labor cost.

1.	Surface Closers	25 years.
2.	Locksets etc.	2 years
3.	Balance of hardware	2 years

PART 2 - PRODUCTS

2.01 MATERIALS AND FABRICATION

A. Hand of Door: The drawings show the swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door swing shown.

B. Base Metals: Produce hardware units of the basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness but in no case of lesser quality material.

C. Fasteners: Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware, which has been prepared for self-tapping sheet metal screws.

D. Screws: Furnish screws for installation, with each hardware item. Finish exposed screws to match the hardware finish.

E. Tools for Maintenance: Furnish a complete set of specialized tools as needed, for the OWNERS continued maintenance, removal and replacement of hardware.

F. Concealed Fasteners: Provide concealed fasteners for hardware units which are exposed when the door is closed except to the extent no standard manufacturer's units are available with concealed fasteners. Use thru bolts only where necessary to adequately fasten hardware to the door.

2.02 HINGES

A. All hinges shall be full mortise five knuckle ball bearing type, template, with non-rising loose pins. All outswing doors shall be furnished with non-removable pins (NRP).

B. All hinges for 1-3/4" thick doors shall be 4-1/2" wide in the open position. For other thickness doors, hinges shall be of a width to permit unobstructed swing of the doors.

C. Size and weight of hinges shall conform to the following:

Up to 36" ----------4-1/2" heavy weight
Over 36" to 44" --------5" heavy weight
Over 44" --------continuous hinges

E. Quantity of hinges shall be provided to conform to the following:

Doors up to 60" in heights ----------2 hinges
Doors 60" to 90" in height ----------3 hinges
Doors 90" and over ---------l hinge every 30" in height

F. All hinges shall be the products of one manufacturer.

2.03 LOCKSETS, LATCHSETS ETC.

A. Unless otherwise noted, all locksets and latchsets shall conform to ANSI A156.13 Series 1000 Grade 1. Furnish wrought steel box strikes and curved lip strikes with proper lip lengths as required.

2.04 KEYS, KEYING, AND CYLINDERS

A. Keys: shall be nickel silver. Furnish a quantity of keys as follows.

1.	Master Keys	5
2.	Change Keys	3 each per cylinder
3.	Control Keys	5
4	Construction Keys	5

B. Keying: All locks shall be construction keyed and great grand master keyed to the existing Sargent keying system. Hardware supplier to meet with the Owner to establish keying requirements.

C. Cylinders: All cylinders shall be removable core with visual key control. Furnish brass construction cores. Plastic cores will not be accepted.

2.05 DOOR CLOSING DEVICES

A. All closers shall meet ANSI A156.4 Grade 1 requirements, barrier free.

B. All closers shall be installed so that closer bodies are positioned on room side of doors to and from corridors, i.e., in-swing doors shall be regular arm. Out-swing doors shall have a parallel arm. Regular arm shall be used in connecting doors between rooms.

C. Furnish all required brackets, filler plates and any others items required to insure proper installation and operation.

2.06 PROTECTION PLATES

A. Furnish kick plates on all utility type doors only. All kick plates shall be 12" high x 2" less door width x .050 thick x beveled three edges.

2.07 FLUSH BOLTS

A. Flush Bolts: Shall be Trimco W3917/W3916 series furnish 3910 dustproof strikes for all bottom bolts. Top bolts shall be furnished with proper extensions to allow for easy operation.

B. Automatic Flush Bolts: Shall be Trimco 3810 series furnish 3910 dustproof strikes for all bottom bolts. Top bolts shall be furnished with proper extensions to allow for easy operation.

2.08 OVERHEAD STOPS

A. Unless otherwise noted, furnish Dorma 900S series on wood doors and Dorma 910S series for metal doors.

2.09 DOOR STOPS

A. Unless otherwise noted, all door stops shall be Timco 1270WV, wall mounted with concealed fasteners. Where wall stops will not function properly furnish floor mounted Trimco W1211 stop.

2.10 APPROVED MANUFACTURERS:

A. Hinges: PBB, Stanley and McKinney.
B. Locksets, Latchsets and Cylinders: Sargent .
C. Surface Closers: Dorma, LCN and Norton or approved equal.
D. Exit Devices: Von Duprin, Sargent
E. Door Stops: Trimco, Rockwood and Ives.
F. Automatic Operators: Tormax or approved equal.
G. Seals and Saddles: Zero
H. Protection Plates: Trimco, Rockwood and Ives.

PART 3 - EXECUTION

3.01 GENERAL

A. Approval: As soon as practical after award of Contract and before a hardware schedule is prepared, and before any hardware is ordered or delivered to the project, the CONTRACTOR shall submit to the ARCHITECT for his written approval, copies of sample list, listing each of the different items of builders hardware and catalog cuts of each item.

B. Templates: As soon as the hardware schedule is approved the hardware supplier shall furnish to the various fabricators, required templates for fabrication purposes. Templates shall be made available not more than (1O) days after receipt of the approved hardware schedule.

C. Packaging and Marking: All hardware shall be shipped with proper fastenings for secure application. Each package of hardware shall be legibly marked indicating the part of the work for which it is intended. Markings shall correspond with the item numbers shown on the approved hardware schedule. Keys shall be tagged within each package set and plainly marked on the face of the envelope with the key control number, door designation and all identification as necessary.

D. Delivery: Delivery shall be made to the project site to the attention of the GENERAL CONTRACTOR. Where delivery of special hardware is required at any fabricators plant, the hardware supplier shall make such delivery.

3.02 INSTALLATION

A. Mount hardware units at heights recommended in "Recommended Locations for Builders Hardware" by BHMA, unless otherwise noted or directed by the ARCHITECT.

B. Install each hardware unit in compliance with the manufacturer's recommendations.

3.03 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer. Replace units that cannot be adjusted.

B. Wherever hardware installation is made more than one (1) month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance make a final check, and adjust all hardware items in such space or area. Adjust door control devices and compensate for final operation of heating and ventilating equipment.

C. Instruct OWNERS personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

3.04 HARDWARE SETS

A. The following is a general listing of hardware requirements and is not intended for use as a final hardware schedule. Any items of hardware required by established standards or practices, or to meet state and local codes or proper door operation shall be furnished whether or not specifically called out in the following listed groups.

HARDWARE SET #1
Each to have:

	Hinges	PBB (see description) x US32D
1	Office Lock	Sargent 8205-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Door Stop	Trimco (see description) x US32D
3	Silencers	Trimco 1229A

HARDWARE SET #1A
Each to have:

	Hinges	PBB (see description) x US32D
1	Office Lock	Sargent 8205-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Overhead Stop	Dorma (see description) x US26D
3	Silencers	Trimco 1229A

HARDWARE SET #1B

Each to have:

	Hinges	PBB (see description) x US32D
1	Office Lock	Sargent 8205-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Door Stop	Trimco (see description) x US32D
3	Silencers	Trimco 1229A

HARDWARE SET #1C
Each to have:

	Hinges	PBB (see description) x US32D
1	Office Lock	Sargent 8205-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer	Dorma 8616DA-AF-FC x Alum
1	Door Stop	Trimco (see description) x US32D
3	Silencers	Trimco 1229A

HARDWARE SET #1D
Each to have:

	Hinges	PBB (see description) x US32D
1	Office Lock	Sargent 8205-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8616DA-IS-FC x Alum
3	Silencers	Trimco 1229A

HARDWARE SET #1E
Each to have:

	Hinges	**PBB (see description) x US32D**
1	**Office Lock**	**Sargent 8205-LNME x US32D**
1	**Temporary Brass Core**	**Sargent (to suit)**
1	**Permanent Core**	**Sargent (to suit) x US26D**
1	**Surface Closer w/stop**	**Dorma 8616DA-IS-FC x Alum**
1	**Set Seals**	**Zero 870A @ jambs & head**
1	**Door Bottom**	**Zero 369A**

HARDWARE SET #2
Each to have:

	Hinges	PBB (see description) x US32D
1	Storeroom Lock	Sargent 8204-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8616DA-DS-FC x Alum
3	Silencers	Trimco 1229A

HARDWARE SET #2A
Each to have:

	Hinges	PBB (see description) x US32D
1	Storeroom Lock	Sargent 8204-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8616-IS-FC x Alum
3	Silencers	Trimco 1229A

HARDWARE SET #2B
Each to have:

	Hinges	PBB (see description) x US32D
1	Storeroom Lock	Sargent 8204-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Overhead Stop	Dorma (see description) x US26D
3	Silencers	Trimco 1229A

HARDWARE SET #2C
Each to have:

	Hinges	PBB (see description) x US32D
1	Storeroom Lock	Sargent 8204-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8616DA-DS-FC x Alum
1	set Smoke Seals	Zero 188S-BK @ jambs & head

HARDWARE SET #2D
Each to have:

	Hinges	PBB (see description) x US32D
1	Storeroom Lock	Sargent 8204-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8616DA-DS-FC x Alum
3	Silencers	Trimco 1229A

HARDWARE SET #2E
Each to have:

	Hinges	PBB (see description) x US32D
1	Storeroom Lock	Sargent 8204-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer	Dorma 8616DA-AF-FC x Alum
1	Door Stop	Trimco (see description) x US32D
3	Silencers	Trimco 1229A

HARDWARE SET #2F
Each to have:

	Hinges	PBB (see description) x US32D
1	Storeroom Lock	Sargent 8204-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8616DA-IS-FC x Alum
1	set Smoke Seals	Zero 188S-BK @ jambs & head

HARDWARE SET #2G
Each to have:

1	Continuous Hinge	Zero 910DBAA
1	Storeroom Lock	Sargent 8204-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8916-SDS x Alum
1	set Weather Seals	Zero 429A @ jambs & head
1	Door Bottom	Zero 8193A
1	Saddle	Zero (as detailed)

HARDWARE SET #3
Each to have:

	Hinges	PBB (see description) x US32D
1	Passage Set	Sargent 8215-LNME x US32D
1	Surface Closer	Dorma 8616DA-AF-FC x Alum
1	Door Stop	Trimco (see description) x US32D
1	set Smoke Seals	Zero 188S-BK @ jambs & head

HARDWARE SET #3A
Each to have:

	Hinges	PBB (see description) x US32D
1	Passage Set	Sargent 8215-LNME x US32D
1	Surface Closer	Dorma 8616DA-AF-FC x Alum
1	Door Stop	Trimco (see description) x US32D
3	Silencers	Trimco 1229A

HARDWARE SET #3B
Each to have:

	Hinges	PBB (see description) x US32D
1	Passage Set	Sargent 8215-LNW x US32D
1	Surface Closer w/stop	Dorma 8616DA-DS-FC x Alum
1	set Smoke Seals	Zero 188S-BK @ jambs & head

HARDWARE SET #4
Each to have:

	Hinges	PBB (see description) x US32D
1	Privacy Set	Sargent 8265-LNME x US32D
1	Surface Closer w/stop	Dorma 8616DA-DS-FC x Alum
1	set Smoke Seals	Zero 188S-BK @ jambs & head

HARDWARE SET #4A
Each to have:

	Hinges	PBB (see description) x US32D
1	Privacy Set	Sargent 8265-LNME x US32D
1	Surface Closer	Dorma 8616DA-AF-FC x Alum
1	Door Stop	Trimco 1270WV x US32D
1	set Smoke Seals	Zero 188S-BK @ jambs & head

HARDWARE SET #5
Each to have:

	Hinges	PBB (see description) x US32D
1	Classroom Lock	Sargent 8205-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8616DA-IS-FC x Alum
1	Door Stop	Trimco (see description) x US32D
1	set Smoke Seals	Zero 188S-BK @ jambs & head

HARDWARE SET #5A
Each to have:

	Hinges	PBB (see description) x US32D
1	Classroom Lock	Sargent 8205-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer	Dorma 8616DA-AF-FC x Alum
1	Door Stop	Trimco (see description) x US32D
3	Silencers	Trimco 1229A

HARDWARE SET #6
Each to have:

	Hinges	PBB (see description) x US32D
2	Manual Flush Bolts	Trimco (see description) x US26D
1	Dust Proof Strike	Trimco 3910 x US32D
1	Storeroom Lock	Sargent 8204-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer/Stop	Dorma 8616DA-DS-FC x Alum
2	Silencers	Trimco 1229A

HARDWARE SET #6A
Each to have:

	Hinges	PBB (see description) x US32D
2	Manual Flush Bolts	Trimco (see description) x US26D
1	Dust Proof Strike	Trimco 3910 x US32D
1	Storeroom Lock	Sargent 8204-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8616DA-IS-FC x Alum
2	Silencers	Trimco 1229A

HARDWARE SET #6B
Each to have:

	Hinges	PBB (see description) x US32D
2	Manual Flush Bolts	Trimco (see description) x US26D
1	Dust Proof Strike	Trimco 3910 x US32D
1	Storeroom Lock	Sargent 8204-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8916-SDS x Alum
1	set Weather Seals	Zero 429A @ jambs & head
2	Door Bottoms	Zero 8193A
1	set Astragal Seals	Zero 328A x 328A
1	Saddle	Zero (as detailed)

HARDWARE SET #7
Each to have:

	Hinges	PBB (see description) x US32D
1	Exit Device	Von Duprin 98NL-F x 02 x US26D
1	Masterkeyed Cylinder	Sargent (to suit) x US26D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8916-SDS x Alum
1	set Smoke Seals	Zero 188S-BK @ jambs & head

HARDWARE SET #7A
Each to have:

1	Continuous Hinge	Zero 910DBAA
1	Exit Device	Von Duprin 98EO x US26D
1	Surface Closer w/stop	Dorma 8916-SDS x Alum
1	set Weather Seals	Zero 429A @ jambs & head
1	Door Bottom	Zero 8193A
1	Saddle	Zero (as detailed)

HARDWARE SET #8
Each to have:

	Hinges	PBB (see description) x US32D
2	Manual Flush Bolts	Trimco (see description) x US26D
1	Dust Proof Strike	Trimco 3910 x US32D

1	Exit Device	Von Duprin 9875L-F x 02 x US26D
1	Masterkeyed Cylinder	Sargent (to suit) x US26D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8916-SDS x Alum
1	set Smoke Seals	Zero 188S-BK @ jambs & head
1	set Astragal Seals	Zero 328A x 328A

HARDWARE SET #9
Each to have:

1	Center Hung Floor Closer	Dorma BTS80 series x US26D
1	Set Center Pivots	Dorma CP440 (inactive leaf) x US26D
1	Angle Stop	Trimco 1217S (inactive leaf) x US26D
2	Manual Flush Bolts	Trimco W3913 x US26D
1	Dust Proof Strike	Trimco 3910 x US32D
2	Door Pulls (back to back)	Rockwood RM3301 x 36” x US32D
1	Door Stop	Trimco (see description) x US32D

HARDWARE SET #10
Each to have:

	Hinges	PBB (see description) x US32D
1	Dead Lock	Sargent 4877 x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Set Push & Pull	Trimco 1895-4B x US32D
1	Surface Closer w/stop	Dorma 8616DA-DS-FC x Alum
2	Silencers	Trimco 1229A

HARDWARE SET #11
Each to have:

1	Set Offset Pivots	Rixson 117 1/4 x US32D
1	Dead Lock	Sargent 4877 x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Recessed Pull	Trimco 1115 x US32D
1	Door Stop	Trimco 1270WV x US32D
3	Silencers	Trimco 1229A

C. The following hardware contains electrical components. Coordinate with electrical and security drawings.

HARDWARE SET #E1
Each to have:

	Hinges	PBB (see description) x US32D
1	Power Transfer	Securitron EL-CEPT x US32D
1	Electro Lynx Frame Wiring	Sargent QC-C 1500P (size as required)
1	Electric Lock (fail secure)	Sargent QC-Cxxx (size as required)

		RX8271-LNME x US32D
1	Surface Closer	Dorma 8616DA-AF-FC x Alum
1	Door Stop	Trimco (see description) x US32D
3	Silencers	Trimco 1229A
1	Power Supply	(by security vendor)
1	Door Contact	(by security vendor)
1	Card Access System	(by security vendor)

Operation: Fail Secure
- Card reader on non secure side of door unlocks electric lock.
- Free egress on secure side of door. RX switch in electric lock shunts alarm.

HARDWARE SET #E1A
Each to have:

	Hinges	PBB (see description) x US32D
1	Power Transfer	Securitron EL-CEPT x US32D
1	Electro Lynx Frame Wiring	Sargent QC-C 1500P (size as required)
1	Electric Lock (fail secure)	Sargent QC-Cxxx (size as required)
		RX8271-LNME x US32D
1	Surface Closer w/stop	Dorma 8616DA-IS-FC x Alum
3	Silencers	Trimco 1229A
1	Power Supply	(by security vendor)
1	Door Contact	(by security vendor)
1	Card Access System	(by security vendor)

Operation: Fail Secure
- Card reader on non secure side of door unlocks electric lock.
- Free egress on secure side of door. RX switch in electric lock shunts alarm.

HARDWARE SET #E1B
Each to have:

	Hinges	PBB (see description) x US32D
1	Power Transfer	Securitron EL-CEPT x US32D
1	Electro Lynx Frame Wiring	Sargent QC-C 1500P (size as required)
1	Electric Lock (fail secure)	Sargent QC-Cxxx (size as required)
		RX8271-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8616DA-DS-FC x Alum
3	Silencers	Trimco 1229A
1	Power Supply	(by security vendor)
1	Door Contact	(by security vendor)
1	Card Access System	(by security vendor)

Operation: Fail Secure
- Card reader on non secure side of door unlocks electric lock.
- Free egress on secure side of door. RX switch in electric lock shunts alarm.

HARDWARE SET #E1C

Each to have:

	Hinges	PBB (see description) x US32D
1	Power Transfer	Securitron EL-CEPT x US32D
1	Electro Lynx Frame Wiring	Sargent QC-C 1500P (size as required)
1	Electric Lock (fail secure)	Sargent QC-Cxxx (size as required) RX8271-LNME x US32D
1	Surface Closer	Dorma 8616-AF-FC x Alum
1	Door Stop	Trimco (see description) x US32D
1	Set Smoke Seals	Zero 188S-BK @ jambs & head
1	Power Supply	(by security vendor)
1	Door Contact	(by security vendor)
1	Card Access System	(by security vendor)

Operation: Fail Secure
- Card reader on non secure side of door unlocks electric lock.
- Free egress on secure side of door. RX switch in electric lock shunts alarm.

HARDWARE SET #E1D
Each to have:

	Hinges	PBB (see description) x US32D
1	Power Transfer	Securitron EL-CEPT x US32D
1	Electro Lynx Frame Wiring	Sargent QC-C 1500P (size as required)
1	Electric Lock (fail secure)	Sargent QC-Cxxx (size as required) RX8271-LNME x US32D
1	Surface Closer w/stop	Dorma 8616DA-IS-FC x Alum
1	Set Seals	Zero 870A @ head & jambs
1	Door Bottom	Zero
1	Power Supply	(by security vendor)
1	Door Contact	(by security vendor)
1	Card Access System	(by security vendor)

Operation: Fail Secure
- Card reader on non secure side of door unlocks electric lock.
- Free egress on secure side of door. RX switch in electric lock shunts alarm.

HARDWARE SET #E2
Each to have:

	Hinges	PBB (see description) x US32D
2	Manual Flush Bolts	Trimco (see description) x US26D
1	Dust Proof Strike	Trimco 3910 x US32D
1	Power Transfer	Securitron EL-CEPT x US32D
1	Electro Lynx Frame Wiring	Sargent QC-C 1500P (size as required)
1	Electric Lock (fail secure)	Sargent QC-Cxxx (size as required) RX8271-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8916-SDS-FC x Alum
1	set Weather Seals	Zero 429A @ jambs & head

2	Door Bottoms	Zero 8193A
1	set Astragal Seals	Zero 328A x 328A
1	Saddle	Zero (as detailed)

Operation: Fail Secure
- Card reader on non secure side of door unlocks electric lock.
- Free egress on secure side of door. RX switch in electric lock shunts alarm.

HARDWARE SET #E2A
Each to have:

	Hinges	PBB (see description) x US32D
2	Semi Auto Flush Bolts	Trimco (see description) x US26D
1	Dust Proof Strike	Trimco 3910 x US32D
1	Power Transfer	Securitron EL-CEPT x US32D
1	Electro Lynx Frame Wiring	Sargent QC-C 1500P (size as required)
1	Electric Lock (fail secure)	Sargent QC-Cxxx (size as required) RX8271-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Coordinating Closer	Dorma TS93GSR series x 630
1	Wall Stop	Trimco 1270WV x US32D
2	Silencers	Trimco 1229A

Operation: Fail Secure
- Card reader on non secure side of door unlocks electric lock.
- Free egress on secure side of door. RX switch in electric lock shunts alarm.

HARDWARE SET #E2B
Each to have:

	Hinges	PBB (see description) x US32D
2	Semi Auto Flush Bolts	Trimco (see description) x US26D
1	Dust Proof Strike	Trimco 3910 x US32D
1	Power Transfer	Securitron EL-CEPT x US32D
1	Electro Lynx Frame Wiring	Sargent QC-C 1500P (size as required)
1	Electric Lock (fail secure)	Sargent QC-Cxxx (size as required) RX8271-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Coordinating Closer	Dorma TS93GSR series x 630
1	Door Stop	Trimco (see description) x US26D
2	Silencers	Trimco 1229A

Operation: Fail Secure
- Card reader on non secure side of door unlocks electric lock.
- Free egress on secure side of door. RX switch in electric lock shunts alarm.

HARDWARE SET #E3
Each to have:

	Hinges	PBB (see description) x US32D
1	Power Transfer	Securitron EL-CEPT x US32D
1	Electro Lynx Frame Wiring	Sargent QC-C 1500P (size as required)
1	Electric Lock (fail safe)	Sargent QC-Cxxx (size as required) RX8270-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8616DA-DS-FC x Alum
1	set Smoke Seals	Zero 188S-BK @ jambs & head
1	Power Supply	(by security vendor)
1	Door Contact	(by security vendor)
1	Card Access System	(by security vendor)

Operation: Fail Safe
- Card reader on non secure side of door unlocks electric lock.
- Free egress on secure side of door. RX switch in electric lock shunts alarm.
- When signaled from the fire alarm system or in the event of a loss of power, the electric lock, unlocks automatically.

HARDWARE SET #E3A
Each to have:

1	Continuous Hinge	Zero 910DBAA-EPT cutout
1	Power Transfer	Securitron EL-CEPT x US32D
1	Electro Lynx Frame Wiring	Sargent QC-C 1500P (size as required)
1	Electric Lock (fail safe)	Sargent QC-Cxxx (size as required) RX8270-LNME x US32D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer w/stop	Dorma 8916SDS-FC x Alum
1	set Weather Seals	Zero 429A @ jambs & head
1	Door Bottom	Zero 8193A
1	Saddle	Zero (as detailed)
1	Power Supply	(by security vendor)
1	Door Contact	(by security vendor)
1	Card Access System	(by security vendor)

Operation: Fail Safe
- Card reader on non secure side of door unlocks electric lock.
- Free egress on secure side of door. RX switch in electric lock shunts alarm.
- When signaled from the fire alarm system or in the event of a loss of power, the electric lock, unlocks automatically.

HARDWARE SET #E3B
Each to have:

	Hinges	PBB (see description) x US32D
1	Power Transfer	Securitron EL-CEPT x US32D
1	Electro Lynx Frame Wiring	Sargent QC-C 1500P (size as required)
1	Electric Lock (fail safe)	Sargent QC-Cxxx (size as required) RX8270-LNME x US32D

1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Surface Closer	Dorma 8616DA-AF-FC x Alum
1	Door Stop	Trimco (see description) x US32D
1	set Smoke Seals	Zero 188S-BK @ jambs & head
1	Power Supply	(by security vendor)
1	Door Contact	(by security vendor)
1	Card Access System	(by security vendor)

Operation: Fail Safe
- Card reader on non secure side of door unlocks electric lock.
- Free egress on secure side of door. RX switch in electric lock shunts alarm.
- When signaled from the fire alarm system or in the event of a loss of power, the electric lock, unlocks automatically.

HARDWARE SET #E4
Each to have:

1	Continuous Hinge	Zero 910DBAA-EPT cutout
1	Power Transfer	Von Duprin EPT10 x SP28
1	Exit Device	Von Duprin EL-RX98NLOP x US26D
1	Master Keyed Cylinder	Sargent (to suit) x US26D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Door Pull	Trimco 1191-4J x US32D
1	Surface Closer w/stop	Dorma 8916-SDS x Alum
1	set Weather Seals	Zero 429A @ jambs & head
1	Door Bottom	Zero 8193A
1	Saddle	Zero (as detailed)

Operation: Fail Secure
- Card reader on non secure side of door unlocks electric exit device.
- Free egress on secure side of door. RX switch in electric lock shunts alarm.

HARDWARE SET #E5
Each to have:

~~1~~	~~Automatic Operator~~	~~Tormax TN110 x US26D~~
1	Continuous Hinges	Ives 112HD
~~1~~	~~set Push & Pull~~	~~Blumcraft DH100-F x US32D~~
1	Set Door Pulls (mount BTB)	Rockwood RM3300 series x US32D
1	Automatic Operator	Besam SW200i-OS OHC series w/ weather stop strip x Alum
1	Saddle	Zero (as detailed)
1	Wall Actuator	Deltrex F106-E24

Operation:
- Normal Operation: Wall actuator in lobby signals automatic operator to open door.
- Inside door is sequenced with outside door.
- Inside: Free egress.

HARDWARE SET #E6
Each to have:

~~2~~	~~Floor Closers~~	~~Rixson SC2890NHO-CWF x US26D~~
2	Continuous Hinges	Ives 112HD x EPT cutout
~~2~~	~~Exit Devices~~	~~Blumcraft H100-F x US32D~~
1	Electric Exit Device	Von Duprin EL9847NLOP(less pull) US32D
1	Electric Exit Device	Von Duprin EL9847EO x US32D
2	Master Keyed Cylinders	Sargent (to suit) x US26D
2	Temporary Brass Cores	Sargent (to suit)
2	Permanent Cores	Sargent (to suit) x US26D
1	Automatic Operator	Besam SW200i-OS OHC series w/ weather stop strip x Alum
1	Concealed Closer	LCN 2030 series x 689 (Coordinate closer with Besam)
2	Door Pulls	Rockwood RM3300 series x US32D
1	Saddle	Zero (as detailed)
2	Wall Actuators	Zero Helco F106-E24
1	Card Access System	(by security vendor)

Operation: Fail Secure
- During normal operating hours the exit devices are electrically dogged through the card access system which will allow the doors to be open freely. The outside wall actuator will signal operator to open door, then in sequence open the vestibule door. The actuator in the vestibule is used if the cycle of operation times out and the door closes
- After Hours: Card reader on non secure side of door unlocks electric exit device to open door.
- Inside: Free egress.

HARDWARE SET #E7
Each to have:

~~1~~	~~Automatic Operator~~	~~Tormax TN110 x US26D~~
1	Continuous Hinges	Ives 112HD x EPT coutout
1	Power Transfer	Von Duprin EPT10 x SP28
~~1~~	~~Exit Devices~~	~~Blumcraft H100-F x US32D~~
1	Electric Exit Device	Von Duprin EL98NLOP(less pull) US32D
1	Master Keyed Cylinder	Sargent (to suit) x US26D
1	Temporary Brass Core	Sargent (to suit)
1	Permanent Core	Sargent (to suit) x US26D
1	Set Door Pulls (mount BTB)	Rockwood RM3300 series x US32D
1	Automatic Operator	Besam SW200i-OS OHC series w/ weather stop strip x Alum
~~1~~	~~Electric Strike~~	~~Folger Adam 310-1 x US32D~~
1	Saddle	Zero (as detailed)
1	Power Supply	Von Duprin PS900 series
2	Wall Actuators	Zero Helco F106-E24
1	Card Access System	(by security vendor)

Operation: Fail Secure

- During normal operating hours the exit device is electrically dogged through the card access system which will allow the doors to be open freely. The outside wall actuator will signal operator to open door, then in sequence open the vestibule door. The actuator in the vestibule is used if the cycle of operation times out and the door closes
- After Hours: Card reader on non secure side of door unlocks electric exit device to open door.

HARDWARE SET #E8
Each to have:

2	Continuous Hinges	Ives 112HD
2	Sets Door Pulls (mount BTB)	Rockwood RM3300 series x US32D
1	Automatic Operator	Besam SW200i-OS OHC series w/ weather stop strip x Alum
1	Concealed Closer	LCN 2030 series x 689 (Coordinate closer with Besam)
2	Wall Actuators	Zero Helco F106-E24
1	Saddle	Zero (as detailed)
1	Card Access System	(by security vendor)

Operation: Fail Secure

- The inside wall actuator will signal operator to open door , then in sequence open the exterior door. The actuator in the vestibule is used if the cycle of operation times out and the door closes
- Inside: Free egress.

END OF SECTION

SECTION 088000

INTERIOR GLASS AND GLAZING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the glass and glazing as shown on the drawings and/or specified herein, including but not limited to glazing of the following:

1. Interior borrowed lites.

2. Interior mirrors, frameless.

3. Decorative laminated glass.

4. Window film.

5. Decorative, back-painted glass artwork panels.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Ornamental metal work - Section 057000.

E. Architectural woodwork - Section 064023.

F. Hollow metal doors and frames - Section 081113.

G. Wood stile and rail doors - Section 081433.

H. Glazed curtain walls - Section 084413.

I. Framed mirrors - Section 102800.

1.5 PERFORMANCE REQUIREMENTS

A. Glass units shall be annealed, heat strengthened, fully tempered or laminated where required to meet safety glazing requirements, as shown, specified, or recommended by the glass fabricator, and as required by the prevailing Building Code.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, glazing instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements.

B. Verification Samples: Submit representative samples of each glass and glazing material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide glass samples having minimum size of 144 sq. in. and 6 in. long samples of sealants and glazing materials; all samples shall bear the name of the manufacturer, brand name, thickness, and quality.

C. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 QUALITY ASSURANCE

A. Source: For each glass and glazing type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.

B. Installer: A firm with a minimum of five years experience in type of work required by this Section and which is acceptable to manufacturers of primary materials; and with a successful record of in-service installations similar in size and scope to this Project.

C. Glazing Publications: Comply with published recommendations of the Glass Association of North America's (GANA's) "Glazing Manual" and "Laminated Glass Design Guide," unless more stringent requirements are indicated.

D. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council.

2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

E. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations and GANA Manual.

1. Protect materials from moisture, sunlight, excess heat, sparks and flame.

2. Sequence deliveries to avoid delays, but minimize on-site storage.

PART 2 PRODUCTS

2.1 GLASS MATERIALS AND PRODUCTS

A. Ultra-Clear (Low-Iron) Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.

1. Low Iron Tempered Glass: Provide "Starphire" by PPG, or approved equal, tempered in accordance ASTM C 1048, thicknesses as indicated.

B. Clear Float Glass: ASTM C 1036, Type I (Transparent, Flat), Class 1 (Clear), Quality q3, minimum 1/4" thick.

C. Clear Tempered Glass: ASTM C 1048, Condition A (Uncoated), Type I (Transparent, Flat), Class 1 (Clear), Quality q3, Kind FT, minimum 1/4" thick. Tempered glass must be certified by SGCC to meet applicable standards. Tempered glass shall also conform to the following:

1. Length and Width: For 2.9 mm to 6.0 mm; +/-1.6 mm.

2. Diagonal: +/- 3.0 mm.

3. Edgework: Belt seaming or diamond wheels. 1.5 mm seam of upper and lower glass edges. No sharp edges.

4. Corners: No more than 3.0 mm from square.

5. Float Glass Defects: Must meet the requirements of ASTM C 1036. The most common defects are scratches, stones gaseous bubbles and edge chips. Tables in the glass standards have limits for size/quantity of defects.

6. Tempered glass shall have a minimum surface compression of 10,000 psi.

7. Tempered glass to be heat-treated by horizontal (roller hearth) process with inherent roller-wave distortion parallel to the bottom edge of the glass when installed.

8. Flatness Tolerances

   a. Roller-Wave or Ripple: The deviation from flatness at any peak shall be targeted not exceed 0.003” as measured per peak to valley for 1/4” (6mm) thick glass.
   b. Bow and Warp: The bow an warp tolerances shall target a not exceed 1/32” per linear foot.
   c. Fully tempered glass shall be heat soaked to EN 14179-1:2005-European Heat Soaking Standard.

D. Laminated Safety Glass: Provide two glass panes of equal thickness, laminated together with a polyvinyl butyl interlayer, conform to ASTM C 1172, and as follows:

   1. Interlayer Color: Colored.

   2. Interlayer Material: Provide Monsanto "Saflex" or DuPont "Butacite," 0.030" thick at vertical applications, and 0.060" thick at sloped or horizontal applications.

   3. Minimum thickness of 1/4".

E. Frameless Mirrors: 1/4", Quality q2, clear float glass with silver, copper, and organic coating, and as follows:

   1. Edges: Uniformly ground and polished.

F. Acid etch one face of tempered glass, by caustic material process, in pattern per Architect.

2.2 WINDOW FILM

A. Acceptable Manufacturer: 3M Window Film, 3M Center Bldg. 0223-02-S-24 ; St. Paul, MN 55144-1000; Web: www.3m.com/windowfilm

B. Product: Fasara Glass Finishes – Milky White (Milano):

   1. Shading Coefficient: 0.75%.

   2. Visible Light Reflectance: 21%.

   3. Visible Light Transmittance: 29%.

2.3 INTERIOR GLASS SCHEDULE

A. IG1: Clear, tempered, low-iron glass.

B. IG2: Clear, tempered, low-iron clear glass with applied film.

C. IG3: Clear, tempered, low-iron, laminated glass with full-height translucent interlayer (Saflex "Arctic Snow").

D. IG4: Clear, tempered, low-iron, laminated glass with combination clear PVB interlayer in upper portion of lite and translucent interlayer (Saflex "Arctic Snow") in lower portion of lite; see drawings for delineation of clear and translucent areas.

E. IG5: Clear, tempered, low-iron glass panels with back-painted artwork. Fabricator: Bendheim or approved alternate.

F. IG6: Fire resistant glass.

G. IG7: Mirror glass, low iron.

H. IG8: Temepred, opaque, low iron whiet glass (Saflex Polar White).

I. IG9: Clear tempered, low iron non-reflective glass.

J. IG10: Clear tempered low iron, acid etched one face.

K. JG11: Tempered opaque white marker board.

2.4 GLAZING MATERIALS AND PRODUCTS

A. General: Provide sealants and gaskets with performance characteristics suitable for applications indicated. Ensure compatibility of glazing sealants with laminated glass interlayers and with any other surfaces in contact.

B. General Glazing and Cap Bead Sealant: Provide sealant with maximum Shore A hardness of 50. Provide one of the following:

1. Dow Corning 795.

2. General Electric Silglaze N 2500 or Contractors SCS-1000.

3. Tremco Spectrem 2.

C. Dense Elastomeric Compression Seal Gaskets: Provide molded or extruded neoprene or EPDM gaskets, Shore A hardness of 75±5 for hollow profile, and 60±5 for solid profiles, ASTM C 864.

D. Cellular, Elastomeric Preformed Gaskets: Provide extruded or molded closed cell, integral-skinned neoprene, Shore A 40±5, and 20% to 35% compression, ASTM C 509; Type II.

E. Preformed Glazing Tape: Provide solvent-free butyl-polyisobutylene rubber with 100% solids content complying with ASTM C1281 AAMA A 800 with integral continuous EPDM shim. Provide preformed glazing tape in extruded tape form. Provide Tremco "Polyshim II" or approved equal.

F. Setting Blocks: Provide 100% silicone blocks with Shore A hardness of 80-90. Provide products certified by manufacturer to be compatible with silicone sealants. Length to be not less than 4". Width for setting blocks to be 1/16" more than glass thickness and high enough to provide the lite recommended by glass manufacturer.

When thickness of setting block exceeds 3/4" the glass manufacturer must be consulted for sizes and configuration.

1. Shims: For shims used with setting blocks, provide same materials, hardness, length and width as setting blocks.

G. Edge Blocks: Provide neoprene or silicone as required for compatibility with glazing sealants. Provide blocks with Shore A hardness of 55±5.

H. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place.

I. Miscellaneous Glazing Materials: Provide sealant backer rods, primers, cleaners, and sealers of type recommended by glass and sealant manufacturers.

J. Mirror Adhesive: Palmer's "Mirro-Mastic," or approved equal; mastic must be compatible with mirror backing.

1. Clips: No. 4 finish Type 304 stainless steel.

2.5 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

C. Grind smooth, polish and arriseexposed glass edges, including but not limietd to:

1. Glass display, storage or locker doors.

2. Glass screen divider at lab desks.

3. Glass artwork panels in lobby.

4. Glass vestibule walls.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

2. Minimum required face or edge clearances.

3. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GENERAL GLAZING STANDARDS

A. Install products using the recommendations from the manufacturer of glass, sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those in the "GANA Glazing Manual".

B. Install glass in prepared glazing channels and other framing members.

C. Install setting blocks in rabbets as recommended by referenced glazing standards in GANA Glazing Manual" and "IGMA Glazing Guidelines".

D. Provide bite on glass, minimum edge and face clearances and glazing material tolerances recommended by "GANA Glazing Manual".

E. Provide weep system as recommended by "GANA Glazing Manual".

F. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics.

G. Distribute the weight of glass unit along the edge rather than the corner.

H. Comply with manufacturers and referenced industry standards on expansion joint and anchors; accommodating thermal movement; glass openings; use of setting blocks, edge, face, and bite clearances; use of glass spacers; edge blocks and installation of weep systems.

I. Protect glass edge damage during handling and installation.

J. Prevent glass from contact with contaminating substances that result from construction operations, such as weld spatter, fireproofing or plaster.

K. Remove and replace glass that is broken, chipped cracked or damaged in any way.

3.4 GLAZING

A. Glazing channel dimensions, as indicated on Shop Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

K. Flush Glazing

1. If the butt joint in the metal framing is in the vertical direction, the glazier shall run the tape initially on the head and sill members going directly over this joint. Should the butt joint in the metal framing run horizontally, tapes must first be applied to the jambs so that it crosses over the joint.

2. Each tape section shall butt the adjoining tape and be united with a tool to eliminate any opening.

3. Do not overlap the adjoining length of tape or rubber shim as this will prevent full contact around the perimeter of glass.

L. Off-Set Glazing

1. Where the glazing legs are off-set, the difference in the rabbet width shall be compensated by employing different glazing tapes with different diameter shims. The difference in shim shall be equal to the size of the off-set. The thinner tape

shall be positioned first on the glazing leg closest to the interior. The thicker tape shall be cut to the exact length of the dimension between the applied tapes, and installed on the outermost glazing leg.

2. Immediately prior to setting glass, paper backing shall be removed. Apply a toe bead of sealant 6" in each direction, from each corner.

3. Locate setting blocks in the sill member at quarter points, or if necessary to within 6" of each corner. Setting blocks must be set equal distance from center line of the glass and high enough to provide the recommended bite and edge clearances.

4. Set edge block according to glass manufacturer's recommendations.

5. Set Glass: The glass shall be pressed firmly against the tape to achieve full contact.

6. Interior stops shall be set, and glazing tape spline for the appropriate face clearance shall be rolled into place, compressing the glass to the shim within the glazing tape.

3.5 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant as recommended by glass manufacturer or glass frame manufacturer.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape where noted on approved shop drawings.

3.6 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.7 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.8 FRAMELESS MIRRORS

A. Apply mastic to back of mirror "pats" spaced 4 pats/sq. ft.; adjust mirror so that it is plumb and in place to avoid distortion of reflecting images. Allow 1/8" space between back of mirror and wall surface.

1. Apply "pats" using Palmer Electric Applicator.

B. Apply stainless steel clips at mirror top and bottom; securely clip to substrate using non-corrosive anchors. At drywall back-up anchors must be secured to studs or steel wallplate spanning from stud to stud.

3.9 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating

substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Clean excess sealant or compound from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.

F. Glass to be cleaned according to GANA Glass Information Bulletin GANA 01-0300 – "Proper Procedure for Cleaning Architectural Glass Products," and GANA Glass Informational Bulletin GANA TD-02-0402 – "Heat Treated Glass Surfaces are Different."

G. Do not use razor blades, scrapers or metal tools to clean glass.

END OF SECTION

SECTION 088813

FIRE-RATED GLASS AND FRAMING SYSTEM

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the fire-rated glass and framing system as shown on the drawings an/or specified herein, including, but not limited to, the following:

1. Interior fire rated system.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Stile and Rail Wood Doors - Section 081433.

E. Door Hardware - Section 087100.

F. Glass and Glazing - Section 088000, for fire-rated glass.

1.5 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM E 119: Methods for Fire Tests of Building Construction and Materials.

2. ASTM E 152: Methods for Fire Tests of Door Assemblies.

3. ASTM E 163: Methods for Fire Tests of Window Assemblies.

B. National Fire Protection Association (NFPA):

1. NFPA 80: Fire Doors and Windows.

2. NFPA 251: Fire Tests of Building Construction & Materials.

3. NFPA 252: Fire Tests of Door Assemblies.

4. NFPA 257: Fire Test of Window Assemblies.

C. Underwriters Laboratories, Inc. (UL):

1. UL 9: Fire Tests of Door Assemblies.

2. UL 10 B: Fire Tests of Window Assemblies.

3. UL 263: Fire Tests of Building Construction and Materials.

4. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies.

D. American National Standards Institute (ANSI):

1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings.

E. Consumer Product Safety Commission (CPSC):

1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.

1.6 PERFORMANCE REQUIREMENTS

A. Duration of Fire Rating for System: Capable of providing a fire rating for 120 minutes.

B. Fire Resistive Rating: Glaze applications in occupancy or area separation walls where glazing exceeds 25% of the wall area, or as otherwise specified with a fire resistive assembly meeting the radiant heat requirements of ASTM E 119. Per ASTM E 119 and UL 263 requirements temperature on the non-fire side of glazing and framing at conclusion of fire test exposure shall be below 250°F above ambient room temperature.

1.7 SUBMITTALS

A. Shop Drawings: Show doors, frames, hardware and steel frame components as shown on shop drawings and schedules.

1. Obtain Architect's approval before fabrication.

B. Samples: Submit in the form of 12-inch square samples for glass and of 12-inch long samples for framing and sealants. Install sealant samples between two strips of material representative in color of the adjoining framing system.

C. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

D. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data and installation instructions.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed work similar in material, design, and extent to that indicated for this Project and whose work has resulted in installations with a record of successful in-service performance.

B. Fire-Rated Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252 and ASTM E 119.

C. Certification: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. Door assembly shall be tested to the acceptance criteria of ASTM E 2074, NFPA 252, UL 9, UL 10-c Standard Methods of Fire Tests of Door Assemblies.

2. An approved independent testing laboratory equal to UL shall conduct fire test.

D. Listings and Labels: Under current follow-up service by an approved independent agency maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.

E. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle under provisions specified by manufacturer. For details on storage and product handling, please contact Technical Glass Products and request information on storage and product handling.

B. Deliver materials to specified destination in manufacturer or distributor's packaging undamaged, complete with installation instructions.

C. Store off ground, under cover, protected from weather and construction activities.

1.10 WARRANTY

A. Provide system supplier's limited five-year warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer Fire Rated Glazing Material: "Pyrostop" fire-rated glazing as manufactured by AGC Flat Glass Europe and distributed by AGC InterEdge Technologies, LLC Tel: 877-376-3343, www.firesafe-glass.com

B. Frame System: "StileLite 300" fire-rated steel frame system as manufactured by Stiles Custom Hollow Metal and supplied by AGC InterEdge Technologies, LLC, 160 North High Street, Hebron, OH 43025; Tel: 877-376-3343, www.firesafe-glass.com

1. Finishes shall be custom color to match other hollow metal frames within the scope of the Project.

2.2 MATERIALS - GLASS

A. Fire Rated Glazing: ASTM C 1036 and ASTM C 1048; composed of multiple sheets of "Optiwhite" high visible light transmission glass laminated with an intumescent interlayer.

1. Thickness of Glazing Material: As indicated on drawings, but not less than 3/4".

2. Fire Rating: 2 hours.

3. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. Land 11).

4. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacture, testing laboratory (UL), fire rating period, safety glazing standards, and date of manufacture.

2.3 MATERIALS - STEEL FRAMING

A. Steel Framing System: Manufacturer's 120 minute interior framing system.

1. Steel Frame: Frames shall be constructed of commercial qulaity, cold rolled steel conforming to ASTM A 366. Steel shall be 14 gauge (0.067") minimum and shall be free of scale, pitting, coil breaks or other surface defects.

B. Modular Frame Construction

1. Frame members shall be a minimum 6-5/8" jamb depth including a 3.5" interior frame, glass and 0.75" deep pressure cap. Frames shall be welded into four sided modules. Corner joints shall have all contact edges closed tight. Face welds shall be finished smooth. Knock-down frames are not acceptable.

2. Module Wall System Grid Assembly: Modules shall be mechanically joined together with concealed fasteners to form a window wall grid system.

3. All finish work shall be neat in appearance, square, and free of defects, warps or buckles. Steel members shall be straight and of uniform profile through their length. Roll formed members shall not be acceptable. After fabrication, all tool marks and surface imperfections shall be removed, and exposed faces of all welded joints shall be dressed smooth.

4. Loose Pressure Caps: Caps shall be a minimum 12 gauge (0.093"), cold rolled steel, butted at corner joints and secured to frame using ¼" hex head sheet metal screws.

5. Pressure Cap Covers: Caps shall be 16 gauge (0.053") steel or stainless steel. Provide all supplementary parts and components, such as inserts, clips, bracing and other miscellaneous supports required for a finished installation. Promptly furnish items to be placed during the installation of other work. Insofar as practicable, fitting and assembly of this work shall be done in the shop.

C. Fabrication

1. Furnish frame assemblies pre-welded. When necessary, splice frames too large for shipping or to fit in available building openings. Fit with suitable fasteners. Knock-down frames are not permitted.

2. Field glaze door and frame assemblies.

3. Factory prepare steel door assemblies for field mounting of hardware.

4. Fabrication Dimensions: Fabricate assembly to approved dimensions. Guarantee dimensions where practicable within required tolerance.

5. Obtain approved Shop Drawings prior to fabrication.

2.4 GLAZED SWINGING STEEL DOORS

A. Materials: Doors shall be constructed from commercial quality, cold rolled steel conforming to ASTM A 366 or hot rolled, pickled and oiled steel conforming to ASTM A 569. The steel shall be 14 gauge (0.067") minimum and shall be free of scale, pitting, coil breaks or other surface defects.

B. Construction

1. Door shall be 1-3/4" thick. Doors shall be neat in appearance and free from warpage or buckle. Edge bends shall be true and straight and of minimum radius for the gauge of metal used.

2. Door core shall be mineral fiber type sufficient to achieve necessary temperature rise rating of 450 degrees for 30 minutes.

3. The top and bottom shall be closed with a continuous channel 0.056" minimum thickness, spot welded to both face sheets 4" o.c. maximum

4. Vertical Edges: Welded and finished flush with no visible seams. Edge shall be beveled 1/8" in 2" profiles.

5. All hardware shall be designed for beveled edges as specified herein.

6. Hardware reinforcements shall comply with NAAMM/HMMA 861.

7. Glass light cutouts shall be continuously stiffened by channel shaped steel sections which shall span the full thickness and be securely fastened to both face sheets by spot welds spaced a maximum of 4" o.c.

8. Glass molding/light kits shall be 16 gauge (0.054") minimum, steel channel shape to accommodate glass size and thickness as called for with mitered corners that are fully welded and finished smooth. One side of light kit shall be removable, secured to the door face with #8 oval head sheet metal screws.

9. Finish: After fabrication, all tool marks and surface blemishes shall be filled and sanded as required to make both faces and both vertical edges smooth and free from irregularities.

2.5 ACCESSORIES

A. Exposed Fasteners: Use fasteners fabricated from Type 304 or Type 316 stainless steel.

B. Glazing Gaskets For Interior Applications: Glaze Pyrostop glass with approved, closed cell PVC tape or pure silicone sealant.

C. Intumescent Tape: As supplied by frame manufacturer.

D. Setting Blocks: Calcium silicate.

E. Perimeter Anchors: Steel or 316 Stainless steel when exposed.

F. Silicone Sealant: One-Part Low Modulus, High Movement-Capable Sealant: Type S; Grade NS; Class 25 with additional movement capability of 100 percent in extension and 50 percent in compression (total 150 percent); Use (Exposure) NT; Uses (Substrates) M, G, A, and O as applicable. (Use-O joint substrates include: Metal factory-coated with a high-performance coating; galvanized steel; ceramic tile.)

1. Available Products: Dow Corning 790 by Dow Corning Corp.

G. Intumescent Caulk: Single component, latex-based, intumescent caulk designed to stop passage of fire, smoke, and fumes through fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.

1. Available Products: Firetemp CI by John-Manville.

2.6 FINISHES

A. As selected by the Architect.

2.7 DOOR HARDWARE

A. Specified in Section 087100.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and members to which the work of this section attaches or adjoins prior to frame installation.

B. Provide openings plumb, square and within allowable tolerances.

C. Notify Architect of any conditions which jeopardize the integrity of the proposed fire rated entrance system. Do not proceed until such conditions are corrected.

3.2 INSTALLATION

A. General: Install systems plumb, level, and true to line, without warp or rack of frames with manufacturer's prescribed tolerances and installation instructions. Provide support and anchor in place.

B. Install systems by a specialty contractor with appropriate experience qualifications; and in strict accordance with the approved shop drawings. Employ experienced mechanics familiar with this type of specialized work.

C. Install glazing in strict accordance with respective glazing material manufacturer's specifications. Field cutting or tampering is not permissible.

D. Firmly pack perimeter of framing system to rough opening with mineral wool fire stop insulation or appropriately rated intumescent sealant.

E. Install door hardware specified in Section 087100.

3.3 PROTECTION AND CLEANING

A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION

SECTION 089000

LOUVERS AND VENTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the louvers and vents as shown on the drawings and/or specified herein, including but not necessarily limited to the following:

1. Aluminum louvers.

2. Blank off panels.

3. Bird screens.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Masonry - Section 042000.

E. Terra cotta assembly – Section 042800.

F. Sheet metal work - Section 076200.

G. Sealant work - Section 079200.

H. Louvers in metal doors - Section 081113.

I. Aluminum assemblies - Section 084412.

J. Louvers connected to ductwork - Division 23.

1.5 QUALITY ASSURANCE

A. Structural Performance: Provide exterior metal louvers capable of withstanding the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter or permanent damage to fasteners and anchors.

1. Wind Load: Uniform pressure (velocity pressure) of 30 lbf/sq. ft., acting inward or outward.

B. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, and other detrimental effects.

1. Temperature Change (Range): 120 deg. F., ambient; 180 deg. F, material surfaces.

C. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details and installation procedures, except as otherwise indicated.

D. Field Measurements: Verify size, location and placement of louver units prior to fabrication.

E. Shop Assembly: Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustments, splicing, mechanical joints and field assembly of units. Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

F. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall

be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, certified test data, where applicable, and installation instructions for required products, including finishes.

B. Shop Drawings: Submit shop drawings for fabrication and erection of louver units and accessories. Include plans, elevations and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery and other information to determine compliance with specified requirements.

C. Samples: Submit six (6) inch square samples of each required finish. Prepare samples on metal of same gauge and alloy to be used in work. Where normal color and texture variations are to be expected, include two (2) or more units in each sample showing limits of such variations.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 WARRANTY

A. Finish shall be warranted for a period of 20 years, starting from date of Substantial Completion of the Project.

PART 2 PRODUCTS

2.1 LOUVER MATERIAL

A. Provide storm resistant extruded aluminum louvers (ASTM B 221), of profiles shown on drawings, manufactured by Construction Specialties, Inc., or equal made by Airolite, Greenheck, Ruskin, or equivalent.

1. Basis of Design

a. Construction Specialties Model RS-7705, 7" frame depth, fixed horizontal, continuous.

B. Heads, sills, jambs and mullions to be one piece structural members of 6063-T52, alloy, 0.080" thick, with integral caulking slot and retaining beads. Blades to be minimum 0.080" thick. Closed cell PVC compression gaskets to be provided between bottom of mullion or jamb and top of sill to insure lead tight connections. Concealed structural supports to be designed by the louver manufacturer to carry a wind load of not less than forty (40) lbs. per square foot. All fasteners to be stainless steel.

C. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Acid-chromate-fluoride-phosphate conversion coating; Organic Coating: As specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

1. Fluoropolymer Three-Coat System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605-98.

2. Custom color and gloss as selected by the Architect; refer to paint schedule on the elevations.

D. Louvers shall be furnished with 1/2" mesh, 0.063" diameter aluminum wire intercrimp bird screen secured in removable extruded aluminum frames.

E. Provide aluminum blank off panels behind louvers where shown on mechanical drawings, fabricated from 1/8" thick aluminum face sheets, finish to match louvers; reinforce as required to form rigid assembly. Blank off panels shall be insulated with thermafiber insulation of thickness needed to insure an R value of eleven (11).

F. Fastenings: Fasteners for exterior application shall be stainless steel. Provide types, gauges and lengths to suit unit installation conditions. Use Phillips flat head machine screws for exposed fasteners, unless otherwise indicated.

G. Anchors and Inserts: Use non-ferrous metal or hot dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use steel or lead expansion bolt devices for drilled in place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

H. Bituminous Paint: SSPC-Paint 12 (cold applied asphalt mastic).

2.2 FABRICATION, GENERAL

A. Fabricate frames including integral sills to suit adjacent construction with tolerances for installation, including application of sealants in joints between louvers and adjoining work.

B. Include supports, anchorages, and accessories required for complete assembly.

C. Provide sill extensions made of same material as louvers, where indicated, or required for drainage to exterior and to prevent water penetrating to interior.

D. Join frame members to one another and to stationary louver blades by welding, except where indicated otherwise or where field bolted connections between frame members are necessary by size of louvers. Maintain equal blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where louvers and vents are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions and directions for the installation of anchorages which are to be embedded in masonry construction. Coordinate the delivery of such items to the project site.

3.3 INSTALLATION

A. Locate and place louver units plumb, level and in proper alignment with adjacent work.

B. Use concealed anchorages wherever possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers, as indicated.

D. Repair finishes damaged by cutting, welding, soldering and grinding operations required for fitting and jointing. Restore finishes and prime coats of paint so that there is no evidence of corrective work. Return items which cannot be refinished in the field to the shop, make the required alterations, and refinish the entire unit, or provide new units, at Contractor's option.

E. Protect aluminum surfaces from corrosion by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry or dissimilar metals.

F. Provide concealed gaskets, flashings, joint fillers and insulations, and install as the work progresses to make the installations weathertight.

END OF SECTION

SECTION 092713

GLASS-REINFORCED GYPSUM FABRICATIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete interior glass reinforced gypsum fabrications as shown on drawings and/or specified herein including, but not limited to the following

1. Factory-molded, glass-reinforced gypsum fabrications for interior use include the following types:

a. Column covers.

2. Steel framing for direct support of glass-reinforced gypsum fabrications.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Carpentry – Section 062000.

E. Gypsum drywall – Section 092900.

F. Painting – Section 099000.

1.5 SUBMITTALS

A. Product Data: For each type of glass-reinforced gypsum fabrication indicated. Include construction details, material descriptions, weights, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show profiles, thicknesses, finishes, joints, ornamentation, installation tolerances, and anchorage details. Indicate attachment methods, embedded supports, reinforcement, fabrication methods, joint treatments, clearances, and supports.

1. Show connection to suspension system and cutouts for sprinklers, diffusers, grilles, speakers, and lighting fixtures.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension assembly members.

2. Method of attaching hangers to glass-reinforced gypsum fabrications and to building structure.

3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and moldings.

D. Samples: For each exposed product in each profile and size required, and as follows:

1. Linear Moldings: 2-foot long section with finished joint. Show complete pattern.

2. Nonlinear Shapes: Full-size unit.

E. Installer Qualification Data: To demonstrate capabilities and experience of Installer. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating current glass-reinforced gypsum fabrications comply with ASTM C 1355 requirements.

G. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).

c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glass-reinforced gypsum fabrication installations similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

C. Fire-Test-Response Characteristics: Provide glass-reinforced gypsum fabrications with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another independent testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame Spread: 25 or less.

2. Smoke Developed: 450 or less.

D. Mockups: Before installing glass-reinforced gypsum fabrications, build mockups for each form of construction and finish required to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.

2. Notify Architect seven days in advance of dates and times when mockups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.

4. Obtain Architect's approval of mockups before starting glass-reinforced gypsum fabrication.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mockups when directed.

7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Gypsum materials shall be manufactured out of minimum 75% synthetic gypsum.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Ship and store glass-reinforced gypsum fabrications in factory-wrapped crates, packaged to keep units dry. Avoid cracking, warping, or staining the units.

B. Comply with manufacturer's written instructions for storage, temperature, and humidity requirements.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install glass-reinforced gypsum fabrications until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Acclimatize glass-reinforced gypsum fabrications to ambient temperature and humidity of spaces in which they will be installed. Remove packaging and move units into installation spaces not less than 48 hours before installing them.

C. Field Measurements: Where glass-reinforced gypsum fabrications are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

A. Coordinate layout and installation of glass-reinforced gypsum fabrications and suspension system components with other construction, including ceilings, light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Plastrglas.

2. Architectural Reproductions Inc.

3. Casting Designs, Inc.

4. Formglas Inc.

5. Molded Fiber Glass/Union City.

2.2 STEEL FRAMING COMPONENTS

A. Framing Components: As indicated and that comply with steel framing components specified in Section 092900 – Gypsum Drywall.

B. Cast-in-Place and Postinstalled Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials, with holes or loops for attaching hanger wires and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488 conducted by a qualified independent testing agency.

1. Cast-in-place type designed for attachment to concrete forms.

2. Chemical anchor.

3. Expansion anchor.

C. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as

determined by testing according to ASTM E 1190 conducted by a qualified independent testing agency.

D. Wire Ties: ASTM A 641, Class 1 zinc coating, soft temper, 0.062 inch thick.

E. Wire Hangers: ASTM A 641, Class 1 zinc coating, soft temper, 0.162-inch diameter.

F. Hanger Rods: Mild steel and zinc coated or protected with rust-inhibitive paint.

G. Flat Hangers: Mild steel and zinc coated or protected with rust-inhibitive paint.

H. Channels: Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch- wide flanges, and as follows:

1. Carrying Channels: 2 inches deep, 590 lb./1000 feet, unless otherwise indicated.

2. Furring Channels: 3/4 inch deep, 300 lb./1000 feet, unless otherwise indicated.

3. Finish: ASTM A 653, G60 hot-dip galvanized coating.

I. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1. Thickness: 0.0329 inch, unless otherwise indicated.

2. Depth: As indicated, or required to support assemblies and as shown on approved shop drawings.

3. Protective Coating: ASTM A 653, G40 hot-dip galvanized coating.

J. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing members securely to substrates.

2.3 GLASS-REINFORCED GYPSUM FABRICATION MATERIALS

A. Glass-Reinforced Gypsum Fabrications: ASTM C 1355/C 1355M.

B. Embedments: Cold-rolled steel channels with ASTM A 653, G60, hot-dip galvanized coating.

C. Embedments: As standard with glass-reinforced gypsum fabrication manufacturer and as required for reinforcement and for anchorage to substrates and framing.

2.4 AUXILIARY MATERIALS

A. Adhesives: As recommended in manufacturer's written instructions.

B. Steel Drill Screws: Provide fasteners, complying with the following requirements, that are of sufficient length and size to securely fasten gypsum-reinforced fabrications to framing members:

1. Screws complying with ASTM C 1002 for fastening glass-reinforced gypsum fabrications to steel members less than 0.033 inch thick.

2. Screws complying with ASTM C 1002 for fastening glass-reinforced gypsum fabrications to wood members.

3. Screws complying with ASTM C 954 for fastening glass-reinforced gypsum fabrications to steel members from 0.033 to 0.112 inch thick.

C. Joint Treatment Materials: Provide materials complying with ASTM C 475 and with the recommendations of the manufacturers of both glass-reinforced gypsum fabrications and joint treatment materials for each application indicated.

D. Control Joints: One-piece control joint with V-shaped slot and removable strip covering slot opening, formed from steel sheet zinc-coated by hot-dip process or from rolled zinc, and complying with ASTM C 1047.

2.5 FABRICATION

A. Fabricate glass-reinforced gypsum units from molds constructed of rigid materials that will result in smooth-finished surfaces conforming to profiles, dimensions, and tolerances indicated, minimum shell thickness shall be 1/4". Provide units as large as practical to minimize joints.

B. Remove units from molds and repair hollows, voids, scratches, and other surface imperfections.

C. Material Compatibility: Fabricate glass-reinforced gypsum fabrications with surface characteristics required for a high-gloss paint finish.

D. Embedments: Incorporate embedments so they develop the full strength of glass reinforced gypsum fabrications. Cover embedments with glass-reinforced gypsum composite not less than 3/16 inch thick.

E. Connection Hardware: Custom designed and fabricated to support and connect glass reinforced gypsum fabrications to hangers, support framing, and substrates.

F. Dimensional Tolerances of Units: As follows:

1. Factory-Finished Edge Straightness: Plus or minus 1/8 inch.

2. Plane Surface Straightness: Plus or minus 1/8 inch.

3. Overall Assembled Length and Width: Plus or minus 1/8 inch per 10 feet.

4. Chords, Radii, and Diameters: Plus or minus 1/8 inch.

5. Squareness: Not more than 1/4-inch difference between diagonals in 16 sq. ft.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for environmental conditions, installation tolerances, and other conditions affecting performance of glass-reinforced gypsum fabrications.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 STEEL FRAMING INSTALLATION

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with details indicated. Select framing components of type, size, and spacing needed to support weight of glass-reinforced gypsum fabrications and to maintain erection tolerances.

B. Supplementary Framing, Blocking, and Bracing: Install supplementary framing as required not only to support glass-reinforced gypsum fabrications but also fixtures and other items penetrating glass-reinforced gypsum fabrications.

3.3 GLASS-REINFORCED GYPSUM FABRICATION INSTALLATION

A. Install glass-reinforced gypsum fabrications level, plumb, true, and aligned with adjacent materials. Use concealed shims where required for alignment.

B. Predrill fastener holes in glass-reinforced gypsum fabrications. Clean fastener holes to remove dirt and oil.

C. Attach glass-reinforced gypsum fabrications to framing and substrates with steel drill screws. Do not use pneumatic staple guns. Countersink screw heads below adjoining finished surface.

D. Fasten as required to comply with dimensional tolerances and not less than 5/16 inch from edge to end.

E. Cover screw heads with joint compound to produce flush, smooth, and level finished surfaces.

F. Attach glass-reinforced gypsum fabrications at joints with adhesive, and band or brace together until adhesive is cured. Cure adhesive according to glass-reinforced gypsum fabrication manufacturer's written instructions.

G. Install control joints where indicated.

H. Joint Finishing: Comply with ASTM C 840 for the following finish level:

1. Level 5.

3.4 ERECTION AND LOCATION TOLERANCES

A. Erection Tolerances: Install glass-reinforced gypsum fabrications so each unit complies with the following dimensional requirements:

1. Plane Alignment (Panel to Panel): 1/16 inch.

2. Variation from Plumb: Plus or minus 1/8 inch per 10 feet.

3. Variation from Straightness: Plus or minus 1/4 inch per 25 feet.

4. Assembly Deflection: Not greater than the length of the assembly divided by 240.

5. Joint Alignment: Not more than 1/8 inch.

6. Joint Width: Not more than 3/8 inch.

END OF SECTION

SECTION 092900

GYPSUM DRYWALL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the gypsum drywall as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Gypsum board work for partitions, ceilings, column enclosures, furring, and elsewhere where gypsum drywall work is shown on drawings.

2. Metal supports for gypsum drywall construction.

3. Acoustical insulation for gypsum drywall work.

4. Sealant for gypsum drywall work.

5. Concealed metal reinforcing for attachment of railings, toilet partitions and other items supported on drywall partitions and walls.

6. Taping and finishing of drywall joints.

7. Installing rings and frames in drywall surfaces for grilles, registers and lighting fixtures.

8. Gypsum shaftwall construction.

9. Bracing and connections.

10. Concealed plywood reinforcing for attachment of equipment.

11. Metal sheet backer for wall base installation.

12. Metal reveals and finish trim.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Steel pan stairs - Section 055100.

E. Ornamental metals – Section 057000.

F. Thermal insulation - Section 072100.

G. Hollow metal door frames - Section 081113.

H. Access doors - Section 083113.

I. Tile – Sectyion 093000.

J. Painting - Section 099000.

K. Office partition system - Section 102219.

L. A/V equipment – Section 115210.

M. Rings for grilles, registers and light fixtures - Division 23 and 26.

1.5 QUALITY ASSURANCE

A. The following standards, as well as other standards which may be referred to in this Section, shall apply to the work of this Section:

1. The Gypsum Construction Handbook, latest edition, USG.

2. ASTM C 645 "Standard Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels For Screw Application of Gypsum Board."

3. ASTM A 568 "Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements For."

4. ASTM C 1396 "Standard Specification for Gypsum Board."

5. ASTM C 475 "Standard Specification for Joint Treatment Materials For Gypsum Wallboard Construction."

6. ASTM C 645 "Specification for Non-Structural Steel Framing Members."

7. ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products."

8. ASTM C 840 "Standard Specification for Application and Finishing of Gypsum Board."

9. ASTM C 919 "Standard Specification for Use of Sealants in Acoustical Applications."

10. ASTM C 954 "Standard Specification for Steel Drill Screws For the Application of Gypsum Board or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness."

11. ASTM C 1002 "Standard Specification for Steel Self-Piercing Tapping Screws For the Application of Gypsum Board."

12. ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Board Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs."

13. ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber."

14. ASTM C 1177 "Specification for Glass Mat Gypsum Substrate for Use at Sheathing."

15. ASTM C 1178 "Specification for Glass Mat Water Resistant Gypsum Backing Board."

16. ASTM C 1278 "Specification for Fiber Reinforced Gypsum Panels."

B. Allowable Tolerances: 1/32" offsets between planes of board faces, and 1/16" in 8'-0" for plumb, level, warp and bow.

C. System Design Load

1. Provide standard drywall wall assemblies designed and tested by manufacturer to withstand a lateral load of 5 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to L/240 of partition height.

   a. Drywall assemblies with tile finish shall have a deflection limit of L/360 and lateral load of 7.5 psf.

2. Provide drywall ceiling assemblies designed, fabricated and installed to have a deflection not to exceed L/360.

D. Fire-Resistance Rating: Where gypsum drywall with fire resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories, or to design designations in UL "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction, and compliant with UL Test #2079; criteria for cycle movement for all field height wall sections requiring allowance for vertical deflection within framing details.

E. Installer: Firm with not less than 5 years of successful experience in the installation of specified materials.

F. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable. Some applicable VOC limits are as follows:

   a. Firestop Sealants: 250 g/l less water.
   b. All Architectural Sealants: 250 g/l less water.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Gypsum materials shall be manufactured out of minimum 75% synthetic gypsum.

4. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

5. Fiberglass insulation shall contain a minimum of 20% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Mineral-wool insulation shall contain a minimum of 50% (combined) pre-consumer/post-consumer recycled content. Certification of recycled content shall be in accordance with the Submittal Requirements above.

6. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Submit shop drawing for each drywall partition, concealed reinforcment, furring and ceiling system showing size and gauges of framing members, hanger and anchorage devices, wallboard types, insulation, sealant, methods of assembly and fastening, control joints indicating column lines, corner details, joint finishing and relationship of drywall work to adjacent work.

B. Samples: Each material specified herein, 12" x 12", or 12" long, or in manufacturer's container, as applicable for type of material submitted.

C. Provide signed and sealed calculations and shop drawings by a professional engineer licensed in the State of New York for all partitions to receive tile.

D. Manufacturer's Literature: Submit technical and installation instructions for each drywall partition, furring and ceiling system specified herein, and for each fire-rated and sound-rated gypsum board assembly. Submit other data as required to show compliance with these specifications, including data for mold resistant joint compound.

E. Test Reports: This Contractor shall submit test report, obtained by drywall manufacturer, indicating conformance of drywall assemblies to required fire ratings and sound ratings.

F. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's

literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING AND PROTECTION

A. Deliver, store and handle drywall work materials to prevent damage. Deliver materials in their original, unopened containers or bundles, and store where protected from moisture, damage and from exposure to the elements. Store wallboard in flat stacks.

B. Protect wallboard from becoming wet.

1.8 ENVIRONMENTAL CONDITIONS

A. Provide and maintain minimum temperature of fifty-five (55) degrees F. and adequate ventilation to eliminate excessive moisture within the building in the area of the drywall work for at least twenty-four (24) hours, prior to, during and after installation of drywall work. Installation shall not start until windows are glazed and doors are installed, unless openings are temporarily closed. Space above suspended ceilings shall be vented sufficiently to prevent temperature and pressure build up.

1.9 JOB MOCK-UP

A. At a suitable location, where directed by the Architect, lay up a portion of a finished wall and ceiling demonstrating the quality of work, including finishing, to be obtained under this Section. Omit drywall boards in locations as directed by the Architect to show stud spacing and attachments; after acceptance, complete assembly.

B. Adjust the finishing techniques as required to achieve the finish required by the Architect as described in this Section of these specifications.

C. Upon approval of the mock-up, the mock-up may be left in place as a portion of the finished work of this Section.

D. All drywall work shall be equal in quality to approved mock-up.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers for Gypsum Drywall Panels and Accessories: Materials specified below, unless noted otherwise or specified herein, are those of U.S. Gypsum Co. Equivalent materials of Georgia Pacific, Lafarge North America, or National Gypsum Co. meeting specification requirements are acceptable.

1. All drywall products must be manufactured in North America.

B. Acceptable Manufacturers for Metal Supports of Drywall Assemblies: Unless otherwise noted, provide products manufactured by ClarkDietrich Building Systems, Super Stud Building Products, Marino/Ware, or approved equal.

2.2 METAL SUPPORTS

A. NOTE: Gauge thickness for all metal support products, 20 guage, shall be minimum 33 mil thickness. Gauge thickness specified and/or drawn shall be true base-metal thickness, not "equivalent" thickness.

B. Metal Floor and Ceiling Runners

1. Channel Type: Formed from 20 U.S. Std. gauge (unless otherwise noted) galvanized steel, width to suit channel type metal studs. Use 20 ga. top runners with 1-1/4" minimum flanges.

2. Ceiling runners and head of wall connections at rated partitions shall conform to UL #2079 for cycle movement. Provide positive mechanical connection of framing to structure, allowing for vertical movement within connections. Minimum of 20 ga. galvanized steel for clips, 25 ga. galvanized steel for ceiling runners. Providing a friction free – anti-seizure movement capacity.

   a. As manufactured by the Steel Network, VertiClip or VertiTrack or equal made by Metal-Lite Inc.
   b. FireTrak (including stud clips) by FireTrak Corp. or equal made by Metal-Lite Inc.

3. "J" Type: Formed from 20 U.S. Std. gauge galvanized steel, 1" x 2-1/2" or 4" wide (to suit detail) x 2-1/4" (for shaft wall).

C. Metal Studs, Framing and Furring

1. Channel Type Studs: Channel type with holes for passage of conduit formed from minimum 20 U.S. Std. gauge (unless heavier gauge is required to meet deflection limits) galvanized steel, width as shown on drawings.

2. Furring Channels: Hat shaped, formed from galvanized steel, 25 U.S. Std. gauge.

3. "C-H", “CT”, or “I” Type Stud: 1-1/2" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction; gauge and size as required to meet deflection limits given herein.

4. Double "E" Type Stud or “J” Track with Holding Tabs: 2" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction; gauge and size as required to meet deflection limits given herein.

5. Continuous 16 gauge x 8" wide steel wall plate screwed to studs as required for support of railings, toilet partitions and other items supported on drywall partitions and walls.

D. Suspended Ceiling and Fascia Supports

1. Main Runners: 1-1/2" steel channels, cold rolled at 0.475 lbs. per ft., rust-inhibitive paint finish.

2. Furring Members: Screw-type hat-shaped furring channels of 25 ga. zinc-coated steel; comply with ASTM C 645.

3. Hangers: Galvanized, 1" x 3/16" flat steel slats capable of supporting 5x calculated load supported.

4. Hanger Anchorages: Provide inserts, clips, bolts, screws and other devices applicable to the required method of structural anchorage for ceiling hangers. Size devices for 5x calculated load supported.

5. Furring Anchorages: 16 ga. galvanized wire ties, manufacturer's standard clips, bolts or screws as recommended by furring manufacturer.

E. All galvanized steel members shall have coating conforming to ASTM A 653, G-60.

2.3 GYPSUM WALLBOARD TYPES

A. Moisture/Mold Resistant Gypsum Wall Board (all wall board except as noted below): 1/2" thick and 5/8" thick as indicated on drawings, "Mold Tough", "Mold Tough FR", Lafarge "Mold Defense" and/or Lafarge "Mold Defense Type X," 48" wide, in maximum lengths available to minimize end-to-end butt joints.

1. Board must have a rating of 10 per ASTM D 3273 with a core that meets ASTM C1396, Section 6.

B. Water Resistant Backing Board for Tile Finish: 1/2" thick and 5/8" thick, 3' x 6', "Durock Tile Backer Board" or "Dens-Shield Tile Backer Board" by Georgia Pacific. Cover joints with a pressure sensitive woven glass fiber tape equal to Imperial Type P Tape.

C. Cement Board (for tile backer board where scheduled): ½" and 5/8" thick "Durock Tile Backer Board" by USG, "Wonder Board Lite" by Custom Building Products, or approved equal.

D. Mold Resistant Shaft Wall Liner: Solid gypsum board liner for shaft wall construction, 1" thick, 24" wide, as required to suit condition, by standard lengths as required, beveled edges. Provide "Mold Tough Liner Panel," "DensGlass Ultra Shaft Guard" by Georgia Pacific, Lafarge "Mold Defense Shaftliner Type X" and Lafarge "Weather Defense Shaftliner Type X."

1. Liner board must have a rating 10 per ASTM D 3273 with a core that meet ASTM C1396 Section 6 and ASTM C442.

E. Abuse Resistant Wallboard: 5/8" thick as indicated on drawings, "Fiberock Brand Panel VHI Abuse Resistant," by USG, "Dens Armor Plus Abuse Guard" by Georgia Pacific, or Lafarge "Protects AR100," 48" wide, in maximum lengths available to minimize end-to-end butt joints.

1. Board must achieve a Level 1 rating per ASTM C 1629.

2.4 ACCESSORIES

A. Acoustic Insulation: Paper-less, non-combustible, semi-rigid mineral fiber mat, 2" thick, in walls (unless otherwise indicated), 3 lb./cu. ft. maximum density; Thermafiber LLC "Thermafiber," or approved equal.

B. Fasteners for Wall Board: USG Brand Screws; Type S Bugle Head for fastening wallboard to lighter gauge interior metal framing (up to 20 ga.). Type S-12 Bugle Head for fastening wallboard to heavier gauge interior metal framing (20 ga. to 12 ga.); Type S and Type S-12 Pan Head for attaching metal studs to door frames and runners; and Type G Bugle Head for fastening wallboard to wall board. Lengths specified below under "Part 3 - Execution" Articles and as recommended by drywall manufacturer.

C. Laminating Adhesive: "Sheetrock Brand Joint Compound."

D. Metal Trim - Corner Beads: For 90 degree External Corners - "Dur-A-Bead" No. 103, 27 U.S. Std. ga. galvanized steel, 1-1/4" x 1-1/4", for 90 degree external corners.

E. Metal Trim - Edge Beads: "Sheetrock Brand Paper Faced Metal Bead and Trim."

F. Metal Trim Treatment Materials and Joint Treatment Materials for Gypsum Drywall Boards: Paper tape for joint reinforcing; Setting Type (Durabond 90) or Lightweight Setting Type Joint Compound for taping and topping; and Ready Mix Compound for finishing.

1. For mold-resistant drywall, water resistant drywall, and tile backer board, use glass mesh tape with setting joint compound that is rated 10 when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274. Acceptable joint compound is "Rapid Set One Pass" made by CTS Cement Manufacturing Corp. or “Rapid Joint” manufactured by Lafarge North America or approved equal meeting standards noted herein.

G. Control Joints: No. 0.093, USG.

H. Acoustical Sealant: USG "Acoustical Sealant" or "Tremco Acoustical Caulking" of Tremco Mfg. Co., or approved equal.

I. Neoprene Gaskets: Conform to ASTM D 1056.

J. Single and double leg metal reveals factory fabricated intersections and corners. Supply reveals in longest lengths possible. Factory finish with chemical coversion for field painting Fry Reglet, Milgo Bufkin or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where gypsum drywall is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not

proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. General

1. Install drywall work in accordance with drywall manufacturer's printed instructions and as indicated on drawings and specified herein.

2. All metal framing for drywall partitions shall extend from floor to underside of structural deck above. Provide for vertical deflection with positive mechanical connections of framing members to structure.

3. Provide concealed reinforcement, 16 ga. thick by eight (8) inches wide or as detailed or as recommended by manufacturer, for attachment of railings, toilet partitions, wal hung cabinetry or shelving and other items to be supported on the partitions which cannot be attached to the metal framing members. Concealed reinforcement shall span between metal studs and be attached thereto using two (2) self-tapping pan head screws at each stud.

   a. Provide concealed polywodo reinforcememt where indicated on drawings or in specifications for support of video equipment.
   b. Back of drywall shall be scored or notched to prevent bulging out where reinforcement plate occurs.

B. Fire-Rated Assemblies: Install fire-rated assemblies in accordance with requirements of authorities having jurisdiction, Underwriters' Laboratories and test results obtained and published by the drywall manufacturer, for the fire-rated drywall assembly types indicated on the drawings.

C. Acoustical Assemblies: Install acoustically rated assemblies to achieve a minimum STC as noted on drawings, in accordance with test results obtained and published by the drywall manufacturer, for the drywall assembly type indicated on the drawings.

D. Sealant

1. Install continuous acoustical sealant bead at top and bottom edges of wallboard where indicated or required for sound rating as wallboard is installed, and between metal trim edge beads and abutting construction.

2. Install acoustical sealant in 1/8" wide vertical control joints within the length of the wall or partitions, and in all other joints, specified below under "Control Joints." Install bead of acoustical sealant around electric switch and outlet boxes, piping, ducts, and around any other penetration in the wallboard; place sealant bead between penetrations and edge of wallboard.

3. Where sealant is exposed to view, protect adjacent surfaces from damage and from sealant material, and tool sealant flush with and in same plane as wallboard surface. Sealant beads shall be 1/4" to 3/8" diameter.

E. Wall Board Application

1. Do not install wallboard panels until steel door frames and other custom metal frames or ornamental metal frames are in place; coordinate work with Section 081113, "Steel Doors and Frames."

2. See drawings for all board types. Use fire-rated wallboard for fire-rated assemblies. Use sag-resistant wallboard for ceilings. Use water-resistant wallboard where indicated on drawings and where wallboard would be subject to moisture. Install water-resistant wallboard in full, large sheets (no scraps) to limit number of butt joints.

3. Apply wallboard with long dimension parallel to stud framing members, and with abutting edges occurring over stud flanges.

4. Install wallboard for partitions from floor to underside of structure above and secure rigidly in place by screw attachment, unless otherwise indicated.

5. Provide "Thermafiber" safing insulation meeting standards of Section 078413 at flutes of metal deck where partitions carry up to bottom of metal deck.

6. Neatly cut wallboard to fit around outlets, switch boxes, framed openings, piping, ducts, and other items which penetrate wallboard; fill gaps with acoustic sealant.

7. Where wallboard is to be applied to curved surfaces, dampen wallboard on back side as required to obtain required curve. Finish surface shall present smooth, even curve without fluting or other imperfections.

8. Screw fasten wallboard with power-driven electric screw driver, screw heads to slightly depress surface of wallboard without cutting paper, screws not closer than 3/8" from ends and edges of wallboard.

9. Where studs are doubled-up, screw fasten wallboard to both studs in a staggered pattern.

F. Cementitious Backer Board

1. General: Furnish cementitious backer board in maximum available lengths. Install horizontally, with end joints over framing members.

2. Fastening: Secure cementitious backer board to each framing member with screws spaced not more than 12 inches on center and not closer than 1/2" from the edge. Install screws with a conventional screw gun so that the screw heads are flush with the surface of the board.

3. Joint Treatment: Fill space between edge of backer and receptor with dry-set Portland cement or latex-Portland cement mortar. Fill all horizontal and vertical joints and corners with dry-set Portland cement or latex-Portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.

G. Metal Trim: Install and mechanically secure in accordance with manufacturer's instructions; and finish with three (3) coats of joint compound, feathered and finish sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions.

1. Corner Beads: Install specified corner beads in single lengths at all external corners, unless corner lengths exceed standard stock lengths.

2. Edge Beads: Install specified edge beads in single lengths at all terminating edges of wallboard exposed to view, where edges abut dissimilar materials, where edges would be exposed to view, and elsewhere where shown on drawings. Where indicated on drawings, seal joint between metal edge bead and adjoining surface with specified gasket, 1/8" wide minimum and set back 1/8" from face of wallboard, unless other size and profile indicated on drawings.

3. Casing beads shall be set in long lengths, neatly butted at joints. Provide casing beads at juncture of board and vertical surfaces and at exposed perimeters.

4. Reveals: Install specified reveal beads in single lengths.

H. Control Joint Locations: Gypsum board surfaces shall be isolated with control joints where:

1. Ceiling abuts a structural element, dissimilar wall or other vertical penetration.

2. Construction changes within the plane of the partition or ceiling.

3. Shown on approved shop drawings.

4. Ceiling dimensions exceed thirty (30) feet in either direction.

5. Wings of "L," "U," and "T" shaped ceiling areas are joined.

6. Expansion or control joints occur in the structural elements of the building.

7. Shaftwall runs exceed 30' without interruption.

8. Partition or furring abuts a structural element or dissimilar wall or ceiling.

9. Partition or furring runs exceed 30' without interruption.

10. Where control joints are required, ceiling height door frames may be used as control joints. Less than ceiling height frames shall have control joints extending to the ceiling from both corners.

I. Joint Treatment and Spackling

1. Joints between face wallboards in the same plane, joints at internal corners of intersecting partitions and joints at internal corners of intersections between ceilings and walls or partitions shall be filled with joint compound.

2. Screw heads and other depressions shall be filled with joint compound. Joint compound shall be applied in three (3) coats, feathered and finish surface sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions. Treatment of joints and screw heads with joint compound is also required where wallboard will be covered by finish materials which require a smooth surface, such as vinyl wall coverings.

3.3 FURRED WALLS AND PARTITIONS

A. Use specified metal furring channels. Run metal furring channel framing members vertically, space sixteen (16) inches o.c. maximum. Fasten furring channels to concrete or masonry surfaces with power-driven fasteners or concrete stub nails spaced sixteen (16) inches o.c. maximum through alternate wing flanges (staggered) of furring channel. Furring channels shall be shimmed as necessary to provide a plumb and level backing for wallboard. At inside of exterior walls, an asphalt felt protection strip shall be installed between each furring channel and the wall. Furring channel and splices shall be provided by nesting channels at least eight (8) inches and securely anchoring to concrete or masonry with two (2) fasteners in each wing.

B. Wallboard Installation: Same as specified under Article 3.4 - "Metal Stud Partitions."

3.4 METAL STUD PARTITIONS

A. Runner Installation: Use channel type. Align accurately at floor according to partition layout. Anchor runners securely sixteen (16) inches o.c. maximum with power-driven anchors to floor slab, with power-driven anchors to structural slab above. See "Stud Installation" below for runners over heads of metal door frames. Where required, carefully remove sprayed-on fireproofing to allow partition to be properly installed.

B. Stud Installation

1. Use channel type, positioned vertically in runners, spaced as noted on drawings, but not more than sixteen (16) inches o.c.

2. Anchor studs to floor runners with screw fasteners. Provide snap-in or slotted hole slip joint bolt connections of studs to ceiling runners leaving space for movement. Anchor studs at partition intersections, partition corners and where partition abuts other construction to floor and ceiling runners with sheet metal screws through each stud flange and runner flange.

3. Connection at ceiling runner for non-rated partitions shall be snap-in or slotted hole slip joint bolt connection that shall allow for movement. Seal studs abutting other construction with 1/8" thick neoprene gasket continuously between stud and abutting construction.

4. Connections for fire rated partitions at ceiling runners shall conform to UL Design #2079.

5. Install metal stud horizontal bracing wherever vertical studs are cut or wallboard is cut for passage of pipes, ducts or other penetrations, and anchor horizontal bracing to vertical studs with sheet metal screws.

6. At jambs of door frames and borrowed light frames, install doubled-up studs (not back to back) from floor to underside of structural deck, and securely anchor studs to jamb anchors of frames and to runners with screws. Provide cross braces from hollow metal frames to underside of slab.

7. Over heads of door frames, install cut-to-length section of runner with flanges slit and web bent to allow flanges to overlap adjacent vertical studs, and securely anchor runner to adjacent vertical studs with sheet metal screws. Install cut-to-length vertical studs from runner (over heads of door frame) to ceiling runner sixteen (16) inches maximum o.c. and at vertical joints of wallboard, and securely anchor studs to runners with sheet metal screws.

8. At control joints, in field of partition, install double-up studs (back to back) from floor to ceiling runner, with 1/4" thick continuous compressible gasket between studs. When necessary, splice studs with eight (8) inches minimum nested laps and attach flanges together with two (2) sheet metal screws in each flange. All screws shall be self-tapping sheet metal screws.

C. Runners and Studs at Chase Wall: As specified above for "Runners" and "Studs" and as specified herein. Chase walls shall have either a single or double row of floor and ceiling runners with metal studs sixteen (16) inches o.c. maximum and positioned vertically in the runners so that the studs are opposite each other in pairs with the flanges pointing in the same direction. Anchor all studs to runner flanges with sheet metal screws through each stud flange and runner flange following requirements of paragraph 3.4, B. Provide cross bracing between the rows of studs by attaching runner channels or studs set full width of chase attached to vertical studs with one self-tapping screw at each end. Space cross bracing not over thirty-six (36) inches o.c. vertically.

D. Wallboard Installation - Single Layer Application (Screw Attached)

1. Install wallboard with long dimension parallel to framing member and with abutting edge joints over web of framing member. Install wallboard with long dimension perpendicular to framing members above and below openings in drywall extending to second stud at each side of opening. Joints on opposite sides of wall shall be arranged so as to occur on different studs.

2. Boards shall be fastened securely to metal studs with screws as specified. Where a free end occurs between studs, back blocking shall be required. Center abutting ends over studs. Correct work as necessary so that faces of boards are flush, smooth, true.

3. Wallboard screws shall be applied with an electric screw gun. Screws shall be driven not less than 3/8" from ends or edges of board to provide uniform dimple not over 1/32" deep. Screws shall be spaced twelve (12) inches o.c. in the field of the board and 8" o.c. staggered along the abutting edges.

4. All ends and edges of wallboard shall occur over screwing members (studs or furring channels). Boards shall be brought into contact but shall not be forced into place. Where ends or edges abut, they shall be staggered. Joints on opposite sides of a partition shall be so arranged as to occur on different studs.

5. At locations where piping receptacles, conduit, switches, etc., penetrate drywall partitions, provide non-drying sealant and an approved sealant stop at cut board locations inside partition.

E. Wallboard Installation - Double-Layer Application

1. General: See drawings for wallboard partition types required.

2. First Layer (Screw Attached): Install as described above for single layer application.

3. Second Layer (Screw Attached): Screw attach second layer, unless laminating method of attachment indicated on drawings or necessary to obtain required sound rating or fire rating. Install wallboard vertically with vertical joints offset thirty-four (34) inches from first layer joints and staggered on opposite sides of wall. Attach wallboard with 1-5/8" screws sixteen (16) inches o.c. along vertical joints and sixteen (16) inches o.c. in the field of the wallboard. Screw through first layer into metal framing members.

4. Second Layer (Laminated): Install wallboard vertically. Stagger joints of second layer from first layer joints. Laminate second layer with specified laminating adhesive in beads or strips running continuously from floor to ceiling in accordance with manufacturer's instructions. After laminating, screw wallboard to framing members with 1-5/8" screws, spaced twelve (12) inches o.c. around perimeter of wallboard.

F. Wallboard Installation - Laminated Application: Where laminated wallboard is indicated, use specified laminating adhesive, install wallboard vertically and maintain tolerances as specified for screw attached wallboard.

G. Insulation Installation: Install where indicated on drawings. Place blanket tightly between studs.

H. Deflection of Structure Above: To allow for possible deflection of structure above partitions, provide top runners for non-rated partitions with 1-1/4" minimum flanges and do not screw studs or drywall to top runner. Where positive anchorage of studs to top runner is required, anchorage device shall be by means of slotted hole (in clip connection with screw attachment to web of steel through bushings located in slots of clips), or other anchorage device approved by Architect.

I. Control Joints

1. Leave a 1/2" continuous opening between gypsum boards for insertion of surface mounted joint.

2. Back by double framing members.

3. Attach control joint to face layer with 9/16" galvanized staples six (6) inches o.c. at both flanges along entire length of joint.

4. Provide two (2) inch wide gypsum panel strip or other adequate seal behind control joint in fire rated partitions and partitions with safing insulation.

3.5 DRYWALL FASCIAS AND CEILINGS

A. Furnish and install inserts, hanger clips and similar devices in coordination with other work.

B. Secure hangers to inserts and clips. Clamp or bolt hangers to main runners.

C. Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.

D. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.

E. Metal Furring Channels: Space sixteen (16) inches o.c. maximum. Attach to 1-1/2" main runner channels with furring channel clips (on alternate sides of main runner channels). Furring channels shall not be let into or come in contact with abutting masonry walls. End splices shall be provided by nesting furring channels no less than eight (8) inches and securely wire tying. At any openings that interrupt the furring channels, install additional cross reinforcing to restore lateral stability.

F. Mechanical accessories, hangers, splices, runner channels and other members used in suspension system shall be of metal, zinc coated, or coated with rust inhibitive paint, of suitable design and of adequate strength to support units securely without sagging, and such as to bring unit faces to finished indicated lines and levels.

1. Provide special furring where ducts are over two (2) feet wide.

G. Apply board with its long dimension at right angles to channels. Locate board butt joints over center of furring channels. Attach board with one (1) inch self-drilling drywall screws twelve (12) inches o.c. in field of board; eight (8) inches o.c. at butt joints located not less than 3/8" from edges.

3.6 SHAFT WALLS

A. Runner Installation: Use "J" metal runners at floor and ceiling, with the short leg toward finish side of wall. Securely attach runners to structural supports with power-driven fasteners at both ends and twenty-four (24) inches o.c.

B. Shaft Wall Liner: Cut shaft wall liner panels one (1) inch less from floor to ceiling height and erect vertically between J-runners.

C. C-H Studs: Cut metal studs 3/8" to not more than 1/2" less than floor to ceiling height and install between shaft wall liner panels so that panels are fitted snugly into the one (1) inch wide "H", “T” or “I” portion of the stud. Space studs twenty-four (24) inches o.c., unless otherwise indicated on drawings. Install full-length steel E-Studs or

J-runners vertically at T-intersections, corners, door jambs, and columns. Install full length E-Studs or J-runners over shaft wall liner both sides of closure panels. Frame openings cut within a liner panel with J-Runner around perimeter. For openings, frame with vertical E-Stud or J-runner at edges, horizontal runner at head and sill, and reinforcing as shown on the drawings. Suitably frame all openings to maintain structural support for wall. Over metal doors, install a cut to length section of runner and attach to strut-studs with clip angles and 3/8" Type S Screws space twelve (12) inches o.c.

D. Wallboard Installation - Double Layer Installation: Erect gypsum wallboard base layer horizontally one side of studs with end joints staggered. Fasten base layer panels to studs with one (1) inch Type S screws twenty-four (24) inches o.c. Caulk perimeter of base layer panels. Apply gypsum wallboard face layer vertically over base layer with joints staggered and attached with 1-5/8" Type S screws staggered from those in base, spaced eight (8) inches o.c. and driven into studs.

E. Wallboard Installation (Where Both Sides of Shaft Wall are Finished): Apply gypsum wallboard face layers vertically both sides of studs. Stagger joints on opposite partition sides. Fasten panels with one (1) inch or two (2) inches Type S screws spaced eight (8) inches o.c. in field and along edges into studs.

F. Where handrails are indicated for direct attachment to drywall shaft system, provide not less than a sixteen (16) ga. x eight (8) inches wide galvanized steel reinforcement strip, accurately positioned and secured to studs and concealed behind not less than one 1/2" thick course of gypsum board in the system.

G. Integrate stair hanger rods with drywall shaft system by locating cavity of system as required to enclose rods.

3.7 ERECTION AT COLUMN ENCLOSURES

A. Metal furring supports shall be provided under work of this Section, and shall be cut to lengths as necessary for tight fit such that spacing is not more than sixteen (16) inches o.c.

B. Board shall be fastened securely to supports with screws as specified. Place boards in position with minimum amount of joints. Where free ends occur between supports, back-blocking or furring shall be required. Center abutting ends over supports. Correct work as necessary so that faces of boards are flush, smooth and true. Provide clips or cross furring for attachment as required.

C. All layers shall be screw attached to furring.

D. When column finish called for on drawings to be in the same plane as drywall finish layer, maintain even, level plane.

3.8 FINISHING

A. Taping: A thin, uniform layer of taping compound shall be applied to all joints and angles to be reinforced. Reinforcing tape shall be applied immediately, centered over

the joint, seated into the compound. A skim coat shall follow immediately, but shall not function as a fill or second coat. Tape shall be properly folded and embedded in all angles to provide a true angle.

B. Filling: After taping compound has hardened, topping compound shall be applied, filling the board taper flush with the surface. The fill coat shall cover the tape and feather out slightly beyond the tape. On joints with no taper, the fill coat shall cover the tape and feather out at least four (4) inches on either side of the tape. No fill coat is necessary on interior angles.

C. After topping compound has hardened, a finishing coat of topping compound shall be spread evenly over and extending slightly beyond the fill coat on all joints and feathered to a smooth, uniform finish. Over tapered edges, the finished joint shall not protrude beyond the plane of the surface. All taped angles shall receive a finish coat to cover the tape and taping compound, and provide a true angle. Where necessary, sanding shall be done between coats and following the final application of compound to provide a smooth surface, ready for painting.

D. Fastener Depressions: Compound shall be applied to all fastener depressions followed, when hardened by at least two (2) coats of compound, leaving all depressions level with the plane of the surface.

E. Finishing Beads and Trim: Taping compound shall be applied to all bead and trim and shall be feathered out from the ground to the plane of the surface. When hardened, this shall be followed by two (2) coats of topping compound each extending slightly beyond the previous coat. The finish coat shall be feathered from the ground to the plane of the surface and sanded as necessary to provide a flat, smooth surface ready for decoration.

F. Level of finish for surface exposed to view shall conform to Level 4 of ASTM C 840 and GA-214 of the Gypsum Association, unless Level 5 “skim coat” finish is specified.

1. Level 5 finish should be used in the following locations:

a. All soffits at the exterior walls.
b. And in any other miscellaneous locations as indicated in drawings.
c. All walls to receive Scuff Resistant Paint System.

G. Drywall construction with defects of such character which will mar appearance of finished work, or which is otherwise defective, will be rejected and shall be removed and replaced at no expense to the Owner.

3.9 CLEANING AND ADJUSTMENT

A. At the completion of installation of the work, all rubbish shall be removed from the building leaving floors broom clean. Excess material, scaffolding, tools and other equipment shall be removed from the building.

B. Work shall be left in clean condition ready for painting or wall covering. All work shall be as approved by Architect.

C. Cutting and Repairing: Include all cutting, fitting and repairing of the work included herein in connection with all mechanical trades and all other trades which come in conjunction with any part of the work, and leave all work complete and perfect after all trades have completed their work.

3.10 PROTECTION OF WORK

A. Installer shall advise Contractor of required procedures for protecting drywall work from damage and deterioration during remainder of construction period.

END OF SECTION

SECTION 093000

TILE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the tile work as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Concrete wall tiles.

2. Concrete tread/riser tiles.

3. Porcelain floor tile.

4. Porcelain wall tile.

5. Glass tile.

6. Stone saddles.

7. Setting beds, grout, sealant and waterproofing membrane.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Concrete - Section 033000.

E. Unit masonry - Section 042000.

F. Gypsum drywall – Section 092900.

1.5 QUALITY ASSURANCE

A. Qualifications of Installers: For cutting, installing and grouting of ceramic tile, use only thoroughly trained and experienced journeyman tile setters who are completely familiar with the requirements of this work, and the recommendations contained in the referenced standards.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with the following:

1. Manufacture all tile in accordance with Standard Grade Requirements of ANSI A-137.1.

2. Install all ceramic tile in accordance with the recommendations contained in Handbook for Ceramic Tile Installation of the Tile Council of America, Inc., latest edition.

C. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

a. Rubber Floor Adhesives: 60g/l.
b. Subfloor Adhesives: 50g/l.
c. VCT & Asphalt Adhesives: 50g/l.
d. Ceramic Tile Adhesives: 65g/l.
e. Cove Base Adhesives: 50g/l.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. All vinyl, linoleum, laminate flooring, wood flooring, ceramic flooring, rubber flooring and wall base must be certified as compliant with FloorScore low emitting material Standard.

1.6 SUBMITTALS

A. Samples

1. Before any tile is delivered to the job site, submit to the Architect sample panels, approx. minimum 12" x 12" or larger as requireed to exhibit the qualities of the tile sizes specified, mounted on hardboard back-up with selected grout color for each color and pattern of ceramic tile and grout specified.

2. Submit 6" length of stone saddles.

3. Submit 12" x 12" samples of waterproofing membrane.

B. Master Grade Certificates: Prior to opening ceramic tile containers, submit to the Architect a Master Grade Certificate, signed by an officer of the firm manufacturing the ceramic tile used, and issued when the shipment is made, stating the grade, kind of tile, identification marks for tile containers, and the name and location of the project.

C. Mock-Ups

1. At an area on the site where approved by the Architect, provide mockups of porcelain, glass and concrete tile installations.

   a. Make the mock-up approximately 3'-0" x 3'-0" in dimension.
   b. Provide one mock-up for each type, class, and color of installation required under this Section.
   c. The mock-ups may be used as part of the Work, and may be included in the finished Work, when so approved by the Architect.
   d. Revise as necessary to secure the Architect's approval.

2. The mock-ups, when approved by the Architect, will be used as datum for comparison with the remainder of the work of this Section for the purposes of acceptance or rejection.

3. If the mock-up panels are not permitted to be part of the finished Work, completely demolish and remove them from the job site upon completion and acceptance of the work of this Section.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).

c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Provide manufacturer's documentation that all flooring, including vinyl, linoleum, laminate, wood, ceramic, and rubber, and all wall base, shall meet the following criteria:

   a. Installed hard surface flooring must be certified as compliant with the FloorScore Standard as developed by the Resilient Floor Covering Institute. This includes all vinyl, linoleum, laminate flooring, wood flooring, ceramic flooring, rubber flooring, and wall base.
   b. The Volatile Organic Compound (VOC) content of any field applied interior floor adhesive and grout, must meet SCAQMD Rule 1168 VOC limits.

4. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

5. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING

A. Delivery and Storage

1. Deliver all materials of this Section to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store all materials under cover in a manner to prevent damage and contamination; store only the specified materials at the job site.

B. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain temperatures at not less than 50 deg. F. in tiled areas during installation and for 7 days after completion.

PART 2 PRODUCTS

2.1 WALL TILE

A. Laguna large format tile, concrete tile with smooth, polished finish, no aggregate showing, custom size, 4" x 22" nominal size x 5/8" thick, by Concrete Collaborative.

B. Some tiles shall require polished, 90 degree eased edges, see drawings for locations.

C. Porcelain wall tile in size 12" x 12", CasalGrande Padana, "Basaltina" in color Ischia.

D. Wall Base: Laguna Concrete tile base in large format, alternate color, straight face, no cove, custom size, 4" x 22" x 5/8" thick matching concrete wall tile in appearance and size, by Concrete Collaborative.

E. Custom custom riser/treads with Laguna finish smooth, polished, 90 degree eased edges by Concrete Collaborative.

2.2 FLOOR TILE

A. 12" x 24" porcelain tile, CasalGrande Padana, "Basaltina" in color Vulcano.

B. Provide non-slip tile where scheduled, of same characteristics as ceramic specified herein with the addition of 7-1/2% abrasive grain by weight.

2.3 TRIM AND SPECIAL SHAPES

A. Provide finished edges on concrete tile and riser-tread where indicated on the details and at all instances where tile egde isnot covered by stainless steel trim. Trim and special shapes to match the tile specified herein, as required by field conditions and drawing details.

2.4 STONE SADDLES

A. Provide sound, black slate saddles as selected by the Architect, minimum 3/4" thick, with an abrasive hardness of not less than 10.0, when tested in accordance with ASTM C 241. Cut saddle to fit jamb profile, honed finish.

2.5 GLASS TILE

A. Glass tile shall meet ANSI A137.2.

B. Glass tile with etched finish face, in size 12" x 12", and colors 65 and 58, Glacier from Stone Source or Viscaya from Nemo Tile.

2.6 EDGE AND CORNER PROTECTION

A. Tile Edge and Corner Protection: Provide stainless steel trim in dimensions to fit thickness of tiles; Custom Bldg, Products "L" Channel, 17.5 mm or equal.

2.7 MORTAR BED, BOND COAT AND GROUT

A. Portland Cement: ASTM C 150, Type I.

B. Hydrated Lime: ASTM C 207, Type S.

C. Sand: ASTM C 144, clean and graded natural sand.

D. Latex Admixture for Mortar Bed

1. MAPEI, Planicrete AC, blended with a 3:1 site mix.

2. Laticrete 333.

E. Latex – Portland Cement Bond Coat

1. MAPEI, Keralastic System thin set mortar, consisting of Kerabond dry-set mortar and Keralastic latex admixture.

2. Laticrete; 211 dry-set mortar and 4237 latex admixture.

F. Glass Tile Setting Materials:

1. White Grani/Rapid by Mapei or as recommended by Glass Tile manufacturer.

2. Provide crack suppression membrane over entire wall surface that is to be covered with glass tile supplied by setting material manufacturer that is approved by glass tile manufacturer.

G. Wall and Base Tile

1. Over drywall use ANSI A136.1-1967 Organic Adhesive for installation of Ceramic Tile, Type I. Shear strength shall be 50 psi minimum. Adhesive primer as recommended by adhesive manufacturer. Manufacturer shall certify, in writing, that adhesive and primer used are proper types for the intended tile types and application. Conform to TCA Detail W-242.

a. Mapei Type 1 Mastic.
b. Laticrete Type 1 Adhesive.

2. Over cement board use a Latex Portland cement mortar bond coat conforming to ANSI A118.4 and TCA Detail W-244; coat back of board with waterproof membrane as specified below.

3. Over glass mat water resistant gypsum backer board use a Latex Portland cement mortar bond coat conforming to ANSI A118.4 and TCA Detail W-245.

4. Concrete tile or tread bonded to rigid teel surface (base tile or stair tread) : Latapoxy 300 Adhesive.

H. Floor Tile and Stone Saddle - Waterproof Setting Bed: Set floor tile and stone saddle using thin set latex Portland cement bond coat conforming to ANSI A118.4 and waterproofing membrane conforming to TCA Detail F-122.

1. Waterproofing Membrane: "Laticrete 9235 with Mircoban" made by Laticrete International or approved equal “Mapelastic 400” by Mapei with factory blended “Bio-Block Antimicrobial”.

2. Reinforce membrane with polyester fabric.

I. Water: Clean, fresh and suitable for drinking.

J. Grout: For grouting ceramic tile, provide a commercial Portland cement grout "Ultracolor Plus" made by Mapei, Laticrete Sanded Grout with Latex Additive, or approved equal; color as selected by the Architect. Add latex additive to grout made by same manufacturer as grout.

1. Provide unsanded grout where glass tile is used.

K. Physical Properties: The setting beds and grouts must meet the following physical requirements:

1. Compressive Strength – 3000 psi min.

2. Shear Bond Strength – 500 psi min.

3. Water Absorption – 4.0% max.

4. Service Rating (ASTM C 627) – Extra Heavy Duty.

L. Sealer: Seal all grout joints and all unglazed tile using No. 004 “Keraseal Penetrating Sealer for Unglazed Grout and Tile” as manufactured by Mapei Corp. or “Sealer’s Choice 15 Gold” by Aqua Mix Inc..

M. Temporary Protective Coating: Either product indicated below that is applied in the tile manufacturer’s factory and formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, applied hot, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg. F. per ASTM D 87.

2. Grout release in form of manufacturer’s standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

N. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, equal to “Concentrated Stone & Tile Cleaner” made by Aqua-

Mix or approved equal, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.8 SEALANT

A. Joint Backing: Preformed, compressible, resilient, non-extruding, non-staining strips of foam neoprene, foam polyethylene, or other material recommended by sealant manufacturer.

B. Bond Breaker: Polyethylene tape, 3 mils thick, or other material recommended by sealant manufacturer.

C. Sealant Primer: Colorless, non-staining, or type to suit substrate surface, as recommended by sealant manufacturer.

D. Sealant: One-part silicone based sanitary sealant, conforming to ASTM C 920, Type S, Grade NS, Class 25. Sealant hardness upon full cure shall be between 20-30 Shore "A" Durometer. Color of sealant to blend with or match adjacent materials, and as selected by the Architect. Sealant shall be equivalent to 1700 Sanitary Sealant made by General Electric or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where tile is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 CONDITION OF SURFACES

A. Allowable Variations in Substrate Levels for Floors: + 1/8" in 10'-0" distance and 1/4" total max. variation from levels shown.

B. Grind or fill concrete and masonry substrates as required to comply with allowable variations.

3.3 PREPARATION

A. Coordinate the following with Section 033000:

1. Steel trowel and fine broom finish concrete slabs that are to receive ceramic tile. Cure concrete slabs that are to receive tile before tile application. Do not use liquid curing compounds or other coatings that may prevent bonding of tile setting materials to slabs. Slab shall be dry at time of tile installation.

B. Etch concrete substrate as may be required to remove curing compounds or other substances that would interfere with proper bond of setting bed. Rinse with water to

remove all traces of treatment. Surface must meet finish requirements as noted in ANSI 108.01.

C. Blending: for tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at project site before installing.

D. Field Applied Temporary Protective Coating: Pre-coat tile with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.4 JOINTS IN TILE WORK

A. Joint Widths: 1/16" wide in glass, concrete or porcelain tile work.

B. Alignment: Wall, base and floor joints shall align through the field and trim. Direction and location of all joints as directed by Architect.

C. Movement Joints: Conform to TCA Detail EJ171. Locate where movement joints are in back-up material. Provide movement joint at joints between mop receptors and ceramic tile. Provide movement joint at all vertical internal joints of wall tile. Movement joints 1/8" wide in ceramic tile. Fill all movement joints with specified backing and sealant. Use bond breaker where sufficient space for joint backing does not exist.

1. Provide sealant between ceramic tile and plumbing fixtures, mirrors, pipes, countertops and other dissimilar materials penetrating or adjacent to ceramic tile.

3.5 INSTALLATION

A. Comply with the following installation standards

1. Wall tile over drywall using organic adhesive - ANSI A108.4 and A108.10.

2. Wall tile over cement board or glass mat backer board using dry set mortar - ANSI A108.5 and A108.10.

3. Floor tile over waterproofing membrane - ANSI A108.5 and A108.10.

4. Glass tile: Follow the guidelines of the manufacturer of the tile, including installation of crack isolation membrane. Any deviation from the manufacturers recommendations shall be submitted to Architect prior to installation.

B. All setting beds and/or adhesives shall provide for an average contact area of not less than 95%.

C. Allowable Variations in Finished Work: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignment shown.

1. Floors: 1/8" in 10'-0" run, any direction; +/- 1/8" at any location; 1/32" offset at any location.

2. Walls: 1/8" in 8'-0" run, any direction; 1/8" at any location; offset at any location, 1/32".

3. Joints: +/- 1/32" joint width variation of any location; 1/16" in 3'-0" run deviation from plumb and true.

D. Waterproofing Membrane

1. Install the membrane in strict accordance with manufacturer's written recommendations.

2. Upon completion of work, test horizontal membrane for leaks by plugging the drain or damming areas and filling with water for a period of 78 hours minimum. Inspect for leakage. Make necessary adjustments to stop all leakage and retest until watertight. If membrane is not covered by another surface immediately, provide protection until membrane is covered.

E. Handle, store, mix and apply setting and grouting materials in compliance with the manufacturer's instructions.

F. Extend tile work into recesses and under equipment and fixtures, to form a complete covering without interruptions. Terminate work neatly at obstructions, edges and corners without disruption of pattern or joint alignment.

G. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight, aligned joints. Fit tile closely to electrical outlets, piping and fixtures so that plates, collars, or covers overlap tile.

H. Lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are the same size. Lay out tile work and center tile fields both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths.

3.6 INSTALLATION OF STONE SADDLES

A. Install stone saddles cut to profiles and sizes shown, accurately fitted to jambs, coped at stops, set in full bed of mortar herein specified, and with grouted edge joints as specified for floor tile.

3.7 CLEANING AND PROTECTION

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.

2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use cleaners only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from

effects of cleaning. Flush surfaces with clean water before and after cleaning to insure removal of all cleaning material.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. Apply coat of sealer to all grout joints and all unglazed tile.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings from tile surfaces.

E. Leave finished installation clean and free of cracked, chipped, broken, unbonded or otherwise defective tile work.

END OF SECTION

SECTION 095113

ACOUSTIC PANEL CEILINGS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the acoustic panel ceilings as shown on the drawings and/or specified herein, including but not limited to, the following:

1. Acoustical panel units.

2. Exposed "T" suspension system, including hangers and inserts.

3. Provisions for the installation of lighting fixtures, diffusers, grilles and similar items provided under other Sections.

4. Cutting, drilling, scribing and fitting as required for electro-mechanical penetrations.

5. Perimeter and column moldings, trim and accessories for acoustical ceilings.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Metal deck - Section 053100.

E. Gypsum drywall - Section 092900, for drywall ceilings.

F. Sprinklers - Division 21.

G. Diffusers, grilles, radiant panels, and related frames - Division 23.

H. Lighting fixtures - Section 265000.

I. Audiovisual - Section 274000.

1.5 QUALITY ASSURANCE

A. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations published by the Ceilings and Interior Systems Contractor's Association.

B. Qualifications of Installers

1. The suspended ceiling subcontractor shall have a record of successful installation of similar ceilings acceptable to Architect and shall be currently approved by the manufacturer of the ceiling suspension system.

2. For the actual fabrication and installation of all components of the system, use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

C. The work is subject to the following standards:

1. ASTM C 635 "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings," American Society for Testing and Materials.

2. ASTM C 636 "Standard Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels," American Society for Testing and Materials.

D. In addition to suspension system specified, provide seismic struts and seismic clips to meet seismic standards as required by prevailing Codes and Ordinances.

E. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall

be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Shop Drawings: Submit completely dimensioned ceiling layouts for all areas where acoustical ceilings are required, showing:

1. Any deviations from Architect's reflected ceiling plan layouts, especially lighting fixture and dimensions. Also indicate if any light fixtures will not fit into Architect's ceiling layout due to dimensional restrictions of field conditions.

2. Direction and spacing of suspension members and location of hangers for carrying suspension members.

3. Direction, sizes and types of acoustical units, showing suspension grid members, and starting point for each individual ceiling area.

4. Moldings at perimeter of ceiling, at columns and elsewhere as required due to penetrations or exposure at edge of ceiling tiles.

5. Location and direction of lights, air diffusers, air slots, and similar items in the ceiling plane.

6. Details of construction and installation at all conditions.

7. Materials, gauges, thickness and finishes.

B. Samples and Product Literature: Submit the following samples and related manufacturer's descriptive literature.

1. Twelve (12) inch long sample of each component of suspension systems, including moldings.

2. Acoustical units — full size.

C. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.8 PROJECT CONDITIONS

A. Do not install acoustical ceilings until wet-work in space is completed and nominally dry, work above ceilings has been completed, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.9 COORDINATION

A. Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire suppression system components, and partition system.

1.10 EXTRA STOCK

A. Extra Stock: Deliver stock of maintenance material to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quantity of full size units equal to 2.0% of amount installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

A. ACT Panels: Provide at all ACT ceiling locations unless otherwise noted on drawings; see drawings for sizes:

1. Mineral fiber panels equal to "Ultima HRC Square Lay-In" as manufactured by Armstrong World Industries, or equivalent.

a. 24" x 24".
b. 24" x 48".
c. 12" x 72".
d. 1'-3" x length as indicated on the drawings.
e. 12" x length as indicated on the drawings.
f. 24" x length as indicated on the drawings.
g. Provide factory finish sizes:
1). 15" x 24" (Armstrong #FZ42094)
2). 15" x 66" (Armstrong #FZ42092)
3). 24" x 27" (Armstrong #FZ42095)
4). 24" x 66" (Armstrong #FZ42093)
h. Provide manufacturer's perimeter and transition moldings as indicated on drawings.

B. Moisture-Resistant ACT Panels

1. Mineral fiber panels equal to "Ceramaguard Fine Fissured Perforated" with "15/16" Prelude Plus XL Aluminum" suspension system as manufactured by Armstrong World Industries, or equivalent.

a. 24" x 24".
b. 24" x 48".
c. 1'-3" 24".
d. All sizes above x length as indicated on the drawings.

C. Formed Metal Ceiling Panels

1. Metal ceiling panels equal to "Metalworks Tegular" as manufactured by Armstrong World Industries or equivalent. Provide unperforated panels, factory-applied powder coated in white, custom sizes as indicated on drawings.

"Flush Tegular" edge profile with "15/16" Prelude XL HRC" exposed tee suspension system.

2.2 SUSPENSION SYSTEM

A. Provide at all ACT locations, unless otherwise noted on architectural drawings or specified above per 2.1B, "Prelude XL HRC," 15/16" exposed steel suspension system with Blizzard White powder-coated finish system made by Armstrong World Industries, or equivalent made by USG Interiors, Inc. or Chicago Metallic Corp.

B. The suspension system shall support the ceiling assembly shown on the drawings and specified herein, with a maximum deflection of 1/360 of the span, in accordance with ASTM C 635.

C. Provide min. 12 ga. galvanized wire hangers, soft annealed steel conforming to ASTM A 641, prestretched, Class 1 zinc coating, soft temper, size so that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire.

D. Provide ceiling clips and inserts to receive hangers, type as recommended by suspension system manufacturer, sizes for pull-out resistance of not less than five (5) times the hanger design load, as indicated in ASTM C 635.

E. Suspension systems shall conform to ASTM C 635, intermediate duty.

F. Provide manufacturer's standard wall moldings with Blizzard White powder-coated finish to match suspension systems. For circular penetrations of ceilings, provide edge moldings fabricated to diameter required to fit penetration exactly.

G. NOTE: Where continuous recessed fluorescent light fixtures are shown in architectural drawings, install tees such that they can be interrupted to allow for the continuous fixture run.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas where acoustic panel ceilings are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected to permit proper installation of the layout.

3.2 PREPARATION

A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.

B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling, unless otherwise indicated on the Drawings.

Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION

A. Codes and Standards: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations and industry standards.

B. Install suspension systems to comply with ASTM C 636, with wire hangers supported only from building structural members. Locate hangers not more than 6" from each end and spaced 4'-0" along direct-hung runner, leveling to tolerance of 1/8" in 12'-0".

C. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.

D. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, reinforcing, countersplaying or other equally effective means.

E. Install edge moldings at edges of each acoustical ceiling area, and at locations where edge of acoustical units would otherwise be exposed after completion of the work.

1. Secure moldings to building construction by fastening through vertical leg. Space holes not more than 3" from each end and not more than sixteen (16) inches o.c. between end holes. Fasten tight against vertical surfaces.

2. Level moldings with ceiling suspension system, to a level tolerance of 1/8" in 12'-0".

F. Install acoustical units in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.

G. Install hold-down clips in toilet areas, and in areas where required by governing regulations; space 2'-0" o.c. on all cross tees.

H. Light fixtures or other ceiling apparatus shall not be supported from main beams or cross tees if their weight causes the total load to exceed the deflection capability of the ceiling suspension system. In such cases the load shall be supported by supplemental hangers furnished and installed by this Section of work.

I. Where fixture or ceiling apparatus installation causes eccentric loading on runners, provide stabilizer bars to prevent rotation.

3.4 ADJUST AND CLEAN

A. Clean exposed surfaces of acoustical ceilings, including trim, edge molding, and suspension members; comply with manufacturer's instructions for cleaning and touch-

up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 095133

METAL CEILINGS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the metal ceilings as shown on the drawings and/or specified herein, including but not limited to, the following:

1. Metal ceilings

2. Suspension system, including hangers and inserts.

3. Provisions for the installation of lighting fixtures, diffusers, grilles and similar items provided under other Sections.

4. Cutting, drilling, scribing and fitting as required, including for all electro/mechanical penetrations.

5. Perimeter and column moldings, trim and accessories for acoustical ceilings.

6. Acoustic treatments on back of panels.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Steel deck - Section 053100.

E. Drywall ceilings - Section 092900, for ceiling surround.

F. Fire suppression - Division 21.

G. Diffusers, radiant panels, grilles and related frames - Division 23.

H. Lighting - Division 26.

I. Speakers - Division 26.

1.5 QUALITY ASSURANCE

A. Qualifications of Installers

1. The suspended ceiling subcontractor shall have a record of successful installations of similar ceilings acceptable to the Commissioner and shall be currently approved by the manufacturer of the ceiling suspension system.

2. For the actual fabrication and installation of all components of the system, use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations published by the Ceilings and Interior Systems Contractors' Association.

C. The work is subject to applicable portions of the following standards:

1. ASTM C 635 "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings," American Society for Testing and Materials.

2. ASTM C 636 "Standard Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels," American Society for Testing and Materials.

D. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall

be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. Steel materials used for work in this section shall contain a minimum of 25% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Shop Drawings: Submit completely dimensioned ceiling layouts for all areas where metal linear ceilings are required, showing:

1. Any deviations from reflected ceiling plan layouts, especially lighting fixture and dimensions. Also indicate if any light fixtures will not fit into ceiling layout due to dimensional restrictions of field conditions.

2. Direction and spacing of suspension members and location of hangers for carrying suspension members.

3. Direction, sizes and types of metal units, showing suspension grid members, and starting point for each individual ceiling area.

4. Moldings at perimeter of ceiling, at columns and elsewhere as required due to penetrations or exposure at edge of ceiling tiles.

5. Location and direction of lights, air diffusers, air slots, and similar items in the ceiling plane.

6. Details of construction and installation at all conditions.

7. Materials, gauges, thickness and finishes.

B. Samples: Submit samples, including manufacturer's descriptive literature for:

1. All components of suspension systems, including mouldings.

2. Metal tile - full size.

C. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.

b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).

c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.

B. Handle metal acoustical ceiling units carefully to avoid damaging units in any way.

1.8 PROJECT CONDITIONS

A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof.

1.9 COORDINATION

A. Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire suppression system components, and partition system.

PART 2 PRODUCTS

2.1 METAL CEILING PANELS

A. Provide galvanized steel of dimensions shown on the drawngs, custom perforated and unperforated, with acoustical backing; LMD-E 200 Hook-On Ceiling System by Lindner USA, or equivalent ceiling system by Armstrong, Ceilings Plus, or approved equal; provide manufacturer's powder coated finish in custom pearlescent color as selected by the Architect.

1. Perforations holes shall be aligned between adjacent ceiling panels.

2. Provide 2" side return on all panel edges.

3. Provide (white/black) acoustical fleece backing glued on back of panels and encapsulated mineral wool over fleece backing sized to fit panels.

4. Panels shall be fully accessible, with concealed mounting and tight joints between panels.

5. Acoustical performance of ceiling assembly shall meet NRC of 0.80 per ASTM C 423.

6. Perimeter trim pieces shall be custom reveal sections in powder coated custom color to match color of ceiling panels.

2.2 SUSPENSION SYSTEM

A. Supporting grid system consisting of suspension and hook-on profile. Fixing to the concrete ceiling with officially approved metal anchors for a maximum load of 0.5 kN each, vernier type galvanized steel suspension hangers. Suspension with adjustable galvanized vernier hangers. Distance between hangers according to structural requirement and manufacturer's specification. The vernier hangers lower section have to be adjusted to the suspension channel. Only officially approved suspension parts might be used.

B. Provide ceiling clips and inserts to receive hangers, type as recommended by suspension system manufacturer, sized for pull-out resistance of not less than 5 times the hanger design load as indicated in ASTM C635, Table 1, Direct Hung.

C. Suspension system shall conform to ASTM C 635, intermediate duty, with deflection limited to 1/360 of span.

D. Tolerances: in accordance with TAIM Standards ("Technical Working Group of Industrial Metal Ceiling Manufacturers").

E. For circular penetrations of ceilings, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas where metal acoustic ceilings are to be installed and correct any of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.

B. Measure each ceiling area and establish layout of metal acoustic units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION

A. Codes and Standards: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations and industry standards.

B. Install suspension systems to comply with ASTM C 636, as applicable, with hangers supported only from building structural members. Locate hangers not less than 6" from each end, leveling to tolerance of 1/8" in 12'-0".

C. Space rod or flat iron hangers not more than 4'-0" o.c. along main carrying channels; attach by clips or wire ties to building structure. Locate hangers not more than 6" from each end. Space main carrying channels 4'-0" o.c. Attach suspension system to carrying channels using clips or ties, leveling to a tolerance of 1/8" in 12'-0". Provide supplemental framing to comply with wind uplift requirements and calculations.

D. Install edge moldings at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.

1. Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0". Miter corners accurately and connect securely.

E. Scribe and cut metal acoustical units for accurate fit at borders and at interruptions and penetrations by other work through the ceilings. Stiffen edges of cut units as required to eliminate evidence of oil-canning or buckling.

F. Light fixtures or other ceiling apparatus shall not be supported from main beams or cross tees if their weight causes the total load to exceed the deflection capability of the ceiling suspension system. In such cases the load shall be supported by supplementary hangers furnished and installed by this Section of work.

3.4 CLEANING AND PROTECTION

A. Clean exposed surfaces of metal acoustical units, and of trim, edge moldings and suspension members; comply with manufacturers' instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION

SECTION 096416

EDGE GRAIN WOOD FLOORING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the wood flooring, as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Edge grain wood flooring.

2. Adhesive.

3. Field finishing of wood flooring.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Carpentry - Section 062000.

E. Cement self-leveling underlayment - Section 035416.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Specialized wood flooring firm with not less than three (3) years' successful experience in installation of types specified, and acceptable to manufacturer of wood flooring.

B. General Standard: Comply with recommendations of National Wood Flooring Association (NWFA) and manufacturer's recommendations.

C. Source Quality Control: Obtain flooring of each type from single manufacturer or source, to ensure match of quality, color, pattern and texture.

D. Mock-Up: Provide 4'-0" x 4'-0" mock-up of floor. Once installed and approved, mock-up may be used in the final installation.

E. LEED Building Performance Requirements

1. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section

2. Engineered wood, not including salvaged wood, shall contain a minimum of 10% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

3. All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, medium density fiberboard) to be permanently installed on the interior of project shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI). Certification of these products shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. Adhesives used for work in this section including plastic laminating adhesives shall contain no added Urea Formaldehyde.

5. Wood Materials manufactured, fabricated, and or harvested within 500 miles (by air) of the project site shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

6. Solid wood materials shall be FSC Certified as sustainably harvested by the Forest Stewardship Council Documentation of FSC Certification shall be in accordance with the LEED Building Submittal requirements of this Section.

7. All wood flooring must be certified as compliant with FloorScore Standard as developed by the Resilient Floor Covering Institute.

8. Adhesives, sealants, paints and coatings used for work in this section shall meet the requirements of Division 1, Section 018113: "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings", where applicable. VOC Limits include, but are not limited to the following:

Wood Flooring Adhesive	100 g/l
Clear Wood Varnish	350 g/l
Clear Wood Lacquer	550 g/
Wood Stains	250 g/l
Sanding Sealers	275 g/l
Clear Shellac	730 g/l
Pigmented Shellac	550 g/l

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's detailed technical product data and installation instructions for each type of wood flooring. Include instructions for handling, storage, installation, finishing, protection, and maintenance.

B. Samples: Submit sets of range samples for wood flooring; include finish and samples of trim units.

C. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Provide material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Letters of Certification, provided from the product manufacturer on the manufacturer’s letterhead, to verify the amount of recycled content.

4. Letters of Certification, provided from the product manufacturer on the manufacturer’s letterhead, to verify that no added urea formaldehyde is present in any composite wood materials, agrifiber material or adhesive.

5. Provide manufacture documentation that the Wood Flooring and adhesives shall meet all criteria of the following:

   a. Installed hard surface flooring must be certified as compliant with the FloorScore Standard as developed by the Resilient Floor Covering Institute.

(This includes all vinyl, linoleum, laminate flooring, wood flooring, ceramic flooring, rubber flooring and wall base.)

b. The Volatile Organic Compound (VOC) content of any field applied interior Floor Adhesive, sealer, stain & finish must meet SCAQMD Rule 1113 Architectural coatings.

6. Documentation for all new wood products, including FSC Certified. Provide vendor invoices for all permanently installed wood products, FSC Certified or not. Each wood product must be identified on a line-item basis, FSC products must be identified as such on a line item basis, the dollar value of each line item must be shown, the vendors Chain-of-Custody certificate number must be shown on any invoice that includes FSC products.

7. Product Cut Sheets for all materials that meet the LEED Building Performance Requirements this Section.

8. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content).

1.7 DELIVERY, STORAGE AND HANDLING

A. Moisture Content: At time of delivery, limit average moisture content of wood flooring to 12%, with 14% maximum for any piece.

B. Protect wood flooring from excessive moisture in shipment, storage and handling. Deliver in unopened cartons or bundles and store in a dry place, with adequate air circulation. Do not deliver material to building until "wet work" such as concrete and plaster have been completed and cured to a condition of equilibrium.

1.8 PROJECT CONDITIONS

A. Conditioning: Do not proceed with installation of wood flooring until spaces have been enclosed and are at approximate humidity condition planned for occupancy. Condition wood for 7-14 days prior to start of installation by placing in spaces to receive flooring and maintaining ambient temperature between 65 degrees F. and 70 degrees F. before, during and after installation. Maximum relative humidity at any time shall not exceed 35% - 55%. Open packages of wood flooring which are sealed to permit natural adjustment of moisture content.

1.9 SPECIAL PROJECT WARRANTY

A. Submit three (3) year warranty signed by Manufacturer and Contractor agreeing to repair or replace wood flooring which shrinks, warps, cracks, or otherwise deteriorates excessively according to NFWA, or which breaks its anchorage or bond with substrate or otherwise fails to perform as required, due to failures of materials and/or

workmanship and not due to unusual exposure to moisture or other abusive forces or elements not anticipated for application.

1.10 EXTRA STOCK

A. Extra Stock: Deliver stock of maintenance material to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.

1. Wood Panel Units: Furnish quantity of full size units equal to 5.0% of amount installed.

PART 2 PRODUCTS

2.1 WOOD MATERIALS

A. Edge Grain Wood Flooring: Provide edge grain panels for floors and walls made from individual pieces of wood, 5/16" wide x 0.9" high x 61⁄4" long, with the edge grain surface showing, factory assembled with tape, kiln dried (9% +/- 2%). Faces shall be sanded to desired grit according to manufacturer's instructions. Flooring shall be edge grain Ash as manufactured by Kaswell Flooring, or approved equal; Contact: Joshua Kaswell, jkaswell@kaswell.com

B. Wood Trim: Provide wood stripping, nosings, saddles and thresholds, as indicated in or adjacent to wood flooring, of same species, grade and cut as wood flooring.

2.2 ACCESSORIES

A. Mastic: Bona R851, Stauf SMP-960, or approved equal.

B. Patching compound where required, shall be Celo-Set face grade solvent based putty made by Laurence David Inc.

C. Surface conditioning discs shall be 20" dia. 3M disc, very fine grit.

D. Cork Expansion Strip: Composition cork expansion strip FS HH–C–576, Type I–B, Class 2.

E. Grout: Manufacturer's colored tile grout, to fill spaces between round pieces.

2.3 WOOD FIELD FINISHING

A. "DriFast Stain" oil-modified stain as manufactured by BonaKemi USA, Inc., or approved equal; color White matching Architect's control sample, with Bona water-based finish.

1. Type: Water-based, non-yellowing, chemical resistant. Sheen shall be as directed by the Architect.

2. Stain: Water-based, penetrating and non-fading type.

3. Floor Sealer: Waterborne, pliable, penetrating type.

4. Finish Coats: Formulated for multi-coat application on wood flooring.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where edge grain wood flooring is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Wherever direct application of wood flooring to concrete substrate is indicated, test for dryness before proceeding with installation. Provide Relative Humidity (RH) test of concrete slab. Maximum level of vapor to be 75%. If tests show dampness, do not proceed until slab is dry.

3.3 INSTALLATION

A. General: Comply with flooring manufacturer's instructions and recommendations, but not less than recommended by NOFMA in "Hardwood Flooring Installation Material."

B. Pattern: Comply with pattern or direction of pattern for laying wood flooring, as shown on Architect's drawings.

C. Expansion Space: Provide expansion space at walls and other obstructions and terminations of flooring, not less than 1/2". Fill expansion space with flush cork expansion strip. Nail shoe molding or other trim to baseboard, rather than to flooring.

D. Edge Grain Wood Flooring: Installations can start against a straight wall, or snap lines to start in the center and work out to the walls. Break panels, so that every other row starts with approximately one half panel. Doing so will help to keep panel rows straight and parallel. Push panels into the mastic, (including holding tape), and as close to each other as possible, at the ends and sides of each panel. Avoid snugging rows or crowding mastic between strips. Merely place each panel in the mastic to glue them in place, and not to each other. Do not pound directly on panel edges. If needed, use a rubber mallet and a short section of a 2 x 4 (on edge) placed against the last row, but not in adhesive, to snug panels in place. Continue to snap lines during panel placement to maintain square-ness. All mastic must be kept off exposed surfaces. Keep lines straight. Panel ends will be square as received. When reaching a wall or column and needing shorter lengths, be sure end cut is exactly square to the strip length. Use a hardwood, flooring roller if necessary.

3.4 SANDING AND FINISHING

A. Machine sand installed unfinished flooring to remove offsets and non-level conditions, ridges, cups, and sanding machine marks which would be visually noticeable after finishing. Use three (3) grades of sandpaper, ending with 00 grade. Vacuum clean and immediately apply finish. Do not permit traffic on floor after sanding and until finish is

completed. Cover sanded floor with building paper to provide access for application of first finish coats.

B. Oil Finish: Apply oil by lamb's wool or spray. Continuously apply in quantities as recommended by the manufacturer of wood flooring. Allow 12 hours minimum between applications for solvent evaporation. Use facial moisture meter to determine drying of surface before proceeding with additional applications of coating. Be sure that oil penetrates 100%; check floor for damp or wet spots on the surface and remove immediately. Leave the floor totally dry and uniformly full. Allow last application to dry at least 24 hours and then buff only with a high-speed rotary turning pad at 1100 rpm or faster. Follow flooring manufacturer's instructions for use of pad.

3.5 PROTECTION

A. Protect completed wood flooring during remainder of construction period with heavy Kraft paper or other suitable covering, so that flooring and finish will be without damage or deterioration at time of acceptance.

END OF SECTION

SECTION 096519

RESILIENT TILE FLOORING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the resilient tile flooring, as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Vinyl composition tile.

2. Rubber tile.

3. Cork tile.

4. Rubber base.

5. Rubber treads and risers.

6. Transition strips.

7. Accessories.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Concrete slab - Section 033000.

E. Cement leveling compound – Section 035416.

F. Gypsum board partitions - Section 092900.

G. Resilient sheet flooring - Section 096516.

H. Terrazzo - Section 096727.

1.5 QUALITY ASSURANCE

A. Qualifications of Installers: Use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

B. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

   a. Rubber Floor Adhesives: 60g/l.
   b. Subfloor Adhesives: 50g/l.
   c. VCT & Asphalt Adhesives: 50g/l.
   d. Ceramic Tile Adhesives: 65g/l.
   e. Cove Base Adhesives: 50g/l.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. All vinyl, linoleum, laminate flooring, wood flooring, ceramic flooring, rubber flooring and wall base must be certified as compliant with FloorScore low emitting material Standard.

1.6 SUBMITTALS

A. Manufacturer's Data: For information only, submit manufacturer's technical information and installation instructions for type of resilient tile.

B. Samples

1. Submit full-size sample tiles for each type and color required, representative of the expected range of color and pattern variation. Sample submittals will be reviewed for color, texture and pattern only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

2. Submit six (6) inch long samples of base and strips.

3. Submit full-size sample of stair tread.

C. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Provide manufacturer's documentation that all flooring, including vinyl, linoleum, laminate, wood, ceramic, and rubber, and all wall base, shall meet the following criteria:

   a. Installed hard surface flooring must be certified as compliant with the FloorScore Standard for Indoor Air Quality as developed by the Resilient Floor Covering Institute. This includes all vinyl, linoleum, laminate flooring, wood flooring, ceramic flooring, rubber flooring, and wall base.
   b. The Volatile Organic Compound (VOC) content of any field applied interior floor adhesive and grout, must meet SCAQMD Rule 1168 VOC limits.

4. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

5. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 DELIVERY AND STORAGE

A. Deliver materials to the project site in the manufacturer's original unopened containers, clearly marked to indicate pattern, gauge, lot number and sequence of materials.

B. Carefully handle all materials and store in original containers at not less than seventy (70) degrees F. for at least forty-eight (48) hours before start of installation.

1.8 JOB CONDITIONS

A. Continuously heat spaces to receive tile to a temperature of seventy (70) degrees F. for at least forty-eight (48) hours prior to installation, whenever project conditions are such that heating is required. Maintain seventy (70) degrees F. temperature continuously during and after installation as recommended by the tile manufacturer, but for not less than forty-eight (48) hours. Maintain a temperature of not less than fifty-five (55) degrees F. in areas where work is completed.

1.9 EXTRA STOCK

A. Extra Stock: Deliver stock of maintenance material to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.

1. Furnish quantity of 3 full boxes.

PART 2 PRODUCTS

2.1 VINYL COMPOSITION TILE (VCT)

A. Provide 12" x 12" x 1/8" thick vinyl composition tile conforming to ASTM F 1066, Class 2, in colors indicated below; Mannington Commercial "Touchstone" or equivalent. Provide tile units with uniformly distributed color and pattern throughout the thickness of tile. Variations in shades and off-pattern matches between containers are not acceptable.

1. Colors: Assume 4 colors (TBD) in a laser cut pattern as shown on architectural drawings. See Materials finish colors list on Architectural Drawings.

2.2 BASE

A. Provide four (4) inches high, 1/8" thick, continuous 100% percent thermoset, vulcanized rubber, flat, no cove, with pre-formed internal and external corner pieces, color: See Materials Finish Colors list on Architectural Drawings. Base shall conform to ASTM F 1861, Type TS Group 1 as manufactured by Roppe, Marley Flexco, Burke Mercer, or approved equal. Provide preformed interior and exterior corners in the same material, color matched to base.

2.3 RUBBER TILE, STAIR TREADS AND RISERS

A. Treads and Risers: Provide one-piece stair tread and riser “Brasilia” as manufactured by Allstate Rubber, or an approved equal, meeting Type TS (rubber, vulcanized thermoset), Class 2 (patterned). Treads shall be 1/4" thick, in lengths and depth to fit tread of stair, and with 2" ribbed rubber insert. Nosings shall be square, adjustable to fit angle of stair nosing, 1-1/2" height. Surface design shall be raised discs; color shall be as scheduled on the drawings. Treads shall conform to ASTM F 2169. Integral risers shall be smooth, flat, coved-toe, 7 inches high by length matching treads, and tapered. For colors see materials Finish Coat List.

2.4 ACCESSORIES

A. Adhesives: Waterproof, stabilized type, as recommended by the tile manufacturer for the type of service indicated.

1. For cork tile, provide "Expanko 2260" Zero VOC Adhesive, as manufactured by Expanko, Inc.

B. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

C. Concrete Slab Primer: Non-staining type recommended by the tile manufacturer.

D. Leveling Compound: See Section 035416.

E. Edging Strips: 1/8" thick, homogeneous vinyl or rubber composition, tapered or bullnose edge, color as selected by the Architect from manufacturer's standards.

F. Finish

1. Cleaner shall be equal to "Super Shine All" made by Hillyard Chemical Co., or approved equal.

2. Wax shall be equal to "Super Hil-Brite" made by Hillyard Chemical Co., or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where resilient tile flooring is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 CONDITION OF SURFACES

A. Allowable Variations in Substrate Levels (Floors): ± 1/8" in 10'-0" distance and 1/4" total maximum variation from levels shown.

B. Grind or fill concrete and masonry substrates as required to comply with allowable variation.

3.3 PREPARATION

A. Etch concrete substrate as may be required to remove curing compounds or other substances that would interfere with proper bond of adhesive for tile. Rinse with water to remove all traces of treatment.

B. Perform moisture tests on concrete slabs to determine that concrete surfaces are sufficiently cured and are ready to receive tile installation.

C. Concrete Primer: Apply concrete slab primer if recommended by tile manufacturer, prior to application of the adhesive. Apply in compliance with manufacturer's directions.

3.4 ALLOWABLE TOLERANCES

A. Allowable Tolerances in Finished Work: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignment shown.

1. Floors: 1/8" in 10'- 0" run, any direction; 1/32" offset at any location.

3.5 INSTALLATION

A. Install tile only after all finishing operations, including painting, have been completed and permanent heating system is operating. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by tile manufacturer.

B. Place tile units with adhesive cement in strict compliance with the manufacturer's recommendations. Butt tile units tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions and to produce neat joints, laid tight, even and in straight, parallel lines. Extend tile units into toe spaces, door reveals, and into closet and similar openings.

C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on the finish tile as marked in the subfloor. Use chalk or other non-permanent marking devices.

D. Lay tile from center marks established with principal walls, discounting minor off-sets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.

E. Match tiles for color and pattern by using tile from cartons in the same sequence as manufactured and packaged. Cut tile neatly to and around all fixtures. Broken, cracked, chipped or deformed tile is not acceptable.

F. Tightly cement tile to sub-base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks through tile, or other surface imperfections.

G. Lay tile with grain in all tile running in the same direction.

H. Roll cork floor tile with a 3 section 110 lb. roller three times after installation.

I. Place resilient edge strips tightly butted to tile and secure with adhesive. Provide edging strips at all unprotected edges of tile, unless otherwise shown.

J. Bases: In all spaces where base is indicated, install bases tight to walls, partitions, columns, built-in cabinets, etc., without gaps at top or bulges at bottom, with tight joints and flush edges, with molded corner pieces at internal and external corners. Provide end stops adjacent to flush type door frames and where base does not terminate against an adjacent surface. Keep base in full contact with walls until adhesive sets.

K. Stair Treads

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.

2. Tightly adhere to substrates throughout length of each piece.

3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

3.6 CLEANING AND PROTECTION

A. Remove any excess adhesive or other surface blemishes from tile, using neutral type cleaners as recommended by the tile manufacturer. Protect installed flooring from damage by use of heavy Kraft paper or other covering.

B. Finishing: After completion of the project and just prior to the final inspection of the work, thoroughly clean tile floors and accessories. Apply two (2) coats of wax to VCT and BioBased tile floors, and buff using materials as specified herein.

END OF SECTION

SECTION 096723

ARCHITECTURAL EPOXY RESINOUS FLOORING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the epoxy resin composition flooring and cove base as scheduled on the drawings and/or specified herein.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Concrete - Section 033000.

E. Floor drains - Division 22.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Submit manufacturer's technical data application instructions and general recommendations for the epoxy resin composition flooring specified herein.

C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors and finishes available.

1. Submit 3" x 3" samples of color chips from color chart selection designated by the Architect.

D. Material certificates signed by manufacturer certifying that the epoxy resin composition flooring complies with requirements specified herein.

E. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.

F. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer or applicator who has specialized in installing resinous flooring types similar to that required for this Project and who is acceptable to manufacturer of primary materials.

B. Single-Source Responsibility: Obtain epoxy resin composition flooring materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer.

C. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.

B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Comply with epoxy resin composition flooring manufacturer's directions for maintenance of substrate temperature, moisture, ventilation, and other conditions required to execute and protect Work.

B. Lighting: Permanent lighting will be in place and working before installing resinous flooring.

PART 2 PRODUCTS

2.1 MATERIALS

A. Basis of Design: Provide "Sikafloor Decoflake 40315," single broadcast (nominal 40 mils) vinyl flake system consisting of a combination of high solids epoxy, Sikafloor 203 pigmented basecoat, broadcast to refusal with vinyl flakes, sealed with Sikafloor 25 UV-resistant epoxy topcoat, and finished with Sikafloor 315, a high solids, abrasion-resistant, aliphatic polyurethane coating.

B. Colors to be selected by the Architect from standard flakes and base.

2.2 PROPERTIES

A. Physical Properties: Provide flooring system that meet or exceed the listed minimum physical property requirements when tested according to the referenced standard test method in parentheses.

1. Abrasion Resistance (ASTM D 4060): CS-17 Wheels 10-20 mgs./1000 cycles.

2. Hardness (ASTM D 3363 Pencil): 2H to 3H.

3. Adhesion – Primed Concrete: 350 psi (2.4 MPa) – concrete failure.

4. Coefficient of Friction (ASTM 2047): 0.60 - 0.70.

5. Dry Film Thickness: 2.88 mils @ 3.2 wet mil application thickness.

6. Tensile Strength (ASTM D 2370): 2882 psi.

7. Percent Elongation (ASTM D 2370): 2.29.

8. VOC (g/l) (ASTM D 2369-07): 114 g/l.

2.3 SUPPLEMENTAL MATERIALS

A. Joint Sealant: Type recommended or produced by manufacturer of epoxy resin composition flooring system for type of service and joint condition indicated.

B. Waterproofing Membrane: Type recommended or produced by manufacturer of epoxy resin composition flooring system for type of service and floor condition indicated.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where the epoxy resin composition flooring is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

B. Coordinate work with other trades to insure that concrete substrate has been "wet" cured only.

3.2 PREPARATION

A. Examine floors to receive epoxy finish for compliance with levelness requirements (see concrete specifications). Do not install flooring until any non-compliant conditions are corrected.

B. Substrate: Perform preparation and cleaning procedures according to flooring manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry, and neutral substrate for flooring application.

C. Concrete Surfaces: Shot-blast, acid etch or power scarify as required to obtain optimum bond of flooring to concrete. Remove sufficient material to provide a sound surface free of laitance, glaze, efflorescence, and any curing compounds or form release agents. Remove grease, oil, and other penetrating contaminants. Repair damaged and deteriorated concrete to acceptable condition. Leave surface free of dust, dirt, laitance, and efflorescence.

D. Materials: Mix resin and hardener, add colorant and aggregate when required, and prepare materials according to flooring system manufacturer's instructions.

3.3 APPLICATION

A. General: Apply each component of epoxy resin composition flooring system according to manufacturer's directions to produce a uniform monolithic wearing surface of thickness indicated.

B. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate. Coordinate applying primer with topping mix to ensure optimum adhesion between flooring materials and substrate.

C. Body Coat: Over freshly applied primer, trowel apply epoxy mortar mix at manufacturer's recommended spreading rate. Hand or power trowel and grout with epoxy to fill voids. Broadcast vinyl flakes into freshly applied body coat in a rainfall pattern to excess. When cured, sand if necessary to remove trowel marks and roughness.

D. Finish or Sealing Coats: After body coat has cured sufficiently, apply finish or sealing coats of type recommended by flooring manufacturer to produce finish matching approved sample and in number of coats and spreading rates recommended by manufacturer.

1. Final finish coat shall be in color and skid retardant profile as approved by the Architect.

2. Finish floor shall be 1/4" thick, uniform in color and free of travel marks.

E. Cove Base: Apply cove base mix to wall surfaces at locations shown to form cove base height of 4 inches unless otherwise indicated. Round interior and external corners. Follow manufacturer's printed instructions and details including taping, mixing, priming, troweling, sanding, and top-coating of cove base.

F. Joints: Where substrate is interrupted by expansion or control joints, provide joint in flooring to comply with details indicated or, if not otherwise indicated, as recommended by flooring manufacturer.

1. Apply joint sealant materials to comply with resinous flooring manufacturer's recommendations.

3.4 CURING, PROTECTION AND CLEANING

A. Cure epoxy resin composition flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.

B. Protect epoxy resin composition flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and application method.

C. Cleaning: Remove temporary covering and clean epoxy resin composition flooring just before final inspections. Use cleaning materials and procedures recommended by flooring manufacturer.

END OF SECTION

SECTION 096724

RESINOUS FLOORING FOR MECHANICAL EQUIPMENT ROOMS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the epoxy resin composition flooring and base as scheduled on the drawings and/or specified herein.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Concrete - Section 033000.

E. Floor drains - Division 22.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Submit manufacturer's technical data application instructions and general recommendations for the epoxy resin composition flooring specified herein.

C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors and finishes available.

1. Submit 3" x 3" samples of color chips from color chart selection designated by the Architect.

D. Material certificates signed by manufacturer certifying that the epoxy resin composition flooring complies with requirements specified herein.

E. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.

F. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300 – Submittal Requirements under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s); and the location (source) of the raw materials used to manufacture the product(s).
   c. Provide material costs for the materials included in the contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Provide manufacture documentation that all flooring including vinyl, linoleum, laminate, wood, ceramic and rubber and all wall base shall meet the following criteria.:

   a. Installed hard surface flooring must be certified as compliant with the FloorScore Standard as developed by the Resilient Floor Covering Institute. This includes all vinyl, linoleum, laminate flooring, wood flooring, ceramic flooring, rubber flooring and wall base.
   b. The Volatile Organic Compound (VOC) content of any field applied interior Floor Adhesive & grout, must meet SCAQMD Rule 1168 VOC limits.

4. Product Cut Sheets for all materials that meet the LEED Building Performance Requirements this Section.

5. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer literature,

or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content).

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer or applicator who has specialized in installing resinous flooring types similar to that required for this Project and who is acceptable to manufacturer of primary materials.

B. Single-Source Responsibility: Obtain epoxy resin composition flooring materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer.

C. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

a. Rubber Floor Adhesives- 60g/l
b. Subfloor Adhesives- 50g/l
c. VCT & Asphalt Adhesives- 50g/l
d. Ceramic Tile Adhesives- 65g/l
e. Cove Base Adhesives- 50g/l

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

4. All hard flooring including resilient tile must be certified as compliant with FloorScore Standard as developed by the Resilient Floor Covering Institute.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.

B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Comply with epoxy resin composition flooring manufacturer's directions for maintenance of substrate temperature, moisture, ventilation, and other conditions required to execute and protect Work.

B. Lighting: Permanent lighting will be in place and working before installing resinous flooring.

PART 2 PRODUCTS

2.1 MATERIALS

A. Troweled resinous flooring shall be Dex-O-Tex M-E Floor System Membrane and Floor Finish as manufactured by Crossfield Products Corp., Stonhard. Corp. (Stonproof ME 7 and Stonclad GS with Stonkote GS4) Permalith MEP by General Polymers or approved equal meeting the properties specified herein.

2.2 PROPERTIES

A. Colors: As selected by Architect from manufacturer's standard colors.

B. Physical Properties: Provide flooring system that meet or exceed the listed minimum physical property requirements when tested according to the referenced standard test method in parentheses.

	Characteristic	Requirement	Test
2.	Waterproofness	No transmission	50 lbs. water pressure for 60 mins.
3.	Adhesion (strip)	19.2 lbs. per inch	
4.	Tensile Strength		
	a. Elongation (Dry)	29.0%	ASTM D 1117
	b. Breakload (Dry)	106 lbs. per inch	ASTM D 1117
	c. Elongation (Wet)	31.0%	ASTM D 1117
	d. Breakload (Wet)	67 lbs. Per inch	ASTM D 1117
5.	Impact Resistance	No cracking or loosening	MIL-D-3134, Para. 4.7
6.	Resistance to Elevated Temperatures	No flow or slip	MIL-D-3134, Para. 4.7.5.1

2.3 SUPPLEMENTAL MATERIALS

A. Flashing, Sheets, Cant Strips and Accessories: Types as recommended by flooring materials manufacturer, supplied for locations indicated and for locations recommended by manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where composition flooring is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

3.2 PREPARATION

A. Substrate: Perform preparation and cleaning procedures according to flooring manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry, and neutral substrate for flooring application.

B. Concrete Surfaces: Shot-blast, acid etch or power scarify as required to obtain optimum bond of flooring to concrete. Remove sufficient material to provide a sound surface free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents. Remove grease, oil, and other penetrating contaminants. Repair damaged and deteriorated concrete to acceptable condition. Leave surface free of dust, dirt, laitance, and efflorescence.

C. Materials: Mix resin hardener and aggregate when required, and prepare materials according to flooring system manufacturer's instructions.

D. Starting of work implies acceptance of slab.

3.3 APPLICATION

A. General: Apply each component of resinous flooring system according to manufacturer's directions to produce a uniform monolithic flooring surface of 3/16”.

1. Start installation of flooring only in presence of manufacturer's technical representative where terms of warranty require inspection and acceptance of installation as it proceeds.

B. Flooring system shall include the following minimum applications:

1. Bonding coat of neoprene rubber and cement composition in aqueous dispersion applied by brush or trowel.

2. Rot-resistant woven cloth fabric waterproof membrane applied into thickened liquid latex applied over floors and up verticals (bases, curbs, pipe-sleeves, etc.) to a height of 6".

3. Troweled smoothing coat of styrene butadiene liquid emulsion combined with a luminous cement and aggregate and applied to smooth off all laps and butt joints in membrane.

4. Two finish roller applications of elastomeric latex coating in color as selected by the Architect.

C. Cove Base: Apply cove base mix to wall surfaces at locations shown to form cove base height of 8" unless otherwise indicated. Follow manufacturer's printed instructions and details including taping, mixing, priming, troweling, sanding, and top-coating of cove base.

1. In cellar trash room, run membrane 48” up wall.

3.4 TESTING

A. Test installation for leaks immediately after nominal cure of the completed flooring. Flood each area to a depth of one inch for 24 hours. Repair all leaks and repeat test until no leakage is observable.

3.5 CURING, PROTECTION AND CLEANING

A. Cure resinous flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.

END OF SECTION

SECTION 096727

THIN SET EPOXY TERRAZZO

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the thin set epoxy terrazzo as shown on the drawings and/or specified herein, including but not necessarily limited to the following:

1. Thin set epoxy terrazzo floor and vertical thin-set terrazzo.

2. Precast epoxy resin treads and risers.

3. Divider strips, expansion strips, and accessory strips.

4. Preparation of slabs and other concrete surfaces for application of terrazzo.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Concrete work - Section 033000.

E. Unit masonry - Section 042000.

F. Ornamental railings - Section 057010.

G. Gypsum drywall - Section 092900.

1.5 QUALITY ASSURANCE

A. Qualification of Installers: Use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work and have a minimum of ten (10) years experience in this type of floor system and are members in good standing of the National Terrazzo and Mosaic Association (NTMA).

B. Comply with applicable specifications and recommendations of the National Terrazzo and Mosaic Association, Inc. (NTMA).

C. The Installer shall meet with the Architect for a pre-installation meeting prior to commencement of the work. The Architect shall review installation and position of all divider strips prior to installation of terrazzo.

D. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical information and installation instructions for each type of terrazzo, accessory item, and material required.

B. Certifications

1. Submit supplier's/manufacturer's written certification that terrazzo materials meet or exceed specified NTMA properties.

2. Submit supplier’s/manufacturer’s written certification that the concrete substrates have been tested according to ASTM F 1869 Anhydrous Calcium Chloride Moisture Emissions Test and that the moisture vapor transmission rate does not exceed the manufacturer’s recommendations.

a. If moisture vapor transmission levels exceed the manufacturer's recommended levels, the Contractor shall submit the terrazzo manufacturer's recommended remediation method for the Architect's approval.

1). Manufacturer and Contractor shall provide to the owner a three year Joint and Several Warranty from the date of substantial completion stating that the Moisture Vapor Barrier shall protect the epoxy terrazzo installation from moisture related blistering or disbondment and that in the event of any defects related to moisture vapor transmission within the stipulated period, the manufacturer and Contractor shall jointly or severally effect all repairs or replacement necessary to remedy defects. A copy of the warranty shall be submitted to the Architect for approval during submittal process.

2). Contractor shall provide an add alternate with his bid to provide the recommended moisture vapor transmission remediation in the event it is required.

3. Submit manufacturer's written certification that the terrazzo installer is an authorized installer of the manufacturer's epoxy terrazzo system.

C. Shop Drawings: Submit shop drawings showing layout of divider strips, control joint strips, abrasive strips and base and border strips.

1. Submit shop drawings of precast work showing large scale details of jointing and edge conditions and showing elevations and plans for layout of work. Include details of anchorage and other special features required.

D. Samples: Submit twelve (12) inch square samples of each pattern, color and type of terrazzo required, together with minimum twelve (12) inch long samples of each type of accessory item. Contractor should anticipate multiple submissions as required to obtain color to Architect's satisfaction. All samples must be submitted two (2) of each.

E. Maintenance Instructions: Submit two (2) copies of written instructions for recommended periodic maintenance of terrazzo.

F. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.

b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).

c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 WARRANTY

A. The Contractor shall furnish a guarantee of the Epoxy Terrazzo Flooring System for a period of three (3) years after installation. The labor and material guarantee shall include loss of bond, blistering and wear-through to the concrete substrate from normal use.

1.8 MOCK-UP

A. Construct 100 sq. ft. mock-up of terrazzo floor including field and border and wood base for Architect's approval. Do not proceed with any other terrazzo work until mock-up is adjusted and approved by the Architect. Approved mock-up may be incorporated into final work and shall become the standard to which all other terrazzo work must conform. Rejected mock-up must be removed completely and the substrate returned to its original condition.

PART 2 PRODUCTS

2.1 MATERIALS

A. Products: Terroxy Resin Systems by Terrazzo & Marble Supply.

1. Other manufacturers may submit their products for approval provided they meet the criteria specified herein.

2. Option 1

a. Optic White Matrix.
b. Aggregate
1). 35% Chine White stones, #2 size.
2). 30% Sky Blue glass, #2 size.
3). 25% Nero Ibana stones, #2 size.
4). 10% Mother of Pearl, #2 size.

B. Materials:

1. Primer: Terroxy Primer or Terroxy Moisture Vapor Primer and Terroxy Primer (for slabs on grade or light weight and green concrete).

a. Physical properties of moisture mitigating primer shall have a maximum of 0.3 perms with 100% RH.

2. Flexible Reinforcing Membrane: Terroxy Iso-Crack Epoxy Membrane, for substrate crack preparation and reflective crack reduction.

   a. Reinforcement: Fiberglass scrim to cover entire area where terrazzo is to be installed.

3. Epoxy Matrix: Terroxy Epoxy Matrix and in color required for mix indicated.

   a. Physical properties without aggregates. All specimens cured for 7 days at 75 deg. F. plus or minus 2 deg F. and 50 percent plus or minus 2 percent RH. This product shall meet the following requirements:

Property	Test Method	Requirement
Hardness	ASTM D 2240 using Shore-D durometer	75 – 85
Tensile Strength	ASTM D 638	4,800 psi min.
Compressive Strength	ASTM D 695 Specimen B cylinder	12,000 psi min.
Flexural Strength	ASTM D 790	4,500 psi min.
Chemical Resistance	ASTM D 1308 seven days at room temperature by Immersion method	No deleterious effects * Distilled Water * Mineral Oil * Isopropanol * Ethanol * 0.025 Detergent Sol. * 1% Soap Solution * 10% Sodium Hydroxide * 10% Hydrochloric Acid * 30% Sulfuric Acid * 5% Acetic Acid

   b. Physical properties with aggregates shall meet the following requirements:

Property	Test Method	Requirement
Flammability	ASTM D 635	Self extinguishing, extent Of burning 0.025" max.
Thermal Coefficient of Linear Expansion	ASTM D 696	25 x 10 -6 inch per inch degrees to 140 deg. F.
Bond Strength	ACI COMM 403, Bulletin 59-43 (pages 1139-1141)	300 psi (100% concrete failure)

4. Aggregates: Complying with NTMA gradation standards for mix indicated and containing no deleterious or foreign matter.

Abrasion and Impact Resistance	Less than 40 percent loss per ASTM C 131.
24 Hour Absorption Rate:	Less than 0.74 percent.
Dust Content:	Less than 1.0 percent by weight.
Fungus and Bacteria Resistance, MIL-F-5250, Sec. 4.4.2.11	Will not support the growth of fungus or bacteria when subjected to mildew and bacteria tests specified in TT-P-34.
Impact Resistance, Sec. 4.7.3	Withstands 16 ft. lbs. without cracking, delamination or chipping.
Indentation, MIL-D3134F, Sec. 4.7.4	Withstands 2,000 psi for 30 min. without indentation.
Resistance to Elevated Temperature, MIL-D-3134F, Sec. 4.7.5	No slip or flow at required temperature of 158 deg. F.
Abrasion Resistance, ASTM D 4060, CS-17 Wheel	0.1 grams lost
Water Absorption, ASTM D 570-98	10% max. (24 hr. immersion)
Water Immersion, ACI Comm. #403, Bulletin 59-43	
Critical Radiant Flux, ASTM E 648	0.95 W/cm^2
Compressive Strength, psi, ASTM D 695	10,000 min.
Tensile Strength, psi, ASTM C 307	2,500
Flexural Strength, psi, ASTM C 580	3,000 min

5. Finishing Grout: Terroxy Epoxy Matrix or Terroxy Clear Resin as recommended by Terroxy Resin Systems.

C. Mix: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrices and aggregate proportions and mixing.

1. Basis of Design: Terroxy Control Samples.

   a. Color 1: _____.
   b. Color 2: _____.

2.2 STRIP MATERIALS

A. Thin Set Divider Strips: Zinc or aluminum.

1. See Drawings for divider and trim face dimensions and profiles.

B. Control-Joint Strips: Single L-type angle directly above and an line with one edge or the other of the saw cut. Clean and fill saw cut with 100% solids epoxy prior to strip installation.

C. Construction Joint (Cold Joint) Strips: Separate double L-type angles back to back with minimum 1/4" width between. Fill joint and area between strips with semi-flexible joint filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.

D. Expansion Joint Strips: Separate double L-type angles, positioned back to back with minimum 1/4" width between. Fill area between strips with semi-flexible joint filler. Match material, thickness and color of divider strips and depth required for topping thickness indicated.

E. Accessory Strips: Match divider strip width, material and color unless otherwise indicated. Use the following type of accessory strips as required to provide a complete installation:

1. Base bead strips for exposed top of terrazzo base.

2. Edge bead for exposed edges of terrazzo.

F. Reducer strips for terrazzo juncture with other flooring, of same material as the divider strips. For design, see architectural drawings.

2.3 MISCELLANEOUS ACCESSORIES

A. Strip Adhesive: 100% solids epoxy resin adhesive recommended by manufacturer.

1. Use adhesive that has a VOC content of 50g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Anchoring Devices:

1. Strips: Provide mechanical anchoring devises for strip materials as required for secure attachment to substrate.

2. Precast Terrazzo: Provide mechanical anchoring devices as recommended by Terrazzo Contractor for proper anchorage and support of units for conditions of installation and support.

C. Patching and Fill Material: Manufacturer's fill selected aggregates as recommended by manufacturer.

D. Joint Compound: Color to be selected by Architect to match/compliment terrazzo.

E. Cleaner: As recommended by manufacturer a neutral cleaner with pH factor between 7 and 10 specifically designed for terrazzo.

F. Surface Finish System: As recommended by manufacturer degree of polish to be specified by Architect in accordance with desired appearance and level of reflectivity.

G. Sealer: Slip and stain resistant sealer that is chemically neutral with pH factor between 7 and 10, a standard coefficient of friction of 0.6 or higher, does not affect physical properties of terrazzo and complies with NTMA's "Terrazzo Specifications and Design Guide".

2.4 PRECAST TERRAZZO

A. Provide one-piece tread and riser unit in precast epoxy terrazzo as detailed on drawings with 1" abrasive nosing as detailed.

B. Comply with NTMA specifications and recommendations for fabrication of precast terrazzo. Reinforce all precast terrazzo units.

C. Match color and pattern of precast work with color and pattern of cast in place work, unless different color and pattern required.

D. Materials shall conform to the requirements specified above in Para. 2.1.

E. Furnish all inserts, anchors and accessories required for complete installation.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where terrazzo is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 CONDITION OF SURFACES

A. Allowable Variations in Substrate Levels: Refer to Section 03300 – Concrete Work for required tolerances of concrete sub-slab.

B. Grind or fill concrete substrates as required to comply with allowable variations.

3.3 PREPARATION

A. Prepare concrete to "open" the surface pores by means of vacuum blasting to remove all contaminants or bond breaking substances, including but not limited to dust, laitance, curing compounds, coatings, sealers, oil and grease. Shotblast profile shall be ICRI (International Concrete Repair Institute) standard profile of CSP 3-5. Any oil or grease not removed by these methods must be chemically removed. All delaminated or deteriorated concrete shall be mechanically removed by scrabbling or chipping hammers. Areas to be patched should be saw cut to a minimum of 1/2" deep at the perimeters and keyed to the existing concrete.

B. Prime substrate with primer as recommended by manufacturer.

C. Cracks and Control Joints

1. Cracks and control joints greater than 1/16" shall be routed and filled with Flexible Terrazzo Membrane.

2. All cracks and control joints shall be overlaid with a 6" wide by 40 mils thick band of Terrazzo Membrane into which a fiberglass scrim cloth has been embedded. Allow to cure prior to proceeding with terrazzo application.

3.4 INSTALLATION

A. General

1. Comply with NTMA specifications and manufacturer's recommendations for preparation of substrate, installation of metal strips, and for placing, grinding, grouting and finishing.

2. Complete terrazzo installation before the application of other items which might be damaged by this work.

B. Expansion Joints: Where expansion joints are shown, install two (2) divider strips, separated by the joint width shown with removable strips, extending the full depth of the topping and under bed. Do not bridge expansion joints with reinforcement or cross strips.

C. Flooring

1. Work shall be done only under optimum conditions as recommended by manufacturing firm and NTMA recommendations. Surfaces over which matrix is to be applied shall be completely dry and thoroughly clean. Atmospheric and substrate temperature shall be fifty (50) degrees F. or above. If below sixty (60) degrees F., temperature must be stable or rising.

2. Apply primer over entire area to receive floor surfacing. Spread uniformly over surfaces using clean rubber squeegee, or clean steel trowels. Do not allow primer to collect in depressions. Porous areas may require double application of primer.

3. Apply flexible epoxy membrane at 40 mils thick over primer over approximately 10% of floor where required to allow terrazzo to span over cracks, control joints, or saw cut joint without providing a strip.

4. Terrazzo matrix and chips shall be mixed and applied according to manufacturer's instructions.

5. Allow surfacing to set undisturbed for minimum period of twelve (12) hours or until surfaces are hard and sure. Temperatures throughout curing time shall be maintained at minimum of fifty (50) degrees F. It shall be the complete responsibility of the Contractor to protect and maintain system until such cure is attained.

6. Grind using #24-120 grit stone by wet process method utilizing standard terrazzo grinding equipment. Dry grinding using diamond stones is acceptable for rough grind only. Use vacuums adequate to control grinding dust. Finish grind with #18-0 grit stone.

7. Grout as required using resin as recommended by the manufacturer. Apply grout according to manufacturer's instructions. After curing for a minimum of twelve (12) hours, grind using #1000 grit stone using same method and equipment as used for initial grinding operation for a premium polish.

8. After completion of grinding operation, clean floor of all dirt and abrasive particles by washing with a neutral cleaner and mopping down and rinsing with clean water.

9. Finished surfaces shall be approximately 3/8" thick, true to plane and line, and shall conform to the tolerances specified for the concrete substrate; refer to Section 033000 for concrete slab tolerances.

10. Contractor to coordinate location and proper setting of all items to be installed in floor (i.e. drains, electrical outlets, door closers, etc.).

11. Install terrazzo at floor closer pans as required to match adjacent floor. Grind and seal to align with adjacent floor.

3.5 INSTALLATION OF PRECAST TERRAZZO

A. Install precast terrazzo as shown in accordance with NTMA specifications. Tamp units into setting bed to achieve a full bond without voids. Level units at joints. Finish grind at joints if required to remove any minor discrepancies in level of units. Replace warped, stained, damaged and non-matching units as directed. Grout joints with a mixture of Portland cement, pigment and water, matching the matrix of the joints.

3.6 CLEANING AND SEALING

A. Clean and seal terrazzo in accordance with the instructions of the terrazzo sealer manufacturer after installation and finishing operations are completed.

3.7 PROTECTION

A. Protect Contractor shall protect terrazzo flooring from damage until Project completion; any damage that does occur shall be the responsibility of the Contractor to repair or replace to the satisfaction of the Architect.

3.8 MAINTENANCE SEMINAR

A. The manufacturer and installer shall jointly provide a one (1) day seminar to Owner's maintenance staff describing the procedures, methods and materials required to maintain the terrazzo surfaces in excellent condition for the life of the facility. Included in this seminar shall be any "hands on" training for maintenance of finish.

END OF SECTION

SECTION 096728

ELASTOMERIC LIQUID FLOORING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the resinous flooring and base, including but not limited to the following:

1. Elastomeric liquid flooring at elevator lobbies and lab entrance zone, Floor 2-5.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Cast in place concrete – Section 033000.

1.5 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract instructions and general recommendations for the resinous flooring specified herein.

B. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors and finishes available.

1. Submit three (3) 2-1/2" x 4" samples of each material specified herein with color from color chart selection designated by the Architect.

C. Material certificates signed by manufacturer certifying that the composition flooring complies with requirements specified herein.

D. Maintenance written instructions for recommended maintenance practices.

E. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify that no added urea formaldehyde is present in any composite wood materials, agrifiber material, or adhesive.

4. Documentation for all new wood products, including FSC Certified. Provide vendor invoices for all permanently installed wood products, FSC Certified or not. Each wood product must be identified on a line-item basis. FSC products must be identified as such on a line item basis. The dollar value of each line item must be shown. The vendor's Chain-of-Custody certificate number must be shown on any invoice that includes FSC products.

5. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

6. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer or applicator who has specialized in installing flooring types similar to that required for this Project and who is acceptable to manufacturer of primary materials.

B. Single-Source Responsibility: Obtain resinous flooring materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.

B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Comply with resinous flooring manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect Work.

1.9 WARRANTY

A. Provide manufacturer's warranty with flashing endorsement, signed by Applicator and authorized representative of manufacturer, and warranting flooring materials against failures resulting from normal exposure for a period of three (3) years.

PART 2 PRODUCTS

2.1 MATERIALS

A. Provide Bolodtop Jewel or approved equal consisting of non-yellowing high polymers with a total thickness of 3mm.

B. System Components

1. Bolidtop Universal Primer.

2. Bolidtop 525 Compound.

3. Bolidtop Jewel Compound

4. Bolidtop Pn.

2.2 SUPPLEMENTAL MATERIALS

A. Flashing, Sheets, Cant Strips and Accessories: Types as recommended by flooring materials manufacturer, supplied for locations indicated and for locations recommended by manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where resinous flooring is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

3.2 PREPARATION

A. Substrate: Perform preparation and cleaning procedures according to flooring manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry, and neutral substrate for flooring application.

B. Materials: Prepare materials according to flooring system manufacturer's instructions.

C. Starting of work implies acceptance of substrate.

D. Install sound mat and waterproofing (where indicated) in accordance with manufacturer's requirements.

3.3 APPLICATION

A. General: Apply each component of resinous flooring system according to manufacturer's directions to produce a uniform monolithic flooring surface at the nominal thickness required.

1. Start installation of flooring only in presence of manufacturer's technical representative who must approve (in writing to the Architect) condition of the prepared floor slab.

B. Flooring system shall include the following minimum applications:

1. Detail all cracks and control joints according to manufacturer's requirements.

2. Bonding coat per manufacturer's requirements.

3. Membrane coat per manufacturer's requirements.

4. Reinforcement fabric as required by manufacturer.

5. Smoothing coat for reinforced membrane systems as required by manufacturer.

6. Wear course as required by manufacturer.

7. Topcoat/Sealer: One or two topcoats as required by manufacturer.

C. Cove Base: Apply cove base mix to wall surfaces at locations shown to form cove base height of 8" unless otherwise indicated. Follow manufacturer's printed instructions and details including taping, mixing, priming, troweling, sanding, and top-coating of cove base.

3.4 CURING, PROTECTION AND CLEANING

A. Cure resinous flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.

END OF SECTION

SECTION 096816

CARPET (GLUE DOWN)

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the carpeting as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Carpet, glue down installation, including adhesive.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Concrete slab - Section 033000.

E. Resilient base - Section 096500.

F. Audio/visual equipment – Section 115210.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Firm with not less than five (5) years of experience in installation of commercial carpeting of type, quantity and installation methods similar to work of this Section.

B. Manufacturer Qualifications: Firm (carpet mill) with not less than five (5) years of production experience with carpet similar to types specified in this Section; and whose published product literature clearly indicates general compliance of products with requirements of this Section.

C. General Terminology/ Information Standard: Refer to current edition of "Carpet Specifier's Handbook" by The Carpet and Rug Institute; for definitions of terminology not otherwise defined herein, and for general recommendations and information.

D. Carpet used on Project must be from same dye lot for each carpet type.

E. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's complete technical product data for each type of carpet and accessory item required.

B. Shop Drawings: Submit carpet layout and seaming drawings, clearly indicating carpet directions, locations and methods of jointing seams and locations and types of edge strips. Where multiple rolls are required in a space, show that rolls are sequenced and from the same dye lot to insure color match. Indicate columns, doorways, enclosing wall/partitions, built-in cabinets and locations where cut-outs are required in carpet.

C. Samples: Submit 18" x 27" samples of each carpet required and six (6) inch long samples of each type exposed edge stripping.

D. Certification: Submit manufacturer's certification stating that carpet materials furnished comply with specified requirements.

1. Include listing of mill register numbers for carpet furnished.

2. Include supporting certified laboratory test data indicating that carpet meets or exceeds specified test requirements.

E. Maintenance Data: Submit manufacturer's printed maintenance recommendations, including methods and frequency recommended for maintaining carpet in optimum conditions under anticipated traffic and use conditions.

F. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 EXTRA STOCK

A. Overrun: Produce and deliver to project at least five (5) percent overrun on calculated yardage. Provide required overrun exclusive of carpet needed for proper installation, waste and usable scraps.

1.8 PRODUCT DELIVERY AND STORAGE

A. Deliver carpeting materials in original mill protective wrapping with mill register numbers and tags attached. Store inside, in well ventilated area, protected from weather, moisture and soiling.

1.9 WARRANTY

A. The Contractor shall promptly repair seams and edges in the carpet as required, for a period of two (2) years after Substantial Completion of the Project. The exact time for this work shall be left to the discretion of the Owner. Fourteen (14) day notice for repairs shall be given by the Owner, so that the Contractor can make the necessary arrangements.

B. The manufacturer shall provide a warranty that the face yarn of the carpet will not wear more than ten (10) percent in five years. If the carpet wears more than ten (10) percent in five (5) years, the manufacturer will replace the carpet including parts, labor and materials, to the Owner's satisfaction.

PART 2 PRODUCTS

2.1 CARPETING

A. Broadloom: Totally Carpet; Soldy Elite, Style Number 1001, 32 oz tufted yarn weight, 100% solution dyed, broadloom. See Architecturall drawings for Materials Colors list.

2.2 ACCESSORIES

A. Provide resilient edges, reducers and threshold plates where required. They shall be sized to be compatible with the thickness of the carpet, in a color as selected by the Architect, either custom as shown on the Architectural Drawings or of a commercial quality as manufactured by Armstrong, Burke Mercer Industries or approved equal. The type shall be as required by site conditions, as is the custom of the trade, and installation shall be made as recommended by the manufacturer.

B. Adhesive: Provide adhesive as recommended by the carpet manufacturer. Provide adhesive which complies with flame spread rating required for the carpet installation, if any.

C. Leveling Compound: Latex/Portland cement flash patching and leveling compound equal to No. DSP-520 made by H.B. Fuller or No. 226 with 3701 admixture made by Laticrete or equal made by Mapei, or approved equal.

D. Miscellaneous Materials: Provide the types of seaming, adhesives and tape, thread, and other accessory items recommended by the carpet manufacturer and Installer for the conditions of installation and use.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where carpet is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PRE-INSTALLATION REQUIREMENTS

A. Floor shall be clean and free of cracks and protrusions. Any gaps or cracks more than 1/16" wide to be filled in with latex leveling compound. Protrusions must be sanded down smooth, the floor cleanly swept and vacuumed if necessary to remove all dust and grit.

B. Floor temperature shall be 65 deg., at least 24 hrs. prior to installation; and 48 hrs. after carpet is installed.

C. Conduct a moisture test. The presence of moisture in the concrete floor will interfere with the curing and subsequent performance of the adhesive. Conduct the test as follows:

1. Drive a concrete nail a half inch into the floor. Then remove the nail.

2. Place a small amount of anhydrous calcium chloride or calcium sulphate crystals over the hole.

3. Cover the crystals and the hole with a piece of flat glass and seal the edges with waterproof tape or putty. Since concrete pourings vary, repeat the test every 1500 sq. ft.

4. Leave in place 72 hrs. Any color change in the crystals indicates the presence of moisture. Do not apply carpet until slab is free of moisture and meets with approval of carpet adhesive manufacturer.

D. Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period.

3.3 INSTALLATION

A. General

1. Comply with manufacturer's instructions and recommendations. Place seams in the directions as accepted on shop drawings. Maintain direction of pattern and texture, including lay of carpeting.

2. Extend carpet under open-bottomed and raised-bottom obstructions, and under removable flanges of obstructions. Extend carpet into closets and alcoves of rooms indicated to be carpeted, unless another floor finish is indicated for such spaces. Extend carpet under all movable furniture and equipment, unless otherwise indicated.

3. Provide cut-outs for removable access devices in the substrate. Bind edges as neatly as possible and secure both sides of cuts to the substrate. Use double-faced tape on carpet cut-outs which must be lifted from the substrate to gain access to the devices. Cut only three (3) sides wherever it is feasible to provide a carpet flat in lieu of a fully-removable cut-out.

4. Install rubber carpet edge guard at every location where edge of carpet is exposed to traffic, except where another device is indicated.

B. Direct Glue-Down Carpet Installation

1. Select best location for a starting seam; strike a chalk line on the floor at this point. (Use white chalk; colored chalk should not be allowed on the job.)

2. Check the carpet for direction of pile lay.

3. Cut two lengths of carpet allowing about one inch to run up the walls for trimming.

4. Place the untrimmed edge of one length along the chalk line and stay-nail along its center line, parallel to the seam. During this procedure, work out any wrinkles allowing the carpet to lie smoothly on the floor. Stay-nail at approximately 12" - 18" intervals following the center line of the cut along its entire length. Make sure carpet does not shift from the chalk line.

5. After checking for pile direction, unroll second length and overlap the edge of the first length by about 1" to 2". Stay-nail second length as in Para. 4 above.

6. Depending on construction, the carpet edge may be trimmed by one of the following techniques:

   a. Utilizing a top cutter cut between the loops if rows are straight and the cut is not too long.
   b. Scribe cut using a top cutter or cushion back cutter to follow a row on one edge, then overlap and use this cut edge as a guide to trim the second or bottom edge.
   c. Double cut using a top cutter, make a free hand cut through both overlapped edges. When cutting long areas, utilize an electric cutter.
   d. All cut edges must be sealed prior to seaming using a premium latex carpet seaming adhesive.

7. Fold back both lengths towards stay-nails. Do not pull out any stay-nails or tear carpet.

8. The exposed floor between the folded cuts shall be swept and vacuumed if necessary.

9. Using a notched trowel 1/8" x 1/8" spread adhesive evenly, using a semi-circular motion to avoid excessive deposits and missed areas. The number of men required to spread the adhesive will depend on the areas to be covered. If the area is large, use 2 men, one on either side of the center, and have them work in opposite directions. Check the trowels occasionally to see that they are free of foreign matter and also that the 1/8" notch is maintained. It is important to allow sufficient open time in order to let the adhesive become tacky before adhering the carpet.

10. After the adhesive is spread as described in Para. 9 above, lay the folded back edge of the first cut over the cement. To do this, the installers shall position themselves at intervals along the entire length of the fold and grasp the folded edge. Lift it up and walk towards the seam. The installer in the middle of the roll walks ahead, thus forming a wedge. Use a 100 lb. roller to smooth the fabric towards the seam.

11. Next, grasp the folded edge of the second roll and place it over the adhesive as in Para. 10 with the exception that this flap should be walked in evenly rather than using the wedge method. Walk in all but one ft. of this and fold this amount back again.

12. The installer shall now slide this edge until it tightly abuts the edge of the first roll. Hold the edge in place by kneeling on it and work the wrinkles out toward the unglued side.

13. Continue the above procedure throughout the installation.

14. While the cement is still tacky, the carpet must be pressed down along the wall and creased - the excess shall be trimmed.

15. Cross-seaming can be accomplished by Scribe Cutting. Overlap the ends approximately 4". Cut the end with the yarn leaning toward the seam from the back with a straight edge. Use this end as a guide to cut the other end utilizing a top cutter or similar tool.

16. Seal these ends the same as all other cut edges.

17. Exposed edges shall always be protected by a rubber edging. The rubberedge shall be fastened to the floor with contract cement.

18. Stains caused by adhesive can be removed using a dry chlorinated or similar solvent. Apply solvent with a clean cloth using a blotting action. Do not saturate carpet with solvent. Dry with rag or tissue using a blotting and not a rubbing motion.

C. Stairway Carpeting: Install by secure method, recognized to be durable and safe for traffic. Conceal edges and avoid making seams in areas of high wear. Match adjoining carpet installation in every way possible.

3.4 CLEANING UP

A. Upon completion of the carpeting installation in each area, visually inspect all carpet installed in that area and immediately remove all dirt, soil, and foreign substance from the exposed face; inspect all adjacent surfaces and remove all marks and stains caused by the carpet installation: remove all packaging materials, carpet scraps, and other debris from the carpet installation to the area of the job site set aside for its storage.

B. Usable carpet pieces shall be turned over to the Owner.

3.5 PROTECTION

A. Provide temporary, protection against soiling or damage of carpet for the remainder of the construction period.

END OF SECTION

SECTION 099000

PAINTING AND FINISHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Prime painting unprimed surfaces to be painted under this Section.

2. Painting all items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.

3. Painting all ferrous metal (except stainless steel) exposed to view.

4. Painting all galvanized ferrous metals exposed to view.

5. Painting interior concrete block exposed to view (except polished block faces).

6. Painting gypsum drywall exposed to view.

7. Concrete sealer.

8. Epoxy gypsum wall board and concrete and CMU paint.

9. Scuff resistant paints for walls surrounding elevator banks all levels.

10. Painting of wood exposed to view, except items which are specified to be painted or finished under other Sections of these specifications. Back painting of all wood in contact with concrete, masonry or other moisture areas.

11. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.

12. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers, lighting fixtures, and the like, which are exposed to view through these items.

13. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.

14. Painting of any surface not specifically mentioned to be painted herein or on drawings, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, shall be included as though specified.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Shop priming is required on some, but not all of the items scheduled to be field painted. Refer to other Sections of work for complete description.

E. Shop coat on machinery and equipment: Refer to the Sections under which various items of manufactured equipment with factory applied shop prime coats are furnished, including, but not necessarily limited to, the following Sections. All items of equipment furnished with prime coat finish shall be finish painted under this Section.

1. Heating, ventilation and air conditioning - Division 23.

2. Plumbing - Division 22.

F. Color Coding of Mechanical Piping and Electrical Conduits - Division 23.

1. This Color Coding consists of an adhesive tape system and is in addition to painting of piping and conduits under this Section, as specified above.

1.5 MATERIALS AND EQUIPMENT NOT TO BE PAINTED

A. Items of equipment furnished with complete factory finish, except for items specified to be given a finish coat under this Section.

B. Polished concrete masonry units.

C. Factory-finished toilet partitions.

D. Factory-finished wall systems and doors.

E. Non-ferrous metals, except for items specified and/or indicated to be painted.

F. Finished hardware, excepting hardware that is factory primed.

G. Surfaces not to be painted shall be left completely free of droppings and accidentally applied materials resulting from the work of this Section.

1.6 QUALITY ASSURANCE

A. Job Mock-Up

1. In addition to the samples specified herein to be submitted for approval, apply in the field, at their final location, each type and color of approved paint materials, applied 10 feet wide, floor to ceiling of wall surfaces, before proceeding with the remainder of the work, for approval by the Architect. Paint mock-ups to include door and frame assembly.

2. These applications when approved will establish the quality and workmanship for the work of this Section.

3. Repaint individual areas which are not approved, as determined by the Architect, until approval is received. Assume at least two paint mock-ups of each color and gloss for approval.

B. Qualification of Painters: Use only qualified journeyman painters for the mixing and application of paint on exposed surfaces.

C. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Architect in writing of any anticipated problems using the coating systems as specified with substrates primed by others.

D. All paints must conform to the Volatile Organic Compounds (VOC) standards of prevailing codes and ordinances.

E. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Volatile Organic Compounds: The VOC concentrations (in grams per liter) of the product shall not exceed those listed below as determined by U. S. Environmental Protection Agency (EPA) Reference Test Method 24.

Interior Paints and Primers:

Non-flat:	150 g/l
Flat:	50 g/l

Anti-Corrosive Paints (if used in interior applications):

Gloss	250 g/l
Semi-gloss	250 g/l
Flat	250 g/l

The calculation of VOC shall exclude water and tinting color added at the point of sale.

3. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.7 SUBMITTALS

A. Materials List

1. Before any paint materials are delivered to the job site, submit to the Architect a complete list of all materials proposed to be furnished and installed under this portion of the work.

2. This shall in no way be construed as permitting substitution of materials for those specified or accepted for this work by the Architect.

B. Samples

1. Accompanying the materials list, submit to the Architect copies of the full range of colors available in each of the proposed products.

2. Upon direction of the Architect, prepare and deliver to the Architect two (2) identical sets of Samples of each of the selected colors and glosses painted onto 8-1/2" x 11" x 1/4" thick material; whenever possible, the material for Samples shall be the same material as that on which the coating will be applied in the work.

C. Manufacturer's Recommendations: In each case where material proposed is not the material specified or specifically described as an acceptable alternate in this Section of these specifications, submit for the Architect's review the current recommended method of application published by the manufacturer of the proposed material.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).

c. Provide material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.8 PRODUCT HANDLING

A. Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use.

B. Protection

1. Store only the approved materials at the job site, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.

2. Use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.

3. Use all means necessary to protect paint materials before, during and after application and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.9 EXTRA STOCK

A. Upon completion of this portion of the Work, deliver to the Owner an extra stock of paint equaling approximately ten (10) percent of each color and gloss used and each coating material used, with all such extra stock tightly sealed in clearly labeled containers.

1.10 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by the paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F. and 95 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds eighty-five (85) percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.

D. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 PRODUCTS

2.1 PAINT MANUFACTURERS

A. Except as otherwise noted, provide the painting products listed for all required painting made by one of the manufacturers listed in the paint schedule (Section 2.4). These companies are Benjamin Moore, ICI Dulux Paints (ICI) and Sherwin Williams (S-W). Pratt and Lambert Paint. Comply with number of coats and required minimum mil thicknesses as specified herein.

2.2 MATERIALS

A. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.

B. Colors and Glosses: All colors and glosses shall be as selected by the Architect. Certain colors will require paint manufacturer to prepare special factory mixes to match colors selected by the Architect. Color schedule (with gloss) shall be furnished by the Architect.

C. Coloring Pigment: Products of or furnished by the manufacturer of the paint or enamel approved for the work.

D. Linseed Oil: Raw or boiled, as required, of approved manufacture, per ASTM D 234 and D 260, respectively.

E. Turpentine: Pure distilled gum spirits of turpentine, per ASTM D 13.

F. Shellac: Pure gum shellac (white or orange) cut in pure denatured alcohol using not less than four (4) lbs. of gum per gallon of alcohol.

G. Driers, Putty, Spackling Compound, Patching Plaster, etc.: Best quality, of approved manufacture.

H. Heat Resistant Paint: Where required, use heat resistant paint when applying paint to heating lines and equipment.

2.3 GENERAL STANDARDS

A. The various surfaces shall be painted or finished as specified below in Article 2.4. However, the Architect reserves the right to change the finishes within the range of flat, semi-gloss or gloss, without additional cost to the Owner.

B. All paints, varnishes, enamels, lacquers, stains and similar materials must be delivered in the original containers with the seals unbroken and label intact and with the manufacturer's instructions printed thereon.

C. All painting materials shall bear identifying labels on the containers with the manufacturer's instructions printed thereon.

D. Paint shall not be badly settled, caked or thickened in the container, shall be readily dispersed with a paddle to a smooth consistency and shall have excellent application properties.

E. Paint shall arrive on the job color-mixed except for tinting of under-coats and possible thinning.

F. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material thinned or tinted.

G. It shall be the responsibility of the Contractor to see that all mixed colors match the color selection made by the Architect prior to application of the coating.

2.4 SCHEDULE OF FINISHES

A. Exterior Galvanized Ferrous Metals

First Coat: "27 Typoxy" or "N69 Epoxoline II" by Tnemec; "Intergard 345" by International Protective Coatings; or "Carboguard 893 SG" or "Carboguard 888" by Carboline or
Akzo: Devran 203 WB Epoxy Primer

Second Coat: "V73 Endura Shield" or "1074/1075" by Tnemec; "Interthane 870UHS" or "990 UHS" by International Protective Coatings; or "Carbothane 133 LH" by Carboline or
Akzo: Devethne 379H Aliphatic Vizethne

B. Exterior Non-Galvanized Ferrous Metals

Prime Coat: "Tneme-Zinc 90/97" by Tnemec; "Interzinc 52" or "315" by International Protective Coatings; or "Carbozinc 859, Class B" by Carboline or
Akzo: Cathacoat 302V Reinforced Inorganic Zinc Primer

Second Coat: "27 Typoxy" or "N69 Epoxoline II" by Tnemec; "Intergard 345" by International Protective Coatings; or "Carboguard 893 SG" or "Carboguard 888" by Carboline or
Akzo: Bar-Rust 231V Multi Purpose Epoxy Mastic

Third Coat: "V73 Endura Shield" or "1074/1075" by Tnemec; “Interthane 870UHS or 990 UHS" by International Protective Coatings; or "Carbothane 133 LH" by Carboline or
Akzo: Deuthane 379H Aliphatic Urethane

C. Interior Ferrous Metal

Semi-Gloss Finish/Enamel
Primer: 1 coat Acrylic Metal Primer (M04), or touch-up shop primer

First Coat: 1 coat Pristine Eco Spec Interior Latex Enamel (224)
Second Coat: 1 coat Pristine Eco Spec Interior Latex Enamel (224)
Total DFT not less than: 3.0 mils

Semi-Gloss Finish/Alkyd
Primer: 1 coat EnviroSpec DTM Acrylic Coating
First Coat: 1 coat Harmony Interior Latex Semi-Gloss B10 Series
Second Coat 1 coat Harmony Interior Latex Semi-Gloss B10 Series
Total DFT not less than: 4.0 mils

D. Interior Concrete and Concrete Masonry Units

Semi-Gloss Finish/Vinyl Acrylic Latex over filler
Block Filler: 1 coat PrepRite Int./Ext. Block Filler B25W25
First Coat: 1 coat Harmony Interior Latex Semi-Gloss B10 Series
Second Coat: 1 coat Harmony Interior Latex Semi-Gloss B10 Series
Total DFT not less than: 10.7 mils

E. Interior Painted Wood

Semi-Gloss Finish/Alkyd
Primer: 1 coat Harmony Interior Latex Primer B11W900
First Coat: 1 coat Harmony Interior Latex Semi-Gloss B10 Series
Second Coat: 1 coat Harmony Interior Latex Semi-Gloss B10 Series
a. Total DFT not less than: 3.6 mils

or

Eggshell Acrylic Latex Enamel (walls)
Primer: 1 coat Pristine Eco Spec Primer / Sealer First Coat (231)
First Coat: 1 coat Pristine Eco Spec Interior Latex Eggshell Enamel (223)
Second Coat: 1 coat Pristine Eco Spec Interior Latex Eggshell Enamel (223)
a. Total DFT not less than: 2.2 mils

F. Interior Drywall

Flat Finish/Vinyl Acrylic Latex
Primer: 1 coat Harmony Interior Latex Primer B11W900
First Coat: 1 coat Harmony Interior Latex Flat B5 Series
Second Coat: 1 coat Harmony Interior Latex Flat B5 Series
Total DFT not less than: 3.6 mils

or

Flat Finish/Vinyl Acrylic Latex
Primer: 1 coat Pristine Eco Spec Primer/Sealer First Coat (231)
First Coat: 1 coat Pristine Eco Spec Interior Latex Flat (219)
Second Coat: 1 coat Pristine Eco Spec Interior Latex Flat (219)
Total DFT not less than: 2.0 mils

Eggshell Acrylic Latex Enamel
Primer: 1 coat Pristine Eco Spec Primer/Sealer First Coat (231)
First Coat: 1 coat Pristine Eco Spec Interior Latex Eggshell Enamel (223)
Second Coat: 1 coat Pristine Eco Spec Interior Latex Eggshell Enamel (223)
Total DFT not less than: 2.2 mils

G. Concrete Sealer: Two coats of Super Diamond VOX by Euclid Chemical or approved equal.

H. High Performance Paint Systems

1. Drywall Surfaces

1 coat 201 Primer by Tnemec, 5-6 mils d.f.t.
1 coat Series 280 by Tnemec, 6-10 mils d.f.t.
or
2 coats "Carbo-Guard" 954HB by Carboline

2. Masonry Surfaces

1 coat 130 by Tnemec, 60-80 sq. ft./gallon
2 coats Series 280 by Tnemec, 6-8 mils/coat.
or
3 coats "Carbo-Guard" 954HB by Carboline 8-15 mils d.f.t./coat

3. Concrete Surfaces

1 coat 201 by Tnemec, 5-6 mils d.f.t.
2 coats Series 280 by Tnemec, 6-8 mils/coat.
or
3 coats "Carbo-Guard" 954HB by Carboline 8-15 mils d.f.t./coat

I. Scuff Resistant Paint: "Smooth Pearl" by Scuffmaster, consisting of base coat, pearlescent coat and protective clear coat.

2.5 EXISTING SURFACES TO BE PAINTED

A. Existing surfaces shall be painted in accordance with schedule given in Article 2.4 herein except that first or prime coat may be eliminated where existing paint is sound. Where existing paint must be removed down to base material, provide first or prime coat as specified.

2.6 PIPING AND MECHANICAL EQUIPMENT EXPOSED TO VIEW

A. Paint all exposed piping, conduits, ductwork and mechanical and electrical equipment. Use heat resisting paint when applied to heating lines and equipment. The Contractor is cautioned not to paint or otherwise disturb moving parts in the mechanical systems. Mask or otherwise protect all parts as required to prevent damage.

B. Exposed Uncovered Ductwork, Piping, Hangers and Equipment: Latex Enamel Undercoater and one (1) coat Acrylic Latex Flat.

C. Exposed Covered Piping, Duct Work and Equipment: Primer/Sealer and one (1) coat Acrylic Latex Flat.

D. Panel Boards, Grilles and Exposed Surfaces of Electrical Equipment: Latex Enamel Undercoater and two (2) coats Latex Semi-Gloss.

E. Equipment or Apparatus with Factory-Applied Paint: Refinish any damaged surfaces to match original finish. Do not paint over name plates and labels.

F. All surfaces of insulation and all other work to be painted shall be wiped or washed clean before any painting is started.

G. All conduit, boxes, distribution boxes, light and power panels, hangers, clamps, etc., are included where painting is required.

H. All items of Mechanical and Electrical trades which are furnished painted under their respective Contracts shall be carefully coordinated with the work of this Section so as to leave no doubt as to what items are scheduled to be painted under this Section.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL WORKMANSHIP REQUIREMENTS

A. Only skilled mechanics shall be employed. Application may be by brush or roller. Spray application only upon acceptance from the Architect in writing.

B. The Contractor shall furnish the Architect a schedule showing when he expects to have completed the respective coats of paint for the various areas and surfaces. This schedule shall be kept current as the job progresses.

C. The Contractor shall protect his work at all times, and shall protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of the work, he shall remove all paint and varnish spots from floors, glass and other surfaces. He shall remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and shall leave his part of the work in clean, orderly and acceptable condition.

D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide ample in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.

E. Remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.

F. All materials shall be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

G. Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Owner.

H. All coats shall be dry to manufacturer's recommendations before applying succeeding coats.

I. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

3.3 PREPARATION OF SURFACES

A. Existing Surfaces: Clean existing surfaces requiring paint or finishing, remove all loose and flaking paint or finish and sand surface smooth as required to receive new paint or finish. No "telegraphing" of lines, ridges, flakes, etc., through new surfacing is permitted. Where this occurs, Contractor shall be required to sand smooth and re-finish until surface meets with Architect's approval.

B. General

1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished shall be perfectly dry, clean and smooth.

2. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.

3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.

C. Metal Surfaces

1. Weld Fluxes: Remove weld fluxes, splatters, and alkali contaminants from metal surfaces in an approved manner and leave surface ready to receive painting.

2. Bare Metal: Thoroughly clean off all foreign matter such as grease, rust, scale and dirt before priming coat is applied. Clean surfaces, where solder flux has been used, with benzene. Clean surfaces by flushing with mineral spirits. For aluminum surfaces, wipe down with an oil free solvent prior to application of any pre-treatment.

a. Bare metal to receive high performance coating specified herein must be blast cleaned SSPC SP-6 prior to application if field applied primer; coordinate with steel trades furnishing ferrous metals to receive this coating to insure that this cleaning method is followed.

3. Shop Primed Metal: Clean off foreign matter as specified for "Bare Metal." Prime bare, rusted, abraded and marred surfaces with approved primer after proper cleaning of surfaces. Sandpaper all rough surfaces smooth.

4. Galvanized Metal: Prepare surface as per the requirements of ASTM D 6386.

5. Metal Filler: Fill dents, cracks, hollow places, open joints and other irregularities in metal work to be painted with an approved metal filler suitable for the purpose and meeting the requirements of the related Section of work; after setting, sand to a smooth, hard finish, flush with adjoining surface.

D. Plaster Surfaces: Scrape off all plaster nibs or other projections and sand smooth or finish to match adjoining surface texture. Cut out all scratches, cracks, holes, depressions and similar voids and fill with non-shrinking grout, spackles, patching plaster or other approved patching material; allow to dry, refill if necessary, then sand smooth (or refinish) to provide a flush, smooth surface of the same texture as the adjacent plaster surface.

1. Allow at least 28 days, from installation of final plaster coat, before starting work.

E. Gypsum Drywall Surfaces: Scrape off all projections and splatters, spackles all holes or depressions, including taped and spackled joints, sand smooth. Conform to standards established in Section 09250 Gypsum Drywall.

F. Wood Surfaces: Sand to remove all roughness, loose edges, slivers, or splinters and then brush to remove dust. Wash off grease or dirt with an approved cleaner. Fill all cracks, splits, nail holes, screw holes, and surface defects with putty after the priming coat has been applied. Putty shall be brought up flush with the surface and sanded smooth and touched-up with primer when dry.

G. Block Masonry Surfaces: Thoroughly clean off all grit, grease, dirt mortar drippings or splatters, and other foreign matter. Remove nibs or projections from masonry surfaces. Fill cracks, holes or voids, not filled under the "Masonry" Section, with Portland cement grout, and bag surface so that it has approximately the same texture as the adjacent masonry surface.

H. Testing for Moisture Content: Contractor shall test all plaster, masonry, and drywall surfaces for moisture content using a reliable electronic moisture meter. Contractor shall also test latex type fillers for moisture content before application of top coats of paint. Do not apply any paint or sealer to any surface or to latex type filler where the moisture content exceeds seven (7) percent as measured by the electronic moisture meter.

I. Touch-Up: Prime paint all patched portions in addition to all other specified coats.

3.4 MATERIALS PREPARATION

A. Mix and prepare painting materials in strict accordance with the manufacturer's directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

C. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.

D. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Tint undercoats to match the color of the finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

A. General

1. Apply paint by brush or roller in accordance with the manufacturer's directions. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by the paint manufacturer for material and texture required.

2. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried. Sand between each enamel or varnish coat application with fine sandpaper, or rub surfaces with pumice stone where required to produce an even, smooth surface in accordance with the coating manufacturer's directions.

3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.

4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.

   a. "Exposed surfaces" is defined as those areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.

5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint, before final installation of equipment.

6. Paint the back sides of access panels, removable or hinged covers to match the exposed surfaces.

7. Finish doors on tops, bottoms, and side edges the same as the faces, unless otherwise indicated.

8. Enamel finish applied to wood or metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even surface.

9. Paste wood filler applied on open grained wood after beginning to flatten, shall be wiped across the grain of the wood, then with a circular motion, to secure a smooth, filled, clean surface with filler remaining in open grain only. After overnight dry, sand surface with the grain until smooth before applying specified coat.

B. Scheduling Painting

1. Apply the first coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

2. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Prime Coats: Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

D. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.

E. “Touching-Up” of Factory Finishes: Unless otherwise specified or shown, materials with a factory finish shall not be painted at the project site. To “touch-up,” the Contractor shall use the factory finished material manufacturer’s recommended paint materials to repair abraded, chipped, or otherwise defective surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by the painting and finishing work. Leave all such work undamaged. Correct any damages by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.

B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.7 CLEAN UP

A. During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.

B. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION

SECTION 101100

VISUAL DISPLAY SURFACES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the visual display surfaces as shown on the drawings and/or specified herein, including but not necessarily limited to the following:

1. Glass markerboards and all hardware required to attach boards to walls.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Masonry - Section 042000.

E. Architectural woodwork - Section 064023, for tack boards with custom wood trim.

F. Drywall - Section 092900.

1.5 QUALITY ASSURANCE

A. Qualifications of Installers: For installation of visual display boards, use only personnel who are thoroughly trained and experienced in the skills involved and who are completely familiar with the manufacturer's recommended methods of installation.

B. Installation Methods: The recommended installation methods of the manufacturer shall become the basis for acceptance or rejection of actual installation methods used in the work.

C. Manufacturer: Furnish all visual display devices by one manufacturer for entire project.

D. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each material and component part, including data substantiating that materials comply with requirements.

B. Shop Drawings: Submit for each type of visual display device. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, and installation details.

C. Samples: Submit full range of color samples for each type of visual display board and accessory required. Provide 12" square samples of sheet materials and 12" lengths of trim members for color verification after selections have been made.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Provide material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 GLASS MARKERBOARDS

A. Provide opaque, white glass markerboards, on low-iron glass, in sizes shown on the Architectural Drawings, including all concealed wall mounting hardware, provide “Glassboards Float” manufactured by CLARUS Glassboards, Bendheim Architectural Glass, 3 Form or approved equal.

2.2 ACCESSORIES

A. Trim: Furnish stainless steel L-trim surround, size as indicated on drawings. Grind and smooth at corners.

B. Provide clips, anchors and fasteners required for complete installation.

2.3 FABRICATION

A. Assembly: Provide factory-assembled visual display device units unless field-assembled units indicated.

B. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where visual display surfaces are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Deliver factory-built visual display device units completely assembled in one piece without joints, whenever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, prefit at factory, disassembled for delivery, and make final joints at site. Use splines at joints to maintain surface alignment.

B. Install units in locations and mounting heights as shown on drawings and in accordance with manufacturer's instructions, keeping perimeter lines straight, plumb and level. Provide all grounds, clips, backing materials, adhesives, brackets, anchors, trim and accessories for complete installation.

C. Coordinate job-assembled units with grounds, trim and accessories. Join all parts with neat, precision fit.

3.3 ADJUST AND CLEAN

A. Verify accessories required for each unit properly installed and operating units properly functioning.

B. Clean units in accordance with manufacturer's instructions, breaking in only as recommended.

END OF SECTION

SECTION 101400

INTERIOR SIGNAGE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the signage as shown on the drawings and/or specified herein.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Exit signs - Division 26.

1.5 QUALITY ASSURANCE

A. For actual installation of the interior panel signs, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the required skills.

B. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of sign required.

B. Samples: Submit samples of each sign showing finishes, colors, surface textures and qualities of manufacture and design of each sign component, including graphics.

C. Shop Drawings: Submit shop drawings for fabrication and erection of signs. Include plans, elevations, and large scale details of sign wording and lettering layout. Show anchorage and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 PRODUCTS

A. Interior room and code required signs of acrylic with acrylic backer panels

1. Sign types:

a. Room ID signs with number or number and name
b. Room ID with insert window for printed acetate message or occupant names
c. Code required signage for stairs, elevator and other locations.

2. Typeface is Gill Sans Regular

3. Acrylic is painted on front and rear surfaces. Backer is painted on front surface. Paint to be high quality lightfast with UV inhibitors.

B. Laser cut stainless steel dimensional letters mounted by pin-on method.

1. Ground Floor elevator lobby building identification. See interior elevation for sign. Typeface is Gill Sans Regular

C. Fabricated metal exterior sign, post mounted, meeting all requirements of University of Connecticut. building identification signage for size, material, color, graphics, text and installation.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where signs are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install units and components at the locations directed by the Architect, securely mounted with concealed theft-resistant fasteners. Attach to substrates in accordance with the manufacturer's instructions.

B. Install level, plumb, and at the proper height. Cooperate with other trades for installation of sign units to finish surfaces. Repair or replace damaged units as directed by the Architect.

C. Install signage on glass walls with a concealing plate on the opposite side.

END OF SECTION

SECTION 102113

TOILET PARTITIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the toilet partitions as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Floor mounted, stainless steel toilet partitions.

2. Urinal screens.

3. Hardware and accessories.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Gypsum drywall - Section 092900.

E. Tile - Section 093000.

F. Toilet accessories - Section 102800.

1.5 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to fabrication to ensure proper fitting of the work.

B. Inserts and Anchorages: Furnish inserts and anchoring devices which must be built into other work for the installation of toilet partitions and related work. Coordinate delivery with other work to avoid delay.

C. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Shop Drawings: Before any of the materials of this Section are delivered to the job site, submit the following:

1. Room layouts and elevations for all areas, with dimensions based on actual dimensions taken at site.

2. Materials, finishes, details of construction, gauges of metal, hardware, fastening and anchoring conditions and relation to adjoining construction.

B. Samples - Submit:

1. Stainless steel finish - 12" x 12" sample.

2. All hardware and fitting items and fastenings for same. Include all items listed under 2.3 below.

C. Templates: Submit templates to other trades as required for support of toilet partitions.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Provide material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 WARRANTY

A. Provide manufacturer’s written warranty covering all components against breakage, corrosion and delamination for a period of 15 years.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide "Series 500," stainless steel, floor-braced toilet partitions and "Model No. 2" wall-hung urinal screens as manufactured by Bradley Corporation, Mills Metals Division, or approved equal.

B. Manufacturer's names or identifying markings not permitted on exposed surfaces of toilet compartments, urinal screens, or related hardware.

2.2 MATERIALS

A. Stainless Steel Sheet: Prime quality stainless steel, cold rolled, stretcher leveled, conforming to ASTM A 666, Type 316, with No. 4 brushed, vertical finish on exposed faces.

B. Core Insulation: Manufacturer's standard rot-proof and vermin-proof double-faced honeycomb or corrugated type core material; required in all panels, screens, pilasters and doors.

C. Hardware: Chrome plated zinc die castings or stainless steel (Type 304), as indicated below.

1. Pilaster Shoes: Stainless steel, one-piece (no visible joints or seams) flush or offset design, 3" high, 20 gauge.

2. Hinges: Manufacturer's standard heavy-duty continuous, cam type that swings to a closed or partially open position. Stainless steel, with solid stainless steel pin and pintles.

3. Latch: Chrome plated zinc die castings with solid stainless steel slide.

4. Strike and Keeper: One piece, Chrome plated zinc die castings, with rubber bumper mechanically applied and theft proof.

5. Bumper Coat Hook: Chrome plated zinc die castings, with ferrule held rubber bumper on back of each toilet compartment door.

6. Stirrup Brackets: Fourteen (14) gauge stainless steel.

7. Hardware Finishes

a. On Chrome Plated Zinc Die Castings: No. 4 brushed finish.
b. On Stainless Steel: AISI No. 4 Satin Finish.

D. Fasteners: Provide exposed fasteners of stainless steel or chromium plated brass, same finish as adjoining metal, theft proof. Provide concealed fasteners of non-corrosive metal.

E. Furnish galvanized steel anchorage devices complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters to permit structural connection at floor. Furnish shoe at each pilaster to conceal anchorage.

2.3 FABRICATION

A. Minimum Acceptable Metal Gauges:

1. Face Sheets for Panels, Screens and Doors: 22 gauge stainless steel.

2. Face Sheets for Pilasters: 18 gauge stainless steel.

3. Edge Moldings: 18 gauge stainless steel.

4. Concealed Reinforcement

a. For Tapping: 14 gauge galvanized steel.
b. For Anchoring Devices: 12 gauge galvanized steel.

B. Thickness

1. Panels, Screens and Doors: 1" overall thickness.

2. Pilasters: 1-1/4" overall thickness.

C. Sizes: As shown on drawings. Pilasters for compartments shall all be of the same width, except end pilasters which shall be approx. 1/2 the normal width.

D. Construction

1. Panels, screens, doors and pilasters shall have face sheets, with formed edges, pressure cemented to each side of core insulation, providing flat, smooth surface, free of waves, warping, buckles or other defects.

2. Lock edges of face sheets together by either concealed tack welding face sheets at contacting edges at 8" o.c., and installing interlocking edge molding, or by using a combination integral edge molding and internal reinforcing channel epoxy bonded to face sheets.

3. Edge molding shall have corners mitered, welded or brazed, ground flush and finished to match adjacent surfaces. Corners, caps or exposed welds not permitted.

4. Provide concealed reinforcement for hardware, grab bars, fastenings and accessories specified for in both work of this Section and in work of other Sections (such as Toilet Accessories), and for rigidity, strength and support of units in accordance with requirements for type and use of metal toilet partition. Cut partitions in shop to receive toilet accessories, using templates furnished by Section 102813.

5. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

E. Compartment Sizes: Unless otherwise indicated, minimum dimensions of components for toilet compartments shall be as follows:

1. Enclosure Height: 5'-10".

2. Typical Door Width: 2'-4".

3. Door Width for Barrier-Free Compartments: 3'-8".

4. Door Height: 5'-4".

5. Floor Clearance: 0'-6".

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where floor mounted toilet partitions are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install work of this Section in a rigid and permanent manner, straight and plumb, with all horizontal lines level.

B. Install panels and doors 12" above finished floor, unless otherwise indicated. Toilet compartment doors shall be centered on water closets, unless otherwise indicated.

C. Maintain uniform clearance of approx. 1/2" between pilasters and panels, and 1/2" between pilasters or panels and finished wall.

D. Maintain uniform clearance of 1/4" or less between vertical edges of doors and pilasters.

E. Set pilaster units with anchorages having not less than two (2) inches penetration into structural floor. Level, plumb, and tighten installation with devices furnished. Hang doors and adjust so that tops of doors are level with tops of pilasters when doors are in closed position.

END OF SECTION

SECTION 102800

TOILET ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the toilet accessories as shown on the drawings and/or specified herein, including but not limited to, the following:

1. Paper towel disposal units.

2. Paper towel dispenser units.

3. Sanitary napkin disposal units.

4. Grab bars.

5. Shelf and hook strip for janitors closet.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Masonry - Section 042000.

E. Gypsum drywall - Section 092900.

F. Tile - Section 093000.

G. Toilet partitions - Section 102113.

H. Electrical - Division 26.

1.5 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units. Accessories shall be installed at heights in compliance with prevailing Handicapped Code.

C. Products: Unless otherwise noted, provide products of same manufacturer for each type of unit and for units exposed in same areas.

D. 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.

E. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical data, catalogue cuts and installation instructions for each toilet accessory.

B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work

C. Submit schedule of accessories indicating quantity and location of each item.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Provide material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING

A. Deliver accessories to the site ready for use in the manufacturer’s original and unopened containers and packaging, bearing labels as to type or material, manufacturer’s name and brand name. Delivered materials shall be identical to approved samples.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gauge minimum, unless otherwise indicated.

B. Galvanized Steel Sheet: ASTM A 653, G60.

C. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

D. Mirrors: ASTM C 1503, mirror glazing quality, clear glass mirrors, nominal 1/4" thick.

2.2 FASTENING DEVICES

A. Exposed Fasteners: Theftproof type, chrome plated, or stainless steel; match finishes on which they are being used.

B. Concealed Fasteners: Galvanized (ASTM A 123) or cadmium plated.

C. No exposed fastening devices permitted on exposed frames.

D. For metal stud drywall partitions, provide ten (10) gauge galvanized sheet concealed anchor plates for securing surface mounted accessories.

2.3 FABRICATION

A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted. Unobtrusive labels on surfaces not exposed to view are acceptable. Where locks are required for a particular type of toilet accessory, provide same keying throughout project. Furnish two keys for each lock.

B. Surface-Mounted Toilet Accessories, General: Fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage.

C. Recessed Toilet Accessories, General: Fabricate units of all welded construction, without mitered corners. Hang doors of access panels with full-length stainless steel piano hinge. Provide anchorage which is fully concealed when unit is closed.

2.4 ACCESSORY SCHEDULE

A. Toilet Paper Dispenser: University provides Standard Canter Model No. R4500, Jumbo Roll Dispenser, 12-1/2" h x 20-1/2" w x 5-5/8" deep. Contractor shall install the units and any related blocking.

B. Grab Bar: 1-1/4" diameter stainless steel grab bars with set screw concealed mounting, Bobrick model B-5806 series or equal, 36", 42" and 18" length as indicated on drawings.

C. Waste Receptacle: Bobrick recessed waste receptacle B-364.

D. Surface and Partition Mounted Sanitary Napkin Disposal: Bobrick Surface-Mounted Sanitary Napkin Disposal B-254 and Bobrick Partition-Mounted Sanitary Napkin Disposal B-354.

E. Utility Shelf with Mop/Broom Holders and Rag Hooks: Bobrick B-239 or equal.

F. Mirror: Bobrick mirror with stainless steel channel frame, B-165 series, special-ordered size at 60" (w) by 40" (h).

G. Swing-up Grab Bars: Bobrick swing-up grab bar B-4998 or equal.

H. Wall-Mounted Soap Dispenser: Hansgrohe PuraVida Soap Dispenser #41503000.

I. Hand Dryer: TOTO Sensor Activated Clean Dry High Speed Concealed Hand Dryer HDR110#SS.

J. Sanitary Napkin Dispenser: Bobrick TrimLineSeries Recessed Napkin/Tampon Vendor B-37063 series.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where toilet accessories are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

A. Accessories which are to be partition mounted shall be closely coordinated with other trades, so that the necessary reinforcing is provided to receive the accessories.

B. Furnish templates and setting drawings and anchor plates required for the proper installation of the accessories at gypsum drywall and masonry partitions. Coordinate the work to assure that base plates and anchoring frames are in the proper position to secure the accessories.

C. Verify by measurements taken at the job site those dimensions affecting the work. Bring field dimensions which are at variance with those on the approved shop drawings to the attention of the Architect. Obtain decision regarding corrective measures before the start of fabrication of items affected.

D. Cooperate in the coordination and scheduling of the work of this Section with the work of other Sections so as not to delay job progress.

3.3 INSTALLATION

A. Install accessories at locations indicated on the drawings, using skilled mechanics, in a plumb, level and secure manner.

B. Concealed anchor assemblies for gypsum drywall partitions shall be securely anchored to metal studs to accommodate accessories. Assemblies shall consist of plates and/or angles tack welded to studs.

C. Secure accessories in place, at their designated locations by means of theftproof concealed set screws, so as to render removing of the accessory with a screwdriver impossible.

D. Unless otherwise indicated, accessories shall conform to heights from the finished floor as shown on the drawings. Where locations are not indicated, such locations shall be as directed by the Architect.

E. Installed accessories shall operate quietly and smoothly for use intended. Doors and operating hardware shall function without binding or unnecessary friction. Dispenser type accessories shall be keyed alike. Prior to final acceptance, master key and one duplicate key shall be given to Owner's authorized agent.

F. The Architect shall be the sole judge of workmanship. Workmanship shall be of the highest quality. Open joints, weld marks, poor connections, etc., will not be permitted. The Architect has the right to reject any accessory if he feels the workmanship is below the standards of this project.

G. Grab bars shall be installed so that they can support a three hundred (300) lb. load for five minutes per ASTM F 446.

3.4 CLEANING AND PROTECTION

A. Upon completion of the installation, clean accessories of dirt, paint and foreign matter.

B. During the installation of accessories and until finally installed and accepted, protect accessories with gummed canvas or other means in order to maintain the accessories in acceptable condition.

C. Replace and/or repair installed work which is damaged or defective to the Owner's satisfaction, at no additional cost.

END OF SECTION

SECTION 104416

FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the fire extinguishers and cabinets as shown on the drawings and/or specified herein.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Masonry walls - Section 042000.

E. Gypsum drywall - Section 092900.

F. Fire suppression systems - Division 22.

G. Fire hose cabinets and valve cabinets - Division 22.

1.5 QUALITY ASSURANCE

A. Provide portable fire extinguishers, cabinets and accessories by one manufacturer.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

C. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Steel materials used for work in this section shall contain a minimum of 35% (combined) pre-consumer/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the LEED Building Submittal Requirements of this Section.

4. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for all portable fire extinguishers required. For fire extinguisher cabinets include roughing-in dimensions, and details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style and materials. Where color selections by Architect are required, include color charts showing full range of manufacturer's standard colors and designs available.

B. Samples: Submit samples, 6" square, of each required finish. Prepare samples on metal of same gauge as metal to be used in the work. Where normal color variations are to be expected, include 2 or more units in each sample showing the limits of such variations.

C. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.

b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).

c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products of one of the following:

1. J. L. Industries.

2. Larsen's Mfg. Co.

3. Potter Roemer.

2.2 EXTINGUISHERS

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.

B. Abbreviations indicated below to identify extinguisher type related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.

C. Multi-Purpose Dry Chemical Type: UL rated 2A-10B:C, 5 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.

2.3 MOUNTING BRACKETS

A. Provide manufacturer's standard bracket designed to prevent accidental dislodgment of extinguisher, of proper size for type and capacity of extinguisher specified, in manufacturer's standard enamel finish; color to match extinguisher.

2.4 CABINETS

A. Type and Style: Provide "Occult Series," Model SS FS O-2409, with Flame Shield option, of Larsen's Mfg. Co. Provide solid door with white Type A die cut lettering. Fire extinguisher cabinets shall be Type 304 stainless steel with #4 finish.

B. Other manufacturers noted herein may substitute their equivalent cabinet upon acceptance by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where fire extinguishers and cabinets are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install items included in this Section in locations indicated and at heights to comply with applicable regulations of governing authorities.

1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

B. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by the Architect.

3.3 SERVICE

A. Determine the approximate completion date of the work and then inspect, charge, and tag the fire extinguishers at a date not more than 10 days before or not less than one day before actual completion date of the work.

END OF SECTION

SECTION 112423 - FACADE MAINTENANCE SYSTEM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this section, as shown or specified, shall be in accordance with the requirements of the Contract Documents. Any discrepancies or contradictions in the drawings and specification shall be brought to the attention of the Architect and Engineer by the contractor for clarification directly upon discover.

1.2 SUMMARY

A. Provide all labor, materials, equipment, services and accessories necessary to furnish and install the work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein.

B. Work of this Section includes, but is not limited to, the following:

1. Roof anchors.

C. Related Work Specified Elsewhere

1. Rope descent system, including seat board, lines, descent device, chafe gear, etc. by the window cleaning contractor.

2. Safety body harness, with a lanyard and other safety equipment such as independent hanging life lines, by the window cleaning contractor.

3. Two-way radio communication system that will allow communication to a manned station within the building from the platforms, during their use anywhere on the building, by the Architect.

4. Hose Bibs, by the Plumbing Contractor.

1.3 QUALITY ASSURANCE

A. Codes and Standards

1. Design and erection shall comply with the current requirements or a specific variance granted therefrom, of all governing codes and regulatory agencies, including, but not limited to the following:

a. OSHA 1910 Subpart D, (Walking and Working Surfaces)

b. OSHA 1910, Subpart F, Appendix C, (Personnel Fall Arrest Systems).

c. ANSI I 14-1, Window Cleaning Safety.

B. Design Requirements:

1. Roof anchors shall be designed to withstand a 5000 pound ultimate load in any direction.

2. The equipment shall be designed by or under the direction of a Professional Engineer registered in the state of Connecticut.

1.4 SUBMITTALS

1. Proposal: Include with the proposal for analysis by the Owner and Architect before award of the contract the following information:

2. Roof plan locating all anchors and showing all window drops.

3. Reactions at roof anchors.

4. Catalog describing major items of equipment.

5. Statement: Confirmation that the proposed system including all work and equipment locations shown on the bidding drawings are acceptable, or a list of those areas that must be changed to be compatible with the equipment being proposed.

B. Drawings: Furnish compatibility drawings describing all equipment, including location diagrams for all roof anchors, and other items required to be built into the building. Manufacturing detail drawings will not be accepted for review.

1.5 WARRANTY

A. Guarantee: Submit with each proposal two copies of a guarantee against defects in material, workmanship, or installation for all components, providing for repair or replacement for a minimum period of one year, including material and labor.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All components shall be constructed of stainless steel, or galvanized structural steel. Dissimilar metals, when used, shall be protected against electrolytic action.

1. Galvanized steel shall have a zinc coating applied by the hot-dipped process.

2. Comply with ASTM A153 for galvanizing iron and steel hardware.

3. Comply with A 123 for galvanizing both fabricated and un-fabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.76 mm thick or thicker.

B. All connections shall be stainless steel unless otherwise noted.

C. All welds shall be made by certified welders and shall be examined by non-destructive testing. Comply with applicable provisions of AWS D1.1 “Structural Welding Code-Steel”, AWS D1.2. Certify each welder has satisfactorily passed AWS qualification tests for the welding process involved and, if pertinent, has undergone recertification.

D. Obtain mill test reports on all on all metals used in the manufacture of the roof anchors.

E. The material sizes and thicknesses shown on the drawings are for conceptual design purposes. The manufacturer shall provide the final design and detailing of the equipment.

2.2 ROOF ANCHORS

A. Provide galvanized steel roof anchors with a minimum eye opening of 2” diameter.

B. Anchor eye material to be stainless steel.

C. Provide a stainless steel wire rope system through the roof anchors at the penthouse roof only to act as a fall restraint arrest system.

D. Provide shock absorbers as necessary to limit the load on the anchors to a maximum of 5000 lbs.

PART 3 - EXECUTION

3.1 INSPECTION

A. Prior to commencing work, the installer shall examine all aspects of the construction and immediately call to the attention of the Contractor and the Architect any conditions detrimental to a proper installation. The Contractor shall immediately correct all problems

3.2 INSTALLATION

A. All equipment shall be installed by, or under the direct field supervision of the equipment manufacturer.

3.3 EQUIPMENT SCHEDULE

A. One Hundred (100) galvanized steel roof anchors complete with stainless steel fall restraint life lines, shock absorbers and all necessary stainless steel connection hardware.

B. Miscellaneous equipment as required by the drawings and specifications and as required for complete installation.

3.4 CERTIFICATION

A. Provide written certification that all components have been successfully operated following the procedures as specified, and will perform in accordance with the intent of this design.

END SECTION 112423

SECTION 111313

LOADING DOCK BUMPERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the loading dock bumpers as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

1. Rubber dock bumpers.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Cast-in-Place Concrete - Section 033000.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each type of loading dock bumper.

B. Shop Drawings: Submit plans, elevations, sections, details, and attachments to other work for dock bumpers.

C. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

PART 2 PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS

A. Products and materials in this Section shall meet performance criteria and contribute to sustainable design requirements, as specified in Section 018113 (Sustainable Design Requirements). These contributions include, but are not limited to, preconsumer and postconsumer recycled content percentages, regional content percentages, and product VOC content limits.

B. Recycled Content: Products and materials shall comply with minimum recycled content percentages as specified in 018113 (Sustainable Design Requirements).

2.2 DOCK BUMPERS

A. Laminated Tread Bumpers: Provide 6" thick dock bumper units fabricated of multiple plies cut from fabric-reinforced rubber truck tires to a uniform thickness. Laminate plies under pressure on 3/4" dia. steel supporting rods which are welded and bolted to

1/4" thick structural steel angle closures with predrilled anchor holes. Size angles to provide not less than 1" of tread plies extending beyond face or closure angles.

B. Anchorage Devices: Provide anchor bolts, nuts, washers, bolts, sleeves, cast-in-place and/or other anchorage devices as required to fasten bumpers securely in place and to suit installation indicated. Furnish anchorage components which are hot dip galvanized.

C. Dock bumpers shall be manufactured by the Durable Corp. or equal made by Pawling Rubber Co., Kelley Co., Inc., or approved equal meeting these specifications.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where loading dock bumpers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. General: Comply with manufacturer's detailed instructions in installing loading dock equipment.

B. Attach dock bumpers to structure to comply with requirements indicated for spacing, arrangement, position relative to top of platform, and anchorage.

1. Bolted Attachment: Attach to embedded anchor bolts or to cast in place inserts, or attach by drilling and anchoring with expansion anchors and bolts.

3.3 ADJUST AND CLEAN

A. After installation, restore marred or abraded surfaces to original condition.

END OF SECTION

SECTION 115210

AUDIO-VISUAL EQUIPMENT

PART 1 - GENERAL

1.1 General Provisions

A. Attention is directed to all Sections within Division 01 - General Requirements which are hereby made a part of this Section of the Specifications.

1.2 Description Of Work

A. This document describes the products and execution requirements relating to furnishing and installing audiovisual equipment in support of the building of a new Engineering and Science Building on the Storrs Campus of the University of Connecticut.

B. The Work of this Section includes furnishing and installing complete infrastructure required to support the audio-video (AV) components as described in these specifications and in the AV-series drawings, following all applicable Codes and Contract Documents. This work includes, but is not limited to, electrical power in conduit, junction boxes with blank-off plates, empty electrical boxes with conduit and pull strings for low voltage components, switches, and other equipment as noted in the Responsibility Schedule on Sheet AV000 and as shown on drawings, in particular the AV Conduit Riser drawings. Empty conduit shall run from the device to the control zone as noted in these Specifications or shown on AV Drawings, credenza, wall box, or AV equipment closet/MDF Room. In addition to this minimum requirement, additional electrical and low-voltage requirements are included in these specifications and on the AV Drawings. **These AV specifications are included to provide information about the AV components requiring this infrastructure; the AV components themselves will be purchased and installed under a future contract with a separate specification.**

C. Related Work: The following items are not included in this Section and are specified under the designated Sections:
   1. Division 26 - Electrical for services and connections for AV systems.
   2. Division 12-Furnishings which integrate to all AV systems with table boxes and shade controls.

D. Contractors should examine all drawings and read all divisions of this specification in order to avoid omissions or duplications and to ensure a complete job. Discrepancies between drawings and specifications or obvious omissions shall be referred to the GC and the AV Consultant in written form at least eight business days prior to the bid due date.

1.3 Regulatory Requirements

A. Work shall be carried out in conformance with applicable Building and Electrical Codes, the requirements of OSHA and the applicable provisions of Underwriters Laboratories (U.L.), ANSI, Electronic Industries Association, and National Fire Protection Association. All work shall be in accordance with all applicable codes, local, state, and national.

B. Provide site labor compatible with on-site trade's people.

C. In addition to conformance with the codes stated above, adhere to the following standards and practices in every aspect of the project:
   1. FCC-Federal Communications Commission
   2. AES-Audio Engineering Society
   3. BICSI- Building Industry Consulting Services International
   4. IEEE/ANSI –Recommended Practices for grounding
   5. AES-Audio Engineering Society
   6. SMPTE-Society of Motion Picture Engineers

D. It will be the awarded AV Contractor's responsibility to obtain any permits or certificates required for completing this project as well as associated costs.

1.4 Submittals

A. The contractor shall follow the submittal procedure outlined in Division 01 - General Requirements – Submittal procedure.

B. The University of CT will not be held responsible for items ordered prior to the approval of submitted shop drawings.

C. Samples
   1. Confirmation of color and materials for wall plates being provided shall be submitted and approved by the project team prior to ordering.
      a. Devices located in millwork shall be black with stainless steel faceplate unless otherwise noted.
      b. All devices in GWB shall be white with white faceplate.
      c. Devices and plates in floor boxes should be black.
      d. Devices in Wiremold Poke Thru devices will be white.
      e. Engraving on white backgrounds will be black lettering.
      f. Engraving on stainless steel will be black.
      g. Engraving on black will be white.

PART 2 - PRODUCTS

2.1 Products to be supplied and installed by the General Contractor, Electrical Contractor and Low voltage Contractor:

A. All conduits, junction boxes, above ceiling plenum boxes and pull areas, LCD monitor back boxes and pull areas, as well as, wall blocking as listed on AV Conduit Riser Diagrams.

B. Please refer to AV Drawing AV00 AV Responsibility Schedule for overall description of who is providing and who is installing AV related infrastructure equipment.

C. All equipment is to be new from the factory.

2.2 Products to be supplied and installed by the AV contractor:

A. The AV system components will be bid separately in a process managed by the AV Consultant with oversight from the GC.

B. Drawings, in addition to these Construction Documents, will be provided to prospective AV bidders with system flow diagrams for each system type, as well as equipment lists and system functionality descriptions.

C. Prospective AV bidders shall furnish with their response; a complete list of equipment costs for each item to be furnished, as well as a breakdown in labor costs for each category of labor: Project Management, Engineering, Drafting, Programming, Rack Fabrication and Staging, Installation and Commissioning, Training, Warranty and Preventive Maintenance Visits.

D. All wiring and equipment is to be new from the factory.

PART 3 - EXECUTION

3.1 General

A. Refer to "Responsibility Schedule" on Drawing AV000.
   1. Provide on-site union labor compatible with on-site trade's people.
   2. Keep all parties informed on the schedule of the project.
   3. Provide a detailed schedule of completion showing milestones at the project kick off meeting.

3.2 Physical installation

A. All equipment shall be firmly secured in place unless requirements of portability dictate otherwise.

B. All boxes, equipment, etc. shall be secured plumb and square.

C. In the installation of equipment and cable, consideration shall be given not only to operational efficiency, but also to overall aesthetic factors.

D. All structural support and hardware to support loads plus a safety factor of five.

E. Any infrastructure for future equipment shall be terminated and coiled above ceiling and brought down as needed.

3.3 Cable installation-(Where applicable)

A. All field cable is to be plenum rated and acceptable to local jurisdiction.

B. Where applicable - All cables, regardless of length, shall be marked with printed (no write-on labels will be accepted) wrap-around numbers and shrink-wrap at both ends. There shall be no unmarked cables at any place in the system.

C. Terminations are to be free from stress due to gravity acting on the form.

D. Terminations shall have a sufficient service loop, allowing a re-termination or two without having to open a form to lay in a new cable.

E. RJ terminations are solid in their connectors.

3.4 Grounding Procedures

A. In order to minimize problems resulting from improper grounding, and to achieve maximum signal-to-noise ratios, the following grounding procedures shall be adhered to:
   1. System Grounds: A single primary "system ground" shall be established for the systems in each particular area. All grounding conductors in that area shall connect to this primary system ground. The system ground shall be provided in the audio equipment rack for the area.
   2. The contractor is responsible to insure that the power is on the same electrical phase for all audiovisual equipment, and that a technical ground has been provided. The contractor shall be responsible for determining if the metallic conduit is properly electrically bonded to the building ground system.
   3. Under no condition shall the AC neutral conductor, either in the power panel or in a receptacle outlet, be used for a system ground.
   4. Verify resistance is less than 1 Ohm from ground buss bar to the chassis of each rack-mounted component. Verify less than 1 Ohm from ground buss bar to audio ground terminal of each rack-mounted component's input and output connector.

3.5 Workmanship

A. The contractor is responsible for keeping the jobsite clean, and removes all rubbish at the end of each day. The contractor must cooperate with building officials to keep the disruption to the jobsite at a minimum, and shall be responsible for all damages and marring of finishes caused by the installation. Upon final completion of the systems, clean all stains, remove all masking, protections, equipment, material, and debris from the work and storage areas, and leave those areas in an undamaged and acceptable condition.

END OF SECTION

SECTION 115213

ELECTRIC PROJECTION SCREENS

PART 1 - GENERAL

1.1 General Provisions

A. Attention is directed to all Sections within Division 01 - General Requirements which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Products listed in this section shall be supplied with both a screen and a roller device provided by the same manufacturer as one complete assembly and warranty.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
   1. Division 26 - Electrical
   2. Section 095113-095113 Ceilings
   3. Section 115210 Audio-Visual Equipment

1.3 DEFINITIONS

A. Gain: The screen's luminance or brightness measured perpendicular to the screen center, measured relative to a block of magnesium carbonate which serves as the standard for 1.0 gain. The gain shall be measured in accordance with SMPTE RP 94-2000.

B. Half Gain Viewing angle: The angle from the perpendicular center of the screen at which the light measured from the screen is equal to one half the values measured in the test for gain.

C. Format: Proportional ratio of width to height for projection screen viewing area
   1. Wide Format: 1.60:1 (16x10)

D. Gain Uniformity: The variation in light intensity measured perpendicular to any point on the screen as a percentage of the light intensity measured perpendicular to the center of the screen.

E. Ambient Light Reflectivity: The amount of light reflected from the screen from undesirable off axis sources as a percentage of the light incident on the screen. The measurement is taken perpendicular to the screen and the light source is at 45 degrees from the perpendicular.

1.4 Description Of Work

A. Provide all labor, materials, equipment, services and accessories necessary to furnish and install the work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein.

B. The principal work of this Section includes, but may not be limited to, the following:
   1. Installation of projection screens per manufacturer instructions.
   2. Provision of power distribution system as specified under Division 26
   3. Painting visible surfaces as directed by Architect
   4. Adjustment of screen up and down stops as directed by Architect
   5. Inspecting and insuring that the screens are free from defects
   6. Cleaning the screen surfaces; the contractor shall maintain the surfaces in dust free condition throughout the course of this contract
   7. Coordinating with the AV Contractor for low voltage connections

1.5 Submittals

A. Action Submittals
   1. Provide in accordance with Section 01-3300 – SUBMITTAL PROCEDURES: Manufacturers' product data for projection screens and associated devices, including installation, maintenance, and cleaning instructions.
   2. Shop drawings: Submit large scale shop drawings. Indicate dimensions, fabrication, and installation methods and details including anchors, clamps, strut, threaded rod and safety cables. Submit shop drawings for low voltage and electrical wiring diagram.
   3. Provide Manufacturer's instructions detailing maintenance requirements, and parts catalog that includes complete list of repair and replacement parts, with cuts and identifying numbers.

1.6 Quality Assurance (Qualifications)

A. Manufacturer's Qualifications:
   1. The Manufacturer shall be engaged full time in the production of the products herein.
   2. The product types specified herein shall represent at least sixty-percent of the total volume of products produced by the manufacturer.

B. Contractor Qualifications:
   1. The Contractor shall be an authorized dealer and service facility for the products specified herein.
   2. The Contractor shall employ its own installation staff, sub-contracting the work specified herein is not acceptable.
   3. The Contractor shall demonstrate at least 5 years of experience with the installation of the products specified herein.

C. Regulatory Requirements:
   1. Comply with Uniform Building Code (UBC), Building Code for Connecticut.

1.7 Storage and Handling

A. Deliver and install the projection screens after the building is enclosed and the construction where screens will be installed is substantially complete. The HVAC system shall have been started and shall be supplying clean air. The room shall be broom clean at a minimum. If applicable, mechanical assembly may be installed earlier with the screen properly packaged and stored elsewhere until installation conditions are met.

B. Upon receipt of the screens, inspect the screens for impressions, tears, stains, dirt, foreign matter or other defects. Immediately notify the Manufacturer and file claims with shipping companies. Clean or repair the screens as required, as authorized by the manufacturer, and as approved by the owner's representative. Where screens cannot be repaired or cleaned in the field, return the screen to the manufacturer for repair or replacement.

1.8 Project Ambient Conditions

A. Store electrically operated front projection screens in a ventilated, dry, protected area safe from harmful weather conditions. Temperature must not exceed 80 degrees F.

1.9 Sequencing

A. Manufacturer's suggested sequence with other work: comply with projection screen manufacturer's recommendations for sequencing construction operations.

1.10 Warranty

A. Attention is directed to provision of closeout submittals and applicable parts of Division 1 regarding warranties.

B. Manufacturers shall provide their standard warranty for work specified in this Section. However, such warranty shall be in addition to and not in lieu of all other liabilities which manufacturers and the Contractor may have by law or by other provisions of the contract documents.

C. Screens shall be warranted by the manufacturer not to flake, peel, separate, crack or change optical characteristics for a minimum of five years from date of installation, unless subject to abuse. Mechanisms shall be warranted for five years to operate smoothly, to stop consistently without need for adjustment and to maintain original noise levels.

D. Warranty: Commencing on product receivable date by Owner.

PART 2 - PRODUCTS

2.1 Manufacturers

A. Manufacturer: Da-Lite Screen Company, Inc.

B. Contact: P.O. Box 137, 3100 N. Detroit St., Warsaw, IN 46581-0137; Telephone: (800) 622-3737, (574) 267-8101; Fax: (877) 325-4832, (574) 267-7804; E-mail: info@da-lite.com; website: www.da-lite.com.

2.2 Proprietary Projection Screen Systems

A. Ceiling Recessed Electrically Operated Projection Screens

1. Screen Operation: Electrically operated, UL and ULC listed, retractable, with 1 rigid metal roller and tab guide cable screen tensioning system.
2. Motor: Housed inside metal roller and including automatic thermal overload protection, integral gears, capacitor and electric brake to prevent coasting.
   a. Type: 3-wire with ground with quick connect male plug-in connector, permanently lubricated, quick reversal type designed for mounting inside roller.
   b. Quantity: 1.
   c. Voltage, Frequency: 115 V, 60 Hz
   d. Amperage: 2.4 amps maximum.
   e. Include preset, adjustable limit switches to automatically stop viewing surface in UP or DOWN position.
3. Electric Controls: Wall-mounted switch.
   a. Voltage, Frequency: 115 V, 60 Hz
   b. Switch: 3 position type with cover plate for UP, DOWN and STOP functions.
   c. Junction Box: Internally attached to screen case.
4. Screen Mounting: Ceiling recessed and plenum rated type.
   a. Mounting Hardware: Include mounting hardware.
5. Screen Case: Designed to receive mounting hardware and sized to suit projection screen.
   a. Type 1: Extruded aluminum with heavy gage steel end caps and adjustable steel brackets.
      1) Case Bottom: Self-trimming with built-in flange and equipped with concealed-hinge aluminum door for manual access.
      2) Finish:[White powder coated.
   b. Case Length: Qty. 1 - 135.5” inches; Qty. 1 – 96.5”.

6. Screen Size:

   a. Viewing Area: Qty. 1 - H 72.5 inches × W 116 inches

      Qty. 1 – H 50 inches x W 80 inches

7. Acceptable Material: Da-Lite Screen Company, Inc. Tensioned Advantage Electrol Projection Screen.

   a. Tab Guide Cable Tensioned Screen Material:

      1) Front projection, flame retardant, mildew resistant vinyl, with black backing and with standard black borders, easily cleaned with mild soap and water solution.

      2) Include tab and cable guide on each side of fabric to maintain even, lateral tension and hold viewing surface flat.

      3) Bottom end of fabric to be inserted into a custom aluminum slat bar with added weight to provide vertical tension on the screen surface.

      4) Slat ends to be protected by heavy-duty plastic caps enclosing a preset adjustable mechanism for screen tensioning.

      5) Seamless in all sizes.

   b. Gain: To SMPTE RP 94-2000, 1.0

   c. Half Angle: 60.

   d. Format: 16:10 Wide - 1.60:1

   e. Acceptable Viewing Surface: Da-Lite Screen Company, Inc.:

      1) [Da-Mat].

2.3 Accessories

A. Low Voltage Control (LVC) System:
   1. Single Motor Low Voltage Control System (LVC)
   2. Silent Motor: Built-in Standard

2.4 Product Substitutions

1. Substitutions: In accordance with Section 01-2500 – Substitution Procedures.

EXECUTION

2.5 Installers

A. Product must be installed by technicians who are qualified and experienced in installing electrically operated front projection screens. All electrical work should be performed by licensed electricians

2.6 Preparation And Inspection

A. Examine wall, ceilings and conditions under which this work is to be performed. Notify the Contractor in writing of conditions detrimental to proper completion of the work. Beginning work means that the Installer accepts substrates and conditions

2.7 Coordination

A. Coordinate provision of electrically and manually deployed roller screens with locations of other wall and ceiling mounted components such as visual display boards, casework, structural framing, light fixtures, air diffusers, ducts and fire sprinklers to eliminate potential conflicts.

B. Coordinate requirements for blocking, construction of recesses, and auxiliary structural supports to ensure adequate means for installation of screens.

C. Coordinate installation of recessed mounted screens with construction of suspended ceilings or gypsum board ceilings

2.8 Installation

A. Arrange for timely delivery of the screen from the manufacturer. Do not store the screen for extended periods prior to installation. Coordinate pathway access to bring the screen into the building as required.

B. Verify exact project locations with Owner/Architect prior to installation

C. Install screens in accordance with the approved shop drawings. Strictly comply with the manufacturer's instructions and recommendations. Comply with all requirements as specified in this Section. Comply with all referenced standards.

D. Install projection screens at locations and heights indicated on drawings. Verify locations in field with Architect.

E. Provide and install appropriate structural support in ceilings as required. Work ceiling tiles around openings for flush ceiling screens.

F. Accurately plumb, level, align, square and brace screens.

2.9 Final Cleaning, Adjusting Touch-Up, And Repair

A. After installation of hardware, make adjustments and corrections to leave operating parts in perfect condition.

B. Touch-up damaged shop coatings and repair minor damage to eliminate all evidence of repair to the satisfaction of the owner's representative.

C. Remove and replace work that cannot be satisfactorily repaired

D. Upon completion of work, remove surplus materials, product packaging, rubbish, tools, and equipment

2.10 Testing And Protecting

A. Operate each screen three times minimum. Ensure screens properly extend and retract and that screen is level and viewing surface plumb when extended. Adjust to correct deficiencies. Verify that the screen operates properly, and that the screen hangs flat without ripples.

B. Protect projection screens from damage resulting from subsequent construction activities. Tape craft paper or other protective membrane over the screen housing opening until directed to remove them. If the protective materials interfere with the operation of the screen, remove power from the unit and document this action with clear and legible labeling.

C. Remove and replace damaged screens.

D. After the building is completely clean and prior to turning over the building to the owner for occupancy, deploy all rollup screens and allow them to hang for at least 72 hours to allow the screen fabric to relax into its natural flat and smooth shape. Remove any new debris and dust that have accumulated on the screen and exposed housing surfaces. After the 72 hour period, return the screens to the rolled up position.

2.11 Maintenance

A. Installation and construction work to be performed during hours satisfactory to Owner/Architect. Work may be performed during regular trade working hours or after hours depending on Owner or Architect's project requirements.

END OF SECTION

SECTION 116100 HIGH PERFORMANCE LABORATORY FUME HOODS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. High performance, bench-top and walk-in, variable air volume laboratory fume hoods as specified herein complete and ready for intended use, which operate with up to 50% less exhaust air than a traditional hood but with improved containment.

2. Work tops within fume hoods.

3. Water, laboratory gases, and electrical service fittings and cupsinks in fume hoods.

4. Piping and wiring within fume hoods for service fittings, light fixtures, fan switches, and other electrical devices included with fume hoods.

B. Related Sections:

1. Division 6 Section "Architectural Woodwork" for base cabinets, sinks, and service fittings.

2. Division 22, 23 and 26 Sections for installing service fittings in fume hoods, including piping and wiring within fume hoods, and for other wiring in fume hoods, including connecting light fixtures, fan switches, and other electrical devices included with fume hoods.

3. Division 22, 23 and 26 Sections for connecting service utilities at back of fume hoods. Piping and wiring within fume hoods are specified in this Section.

4. Division 22 Section "Testing, Adjusting, and Balancing for HVAC" for field quality control testing of fume hoods.

5. Commissioning Specifications.

1.02 PERFORMANCE REQUIREMENTS

A. Achieve a performance rating of 4.0 AM 0.05 or better for all tracer gas tests conducted on all of the fume hood designs per the ASHRAE 110-1995 test, or the most current published edition, with an average face velocity of 60 FPM through the 18” vertically opened sash.

1. Face-Velocity Variation: Not more than 10 percent of average face velocity.

B. Static-Pressure Loss: Not more than .15-inch wg at 100 fpm face velocity with 12-inch vertical sash opening when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.

C. Delegated Design: Design fume hoods, including comprehensive engineering analysis by a qualified professional engineer, using seismic performance requirements and design criteria indicated.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For laboratory fume hoods. Include plans, elevations, sections, details, and attachments to other work.

1. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports.

2. Indicate locations and types of service fittings together with associated service supply connection required.

3. Indicate duct connections, electrical connections, and locations of access panels.

4. Include roughing-in information for mechanical, plumbing, and electrical connections.

C. Samples: For fume hood exterior finishes interior lining and work top material], in manufacturer's standard sizes.

D. Product Test Reports: Showing compliance with specified performance requirements for as manufactured containment and static pressure loss based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency.

E. Field quality-control reports.

1.04 QUALITY ASSURANCE

A. Product Designations: Drawings indicate sizes, types, and configurations of fume hoods by referencing designated manufacturer's catalog numbers. Other manufacturers' hoods of similar sizes, types, and configurations, and complying with the Specifications, may be considered. See Division 01 Section "Product Requirements."

B. Product Standards: Comply with SEFA 1, "Laboratory Fume Hoods - Recommended Practices. Provide fume hoods UL listed and labeled for compliance with UL 1805.

C. Safety Glass: Products complying with testing requirements in 16 CFR 1201 for Category II materials.

1. Permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

D. 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.

E. Contractor for work in this section shall have an established organization and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of products specified with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and proven capability to produce the specified equipment of the required quality and the proven capacity to complete an installation of the size and scope of this project within the required time limits. A minimum of 10 years experience in the manufacture of laboratory fume hoods is required. A minimum of 10 years experience in the manufacture of high performance fume hoods is required. Manufacturer must have an installed population of at least 3000 high performance fume hoods installed and operating in the United States.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, the following manufacturers/products are acceptable:

1. Typical locations: 60” and 96” benchtop and walk-in Variable Air Volume standard and ADA-compliant hoods with Vertical Rising Sash:

a. Lab Crafters Air Sentry

b. Mott Safeguard

c. Thermo Scientific Hamilton Concept

2.02 MATERIALS

A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.

B. Glass-Fiber-Reinforced Polyester: Polyester laminate with a chemical-resistant gel coat on the exposed face, and having a flame-spread index of 25 or less per ASTM E 84.

C. Epoxy: Factory molded, modified epoxy-resin formulation with smooth, nonspecular finish.

1. Physical Properties:

a. Modulus of Elasticity: Not less than 2,000,000 psi (1400 MPa).

b. Hardness (Rockwell M): Not less than 100.

c. Water Absorption (24 Hours): Not more than 0.02 percent.

d. Heat Distortion Point: Not less than 260 deg F (127 deg C).

e. Flame-Spread Index: 25 or less per ASTM E 84.

2. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:

a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.

b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).

3. Color: As selected by Architect from manufacturer's full range.

D. Glass: Clear, laminated tempered glass complying with ASTM C 1172, Kind LT, Condition A, Type I, Class I, Quality-Q3with clear, polyvinyl butyral interlayer.

E. Fasteners: Provide stainless-steel fasteners where exposed to fumes.

2.03 FABRICATION

A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations. Fume hoods shall be capable of being partly disassembled as necessary to permit movement through a 35-by-79-inch (889-by-2007-mm) door opening.

B. Steel Exterior: Fabricate from steel sheet, not less than 0.0478 inch (1.2 mm) thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.

C. Ends: Fabricate with double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.

D. Splay top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.

E. Interior Lining: Fiberglass reinforced polyester, ¼” thick. Color: white. These panels to have at least a "Laboratory Grade finish" when tested per the chemical spot test in the Scientific Equipment and Furniture Association

(SEFA) SEFA 8-1999 Standard. Chemical resistance test data to be supplied to the Owner for his evaluation for intended use, upon Owner request.

F. Lining Assembly: Unless otherwise indicated, assemble with stainless-steel fasteners or epoxy adhesive, concealed where possible. Seal joints by filling with chemical-resistant sealant during assembly.

1. Fasten lining components together with [stainless-]steel cleats or angles to form a rigid assembly to which exterior panels are attached.

2. Fasten lining components to a rigid frame assembly fabricated from[stainless] steel and to which exterior panels are attached.

3. Punch fume hood lining side panels to receive service fittings and remote controls. Provide removable plug buttons for holes not used for indicated fittings.

G. Chemically resistant powder coated aluminum, automatically adjusting baffle with slots at top, center and bottom to include automated baffle controls unless otherwise indicated. Baffle control to maintain vortex and containment with sash movement, cross drafts and other factors. See "Baffle Controls/Alarm Systems" section for more information on baffle actuator. Chemical resistance test data on baffle coating to be supplied to the Owner for his evaluation for intended use, upon Owner request. Baffles that do not adjust automatically are unacceptable.

H. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of same material as hood lining, and with duct stub for exhaust connection. Exhaust collars shall be rectangular in shape and shall not project higher than top of fume hoods. External transition pieces are not acceptable.

1. Duct-Stub Material: Stainless steel.

I. Sashes: Provide operable sashes of type indicated.

1. Fabricate from 0.050-inchnominal thickness stainless steel. Form into four-sided frame with bottom corners welded and finished smooth. Make top member removable for glazing replacement. Set glazing in chemical-resistant, U-shaped gaskets.

2. Counterbalance vertical-sliding sash with sash weight and stainless-steel cable system to hold sash in place regardless of position. Provide ball-bearing sheaves, plastic glides in stainless-steel guides, and stainless-steel lift handles. Provide rubber bumpers at top and bottom of each sash unit.

J. Airfoil: Unless otherwise indicated, provide airfoil at bottom of fume hood face opening with 1-inch space between airfoil and work top. Sash closes on top of airfoil, leaving 1-inch opening for air intake. Airfoil directs airflow across work top to remove heavier-than-air gases and to prevent reverse airflow.

1. Fabricate airfoil from stainless steel.

K. Light Fixtures: Provide vaporproof, two-tube, rapid-start, fluorescent light fixtures, of longest practicable length; complete with tubes at each fume hood. Shield tubes from hood interior with 1/4-inch- thick laminated glass or 3-mm-thick tempered glass, sealed into hood with chemical-resistant rubber gaskets. Provide units with fluorescent tubes easily replaceable from outside of fume hood.

1. Provide fluorescent tubes with color temperature of 3500 K and minimum color rendering index of 85.

L. Base Cabinets: Provided under Division 6 Section “Architectural Woodwork."

M. Work Tops:

1. Work Tops, General: Provide units with smooth surfaces free of defects. Make exposed edges and corners straight and uniformly beveled. Where acid storage cabinets are indicated beneath fume hoods, provide holes in work tops as need to accommodate cabinet vents.

2. Epoxy Resin Work Tops: Provide front overhang of 1 inch (25 mm), with continuous drip groove on underside 1/2 inch (13 mm) from edge.

a. Work Top Material: Solid epoxy resin. Color: **Durcon Incorporated, 206 Allison Drive, Taylor TX 76574 (512-595-8000). Color Lunar White, or Epoxyn Products, 500 East 16th Street, Mountain Home, AR 72653 (870-425-0820). Color: 01, Superwhite.**

b. Work Top Configuration: Raised (marine) edge, 1-1/4 inches thick at raised edge, with beveled or rounded edge and corners.

3. Cupsinks: 3” x 6” polypropylene, in color matching countertop. Depth of cupsinks shall be coordinated to work with base cabinets.

N. Filler Strips: Provide as needed to close spaces between fume hoods or fume hood base cabinets and adjacent building construction. Fabricate from same material and with same finish as fume hoods or fume hood base cabinets, as applicable.

O. Ceiling Extensions: Provide filler panels matching fume hood exterior to enclose space above fume hoods at front and sides of fume hoods and extending from tops of fume hoods to ceiling, at located indicated. **Ceiling closure panels at Fifth Floor fume hoods are custom perforated metal as noted on drawings.**

P. Finished Back Panels: Where rear surfaces of fume hoods are exposed to view, provide finished back panels matching rest of fume hood enclosure.

Q. Comply with requirements in Divisions 23 and 26 Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings. Securely anchor fittings, piping, and conduit to fume hoods unless otherwise indicated.

2.04 CHEMICAL-RESISTANT FINISH

A. Preparation: Clean steel surfaces, other than stainless steel, of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.

2. Colors for Fume Hood Finish: As selected by Architect from manufacturer's full range.

2.05 ACCESSORIES

A. Service Fittings: Comply with requirements in Division 12 Section "Laboratory Casework"

1. Provide service fittings with exposed surfaces, including fittings, escutcheons, and trim, finished with acid- and solvent-resistant powder coating complying with requirements in SEFA 7 for corrosion-resistant finishes.

2. Provide service fittings with exposed surfaces in laboratory casework manufacturer's white, or other color as approved by Architect.

3. Service fittings shall be manufactured by WaterSaver Faucet Co., and include the following products:

a. **Natural gas (G), specialty gases (G1-4), vacuum (V) and compressed air (A): L740N-KR.**

b. Nitrogen: L740-N-7

c. Cold water: L740W-9VB-127 (with serated tip and aspirator).

d. Nitrogen regulator: L774V-L panel mounted pressure regulator assembly, with outlet pressure of 0-60 psi and guage range of 0-75 psi. Note: alternatively, this regulator can be Acme Specialty Gases Model SW7250, ~~similar to those specified in Section 06400 for cabinet mounting.~~

4. Cold water, natural gas, **specialty** gases, nitrogen and air service fittings shall be pre-piped to a point of connection 2" above the hood. Low-pressure vacuum piping shall be pre-piped to a location to be coordinated with low-pressure vacuum pumps in cabinets near fume hoods. Water and nitrogen piping shall be type L copper tubing. Cold water piping, fittings and valve bodies shall be factory insulated with ½” thick closed cell elastomeric insulation. Natural gas,

vacuum, and compressed air piping shall be ASTM A 53, type E or S, standard weight (schedule 40) black steel pipe with ASTM A 197/ANSI B16.3 class 150 black malleable iron threaded fittings using thread lubricant or teflon tape. Fittings shall be jamb mounted with clear coated outlets on the inside walls. **Specialty gas piping shall be stainless steel.**

~~5. Where shown, two-inch dia. aluminum high-pressure vacuum tubing shall be pre-piped to a point of connection at the base of the hood superstructure (for connection by the Owner to a high pressure vacuum pump in fume hood base cabinet). Provide finished plate on hood interior side, and transition from 2" tube to ¾". Vacuum pumps in cabinets below fume hood shall be vented to hood interior.~~

6. Electrical Receptacles: Provide two duplex, GFI, 120V, 20A receptacles within each fume hood. Provide moisture-resistant (exterior) covers.

B. Variable Volume Controller, Operation, Indicators and Alarms: Division 23 Controls Contractor shall furnish face velocity monitors, sash position sensors, and operator display panel to fume hood manufacturer for installation at the fume hood manufacturer's factory. Provide pathways for wiring to sash position sensor, face velocity monitors and operator display panel. Coordinate all requirements with Division 23 contractor.

1. Airflow Indicator: Each fume hood shall be provided with airflow indicator of the thermal anemometer type that measures fume hood face velocity and displays data as digital readout.

2. Airflow Alarm: Each fume hood shall be provided with audible and visual alarms that activates when airflow sensor reading is outside of preset range:

a. Thermal-anemometer airflow sensor.

b. Reset and test switches.

c. Switch that silences audible alarm and automatically resets when airflow returns to within preset range.

3. Fume hoods shall be provided with audible and visual alarm that activates when sash is opened beyond preset position, with silence and test switches.

C. Sash Stops: Provide fume hoods with sash stops to limit hood opening to 18". Basis of design is 60 fpm at 18" vertical sash opening. Sash stops can be manually released to open sash fully for cleaning fume hood and for placing large apparatus within fume hood.

2.06 SOURCE QUALITY CONTROL TESTING OF FUME HOODS

A. Submit a test report for the standard product previously tested, if the product is identical to equipment being provided for this project.

B. Evaluation of standard product shall have been conducted in accordance with the method prescribed in NIH Fume Hood Testing Protocol. Hood tests shall be performed by one of the independent, third party, testing agencies listed below:

1. Exposure Control Technologies (www.labhoodpro.com), Cary, NC, (919) 319.4290.

2. SAFELAB (www.safelab.com), Indianapolis, IN, (317) 872.6600.

3. Technical Safety Services (www.techsafety.com), Berkeley, CA, (800) 877.7742.

4. Micro-Clean (www.microcln.com), Lehigh Valley, PA, (610) 867.5302.

C. Testing shall be performed at an independent site, not the manufacturer's test lab.

D. Hoods shall achieve a rating of 6.0 AM 0.01 or better for all tests with an average face velocity of 60 FPM through the 18" vertically open sash.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install fume hoods level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels, but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Comply with requirements in Division 12 Section "Laboratory Casework" for installing work tops, and sinks.

C. Comply with requirements in Divisions 22 and 26 Sections for installing water and laboratory gas service fittings and electrical devices.

1. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink and work top-mounted fittings in sealant recommended by manufacturer of sink or work top material. Securely anchor fittings to fume hoods unless otherwise indicated.

3.02 ADJUSTING

A. Repair or remove and replace defective work, as directed by the Owner's Representative upon completion of installation.

B. Adjust sash, fixtures, accessories and other moving or operating parts to function smoothly.

3.03 CLEANING

A. Clean equipment, touch up as required.

3.04 PROTECTION OF FINISHED WORK

A. Provide all necessary protective measures to prevent damage to equipment from exposure to other construction activity.

B. Advise Contractor of procedures and precautions for protection of material and installed fume hoods from damage by work of other trades.

3.05 PERFORMANCE TESTING

A. Manufacturer must have one of each fume hood~~s~~ type tested to current ASHRAE 110 Standard at an independent (non-field) site. Test reports must be performed and prepared by one of the independent third party organizations listed in section 2.2.B of this specification. Results must indicate tracer gas performance ratings of 4.0 AI 0.05 or better for all tests at the specified face velocities. Manufacturer must have a representative on-site for all tests and must assist in trouble-shooting and correcting all non-conforming hoods.

B. Testing Contractor to provide a complete report of the results of the testing program including an executive summary, an outline of the test procedures and equipment used, a table of the results of each test conducted on each hood and a conclusion and recommendation section discussing the results and (if necessary) recommendations to improve fume hood performance.

C. Refer to specification section **~~239000~~ 230593** for field testing requirements.

3.06 TRAINING

A. Upon completion of the installation of the fume hoods, Manufacturer must conduct a training seminar for the Owner's users at the job site discussing proper operation of the fume hood, fume hood features and best use practices. Training session must be at least 30 minutes in length, not including a question and answer session. Training session must be scheduled within 30 days on completion of the installation.

3.07 WARRANTY

A. Manufacturer must offer a minimum five-year warranty on parts and labor to fix defects in materials and workmanship for fume hoods and casework.

END OF SECTION 116100

SECTION 116200 LABORATORY EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: The following built-in laboratory and miscellaneous equipment:

1. Steam Sterilizer.

2. Glassware Washer

2. Canopy Hood.

B. Related Sections:

1. Laboratory Casework: Section 064023.

2. HVAC: Division 23.

3. Plumbing: Division 24

4. Electrical: Division 26.

1.02 REFERENCES

A. The following standards are cited in this Section. They govern the work of this Section only to the extent specified in each citation.

B. American Society for Testing and Materials (ASTM).

C. Federal Occupational Safety and Health Act (OSHA) for safe handling of flammable/volatile solvents.

D. National Fire Protection Association (NFPA).

E. American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code.

F. National Electric Manufacturer's Association (NEMA), Standards Publication No. LD3 including revisions 1 through 4.

1.03 WARRANTIES

A. All equipment shall be guaranteed for a period of one year from the date of acceptance thereof against defective materials, design, and workmanship. All motors included in any specified equipment shall be provided with a five-year guarantee.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Manufacturers shall have an established organization and production facilities specializing in the manufacture of the equipment. They shall have the demonstrated ability to produce the specified equipment of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

2. Any deviations from the specifications, including type of finish as set forth herein, must be listed in detail separate from other literature submitted.

3. The Contractor is responsible for any alterations to the mechanical or electrical service necessary to accommodate substitute manufacturer's product requirements.

1.05 SUBMITTALS

A. Shop Drawings: Submit large scale drawings indicating dimensions, materials, thicknesses, relation to adjoining work, locations of utility connections, and other details necessary to fully illustrate each item.

B. Product data: Submit manufacturer's specifications which describe the construction, features, operation, capacity, output, utility requirements, controls, and available options of each item.

C. Operating Manuals: Submit step-by-step operating instructions complete with trouble-shooting recommendations, emergency manufacturer contacts, maintenance schedule and instructions.

1.06 PROJECT CONDITIONS

A. Examine project for conditions that affect work. Do not begin installation until unsatisfactory conditions are corrected. Defects caused by unsatisfactory conditions or untimely installation shall be corrected at not cost to the Owner.

PART 2 - PRODUCTS

2.01 STEAM STERILIZERS

A. Sterilizers shall be Model 9200, by Buxton Medical Equipment Corporation, Lindenhurst, New York (631-957-4500), or approved equal by Steris or Getinge, single door type, with chamber sized 20” w x 20” h x 38” l (8.8 cu. ft. volume).

B. Pressure Vessel: Details of chamber design, material, and construction shall meet or exceed the requirements of Section VII, Division 1 of the ASME Code (Unfired Pressure Vessels). The vessel shall bear the ASME stamp of compliance, and the UL label of approval. The inner shell shall be designed for an internal working pressure of 40 psig. Jacket exterior shall be insulated with a one-inch thick foil-covered blanket of glass fiber.

C. Body: Double shell construction. Chamber shall be of all-welded construction with all interior longitudinal corners radiused. Gasket sealing surfaces of chambers shall be true and flat to assure a close, neat fit.

D. Door: Constructed from a single solid piece of type 304 or 316 stainless steel, designed to

meet or exceed the requirements of the ASME code. A single-acting closing mechanism with central low heat conducting handles actuates radial locking arms to extend and clamp the arms in a continuous motion. Radial holding arms prevent leaks by exerting pressure on the gasket. Stainless steel hinge is pivot-bearing type, self-adjusting for accurate gasket alignment. See plans for swing of door.

E. Finish: The interior surfaces of the chamber and door and all non-machined stainless steel surfaces shall have a matte finish. Door cover, fascia, and cabinet shall be stainless steel with No. 4 brushed finish.

F. Cycle Controls:

1. Controls shall be conveniently located and shall not be exposed to the heat, vapor and condensate resulting from the sterilization process. Controls shall be electromechanical with 6-inch inkless recorder (with locking plexiglass cover).

G. Utility Requirements:

1. Cold Water: 3/4" NPT, 30-50 PSIG, 12 GPM.

2. Steam Supply: 3/4" NPT, 40-60 PSIG, 120 lbs./hr.

3. Drain: 1” NPT, open, piped to floor drain.

4. Electrical: 120V, 60 Hz, 15 Amp 1P.

H. Accessories (each sterilizer):

1. Rack.

2. Two shelves.

I. Condensate cooler: Cool condensate to below 140 degrees F. prior to discharging from unit.

2.02 GLASSWARE WASHERS WITH ELECTRIC DRYERS

A. Glassware washers shall be Model 4 by Buxton Medical Equipment Corporation, Lindenhurst, New York (631-957-4500), or approved equal by Steris or Getinge, with steam coil and sump and external steam heat exchanger, integral pure water storage tank, front loading, recessed mounted in custom enclosure type unit with fully automatic programmed cycle of washing and rinsing treatments for laboratory glassware.

B. Washer shall be constructed with drop down door, and shall accommodate loads approximately 21-25" high x 26-28" wide x 26-28" deep.

C. Treatments: Programmable for unlimited rinses.

D. Controls: Washer shall be operated by a programmable microprocessor control system with diagnostic panel. The programmer shall provide cycles for wash, rinses, mineral free water rinses, and drain. The programmer shall include power on/off, cycle start, cycle advance, cycle hold, power mineral free rinses, and a mode for automatic detergent

dispensing. The controller shall be of modular interchangeable design to facilitate repairs and/or replacements. Diagnostic panel shall signal non-standard operation.

E. Construction: Washing chamber and tank shall have coved corners and be constructed of 14 gauge type 304 stainless steel, heli-arc welded, with all welds polished. A channel base plate shall support pump motor and associated equipment. Channel cross members shall be painted with rust resistant paint. All interior and exterior surfaces shall have a polished finish.

1. Tank shall be designed to use minimum water quantity without pump captivation. Fresh water supply line shall be located at a height sufficient to prevent back siphoning. Tank shall be provided with an overflow. Floor of chamber shall be pitched to drain into tank through a removable stainless steel debris basket and pump suction screen.

2. Washing chamber shall be fitted with a 1-1/2" ID quick locking device with "O" ring for automatic connection of interchangeable holders to pump circulatory piping. Floor of chamber shall be provided with tracks matching those on interior of door to align holders with quick lock.

F. Overhead Spray System: Washing and rinsing treatments shall be applied through a stainless steel nozzle that produces a shower-like, full cone spray pattern. The nozzle shall provide large flow capacities with small droplets.

G. Door: Manually operated, drop down type with observation window. Door shall be constructed of 14-gauge, type 304 stainless steel. A safety switch shall automatically stop washer operation if door is opened during cycle.

H. Piping and Valves: All circulatory piping shall be type 304 stainless steel, with strainer and screen to prevent broken glassware from entering the washing holder. A separate debris screen removes suspended particles from circulating water. Strainer is back flushed each time machine drains. Drain valve shall be stainless steel motorized ball valve. All other valves are electric solenoid type. Provide effluent cool-down system to ensure drain discharge does not exceed 140 F.

I. Pump and Motor: Pump shall be all stainless steel centrifugal type with mechanical seal, powered by a closed, coupled 7-1/2 HP motor, with a stainless steel shaft capable of delivering 180 gpm at 98 feet head pressure. Motor shall be protected by appropriate magnetic starter and shall meet all NEMA standards.

J. Utility Requirements:

1. Electrical: 208V, 60 Hz, 3-phase, 13.5 kw, plus 110 V, 5 A. for control.

2. Hot Water: 3/4" NPT 30 GPM (maximum 300 gallons/hour).

3. Drain: 1-1/2" NPT closed connection to drain (by manufacturer), 12 gallons in 10 seconds.

4. DI Water: 3/4" NPT, 15 GPM (maximum 16 gallons/cycle).

5. Overflow: 1-1/2" NPT pipe to open floor drain.

6. Cold Water: ¾” NPT, 30 GPM.

7. Steam: 1” NPT, 450 lbs./hr. @ 40-60 PSIG.

8. Condensate Return: ¾” NPT.

K. Accessories:

1. 49 spindle holder for items up to 3-3/8" in diameter, and frame for 49 spindle holder.

2. Pipette holder (capacity: 400 1-ml pipettes per load) with insert holder.

3. Circular holder with rack to support basket lots of ware.

4. 6" x 6" x 6" test tube baskets.

5. Transport carriage.

2.03 STAINLESS STEEL CANOPY HOOD

A. Provide stainless steel canopy hoods above glasswash room equipment. Provide all necessary ceiling and wall trim angles, leveling devices, vertical, horizontal and slopping surfaces for a complete and tight installation. All components shall be Type 304, 24-gage (minimum) stainless steel, No. 4 finish, with stiffeners and supports as required. All joints shall be butt-welded and ground smooth. Canopy hood suspension shall comply with seismic design requirements. Coordinate canopy hood with all equipment cutouts with selected autoclave/washer vendor’s submittal data.

2.04 ICEMAKER

A. Maestro Model MFD 400, air-cooled, flake icemaker, or approved equal by Hoshizaki or Scotsman.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Check project for conditions that affect work. Do not begin installation until unsatisfactory conditions are corrected. Defects caused by unsatisfactory or untimely installation shall be corrected at no cost to the Owner.

3.02 INSTALLATION

A. Deliver to the project, uncrate, place in location, and assemble all specified equipment.

B. Remove and legally dispose of all debris and crating material.

C. Coordinate with mechanical and electrical trades to assure that utilities provided are correct and that hookups are accomplished correctly.

3.03 ADJUSTING, CLEANING, AND PROTECTION

A. Correct nonconforming, poorly fitting, and damaged work. Remove and replace work that cannot be satisfactorily corrected at the Project.

B. Cover equipment for protection during remainder of construction period. Remove covering at completion of construction, inspect, and make any required final adjustments or repairs.

3.04 DEMONSTRATION

A. Demonstrate operation and maintenance of equipment to designated members of UCONN staff.

END OF SECTION

SECTION 122413

WINDOW SHADES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the window shades in all rooms and public spaces where indicated on the drawings and/or specified herein, including, but not limited to, the following:

1. Manually-operated window shades.

2. Motor-operated window shades.

3. Field measurements of as-built conditions.

4. Accessories and hardware required for complete installation and operation.

5. Blackout shades, motor operated where indicated on the drawings.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Electric service - Division 26.

E. Audiovisual - Section 274000.

1.5 QUALITY ASSURANCE

A. Provide assemblies which are complete assemblies produced by one manufacturer, including hardware, accessory items, mounting brackets, and fastenings.

B. Provide materials in colors as selected by the Architect from manufacturer's standard colors.

C. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

1. Motorized Shade Operators: Include operating instructions and diagrams of wiring connection to AV system, all control points and transformer locations.

2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Submit floor layout and elevations, indicating location of all window treatments, mechanism details, type and size of each unit, type and location of controls. Shop drawings must also show seaming of shade fabric. Submit shop drawings showing details of installation and relation to adjoining construction and conditions.

C. Samples: Submit full size sample of each shade type for Architect's acceptance.

D. Mock-Up

1. Install each type of shade assembly on one complete column bay for Architect's acceptance of installation details, workmanship and operation.

2. Approved mock-up shall be used as the standard for installation of work under this Section, and no further installation work shall proceed before Architect's acceptance of the mock-up.

1.7 WARRANTY

A. Manufacturer's standard non-depreciating 5 year limited warranty covering all hardware, chains, motors, motor control system and shade cloth.

1.8 DELIVERY, STORAGE AND HANDLING

A. Protect shades from damage, soiling and deterioration during transit, storage and handling to, until Owner's acceptance.

1.9 EXTRA SHADE FABRIC

A. Furnish quantity and full size units equal to 5% of amount installed.

PART 2 PRODUCTS

2.1 MANUALLY OPERATED SHADES

A. Provide manually operated shade system equal to "Mechoshade/5 System", made by the MechoShade Corp. or equal made by DFB Sales Inc., Lutron, or approved equal conforming to standards specified herein.

B. Shade system shall be pre-engineered overrunning clutch design that disengages to 90% during the raising and lowering of the shade. The brake can stand a pull force of 40 lb. in the stop position. Requires no adjustment. Self-lubricating hub on to which the brake system is mounted includes an articulated brake assembly which assures smooth, non-jerky operation in raising and lowering the shades. System shall include the following components:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.

2. Provide shade hardware that allows for removal and remounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

3. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.

4. Provide shade hardware system that allow for operation of multiple shade bands (multi-banded shades) by a single chain operator. Connectors shall be offset to assure alignment from the first to the last shade band.

5. Provide shade hardware constructed of minimum 1/8" thick plated steel or heavier as required to support 150% of the full weight of each shade.

6. Drive Bracket/ Brake Assembly:

   a. Mecho Shade Drive Bracket M5 Mecho/5 Pocket Bracket or equal by other manufacturers noted herein.
   b. Drive Chain: #10 qualified stainless steel chain rated to 90 lb.
   c. Minimum Breaking Strength: Nickel plate chain shall not be accepted.

7. Shade Pocket

   a. Mecho #4133 Pocket with removable closure.
   b. Provide end cap as required and where indicated on drawings.

C. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.

1. Hem Pockets and hem Weights: Fabric hem pocket with RF welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be the same, for all shades within one room.

2. Shade Band and Shade Roller Attachment:

   a. Provide extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without deflection. Provide for positive mechanical engagement with drive / brake mechanism.
   b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a “snap-on” “snap-off” spline mounting, without having to remove shade roller from shade brackets.
   c. Mounting spline shall not require use of adhesives, adhesive tapes, staples and/or rivets.

2.2 ELECTRICALLY OPERATED SHADES

A. Provide electrically operated shade system equal to "Electro-Shade" made by the MechoShade Corp. or equal made by DFB Sales, Inc. or approved equal conforming to standards specified herein.

B. Access and Material Requirements:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.

2. Provide shade hardware that allows for removal and remounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

C. Motorized Shade Hardware and Shade Brackets:

1. Provide shade hardware constructed of minimum 1/8’ thick plated steel, or heavier, thicker, as required to support 150% of the full weight of each shade. Plastic components without use of steel angle construction do not meet the intent of this specification and shall not be accepted.

2. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).

3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the motor axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade motor.

   a. Provide one shade band per window unit up to six shade band units per motor.
   b. All shade bands within a single motor group shall be aligned within 1/4".

4. Bracket and Pocket

   a. Mecho Electro/1 standard bracket.
   b. Mecho #4133 Shade Pocket with removable closure; provide end cap as required and where indicated on drawings.
   c. Finish on shade pocket to be custom color powder coating. See finish color schedule.

D. Motor Control System: To be provided in first floor Gathering Space.

1. All motors shall be provided power via individual 3 conductor line voltage circuits connecting each motor to the IQ/MLCs.

2. A maximum of four motors may be operated by a single IQ/MLC control component.

3. Control system components shall provide appropriate (spike and brown out) over current protection (+/- 10% of line voltage) for each of these four individual circuits and shall be rated by UL or ETL as a component of this system.

4. Motor control system shall allow each IQ/MLC group of four shade motors to be controlled by each of four local switch ports, with up to fourteen possible “sub-group” combinations via local 3 button wall switches and all at once via a master 3 button switch. System shall allow for overlapping switch combinations from 2 or more switches.

5. Multiple “sub-groups” from different IQ/MLC control components may be combined to form “groups” operated by a single 3-button wall switch.

6. Each shade motor shall be accessible (for control purposes) from up to four local switches and one master switch.

7. Control system shall allow for automatic alignment of shade hembars at 25%, 50% and 75% of opening heights, or up to three user defined intermediate stopping positions in addition to all up/all down positions regardless of shade height. Control system shall allow shades to be stopped at any point in the opening height, however, shade hembars may not be in alignment at these non-defined positions.

8. Control system shall have two standard operating modes, Normal Mode allow the shades to be stopped anywhere in the opening height and Uniform Mode allow the shades to only be stopped at the pre-defined intermediate stop positions. Both modes shall allow for all up/all down positioning.

9. Control system components shall allow for interface with low voltage Audio Visual system components via a dry contact terminal block.

E. Shade Band: As described herein for manual shades.

F. Finishes: Unless otherwise noted, all exposed parts have an custom powder coated finish.

2.3 SHADE CLOTH

A. Shade cloth shall be ~~EcoVeil 0950 Series (1% openness), 1550 Series (3% openness) and 1350 Series (5% openness).~~ **ThermoVeil Dense Basket Weave 1500 series (3% openness) at all shade locations.**

B. Blackout shade cloth shall be "Equinox 0100 Series," color and optical properties as selected by the Architect, made by MechoShade or approved equal.

2.4 FABRICATION

A. The shade and the fabric shall hang flat without buckling or distortion. The edge, when trimmed, shall hang straight without curling or raveling. An unguided roller shade cloth shall roll true and straight, without shifting sideways more than +/- 1/8" in either direction due to warp distortion or weave design. Shades shall fill window openings from head to sill and jamb-to-jamb.

2.5 SHADE LOCATIONS

A. Motorized Shades: Entire storefront glazing at the Gathering Space, North, South and West Façade.

B. Manual Shades: All window and curtainwall of the building, all floors, all facades with the following exceptions:

1. Within enclosed stairs.

2. At storefront or curtainwall glazing immediately adjacent to or within Entry Vestibules at the Ground Floor – V1A/101 and V1B/C1A.

PART 3 EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where window treatments are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION: GENERAL

A. Coordinate with the work of other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the indicated design and the installation recommendations of the manufacturer as approved by the Architect.

C. Upon completion of the installation, put all components through at least ten (10) complete cycles of operation, adjusting as necessary to achieve optimum operation.

3.3 INSTALLATION OF MOTOR OPERATED SHADES

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions and located so shade band is not closer than 2" to interior face of glass. Allow proper clearances for window operation hardware.

B. To control the responsibility for performance of motorized roller shade systems, the Contractor shall assign the engineering, and installation of motorized roller shade systems, motors, controls, and low voltage electrical control wiring specified in this Section to a single manufacturer and his authorized installer/dealer. The Architect will not produce a set of electrical drawings for the installation of control wiring for the motors, or motor controllers of the motorized roller shades. Power wiring (line voltage), shall be provided by the roller shade installer/dealer, in accordance with the requirements provided by the manufacture. Coordinate the following with the roller shade installer/dealer:

1. Contractor shall provide power panels and circuits of sufficient size to accommodate roller shade manufacturer's requirements, as indicated on the mechanical and electrical drawings.

2. Contractor shall coordinate with requirements of roller shade installer/dealer, before inaccessible areas are constructed.

3. Roller shade installer/dealer shall run line voltage as dedicated home runs (of sufficient quantity, in sufficient capacity as required) terminating in junction boxes in locations designated by roller shade dealer.

4. Roller shade installer/dealer shall provide and run all line voltage (from the terminating points) to the motor controllers, wire all roller shade motors to the motor controllers, and provide and run low voltage control wiring from motor controllers to switch/control locations designated by the Architect. All above ceiling and concealed wiring shall be plenum rated, or installed in conduit, as required by the electrical code having jurisdiction.

5. Contractor shall provide conduit with pull wire in all areas, which might not be accessible to roller shade contractor due to building design, equipment location or schedule.

C. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

D. Clean roller shade surfaces after installation, according to manufacturers written instructions.

E. Engage installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 INSTALLATION OF MANUAL ROLLER SHADES

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions and located so shade band is not closer than 2" to interior face of glass. Allow proper clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces after installation, according to manufacturers written instructions.

3.5 PROTECTION AND CLEANING

A. Protect installed units to ensure proper operating condition, without damage or blemishes. Repair or replace damaged units as directed by the Architect.

END OF SECTION

SECTION 123640

STONE COUNTERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the stone counters as shown on the drawings and/or specified herein including, but not limited to, the following:

1. Counters and fascias.

2. Stainless steel anchoring and fastening devices.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Architectural woodwork – Section 064023.

E. Stone flooring - Section 096430.

F. Counter mounted soap dispenser - Section 102800.

G. Lavatories - Division 22.

1.5 QUALITY ASSURANCE

A. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Shop Drawings: Submit the following shop drawings for Architect's approval.

1. For Stone: Submit complete cutting and setting drawings to Architect for approval. Show sizes, shapes, thicknesses, jointing, anchoring, connection with other work, typical and special anchoring details, supports, dimensions, setting numbers, and color range for stone. Clearly indicate dimensions for locating cutouts in stone. Do not fabricate any stone tops (except for samples) until shop drawings have been approved by the Architect.

B. Samples

1. Stone: Submit 3 sets of 12" x 12" samples of stone. Include full range of color and texture to be expected. Architect will review for color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

2. Anchoring and Fastening Devices: Submit 3 samples of each type of anchoring and fastening device.

1.7 PRODUCT DELIVERY, STORAGE & HANDLING

A. Protect stone during storage and construction against wetting, soiling, staining and damage.

B. Handle stone to prevent chipping, breakage, soiling or other damage. Do not use pinch or wrecking bars without protecting edges of stone with wood or other rigid materials.

C. Store stone on wood skids or pallets, covered with non-staining, waterproof membrane. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones. Protect stored stone from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around stones.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stone

1. Stone Quality and Characteristics: All stone shall be of best quality, sound stock, and carefully selected; uniform in color, pattern, markings, texture and finish; and free from defects impairing strength, durability or appearance such as cracks, seams, mineral stains, flaws, or imperfections which are not a normal characteristic of the stone. Patching or filling of chips or cracks is not permitted. Delivered stone shall match the approved samples, and any stone not matching the approved sample may be rejected by the Architect as unfit. Size and thickness of stone units as indicated on drawings.

2. Stone: Stone shall be _____ with polished finish on all exposed surfaces; concealed surface shall be sawn.

B. Anchors and Fastening Devices: Fabricate from AISI Type 304 stainless steel, No 4 finish.

C. Stone Sealer: Seal stone surfaces with "S-34" made by HMK or approved equal.

PART 3 EXECUTION

3.1 SETTING STONE COUNTER TOPS AND COUNTER FASCIAS

A. Cut-outs and Drilling: Provide counter tops with cut-outs for sinks, faucets, etc. Cut-outs shall be carefully made in accordance with templates furnished under the Plumbing Section. Stone shall be drilled as required to receive anchoring and fastening devices.

B. Setting: Set counter tops in required pattern over cabinet work using stainless steel anchors. Counter fascias shall be doweled to counter top. Set counter tops and counter fascias level, plumb and square.

C. Stone shall be set so that adjacent sections of stone are sequence matched for veining.

D. Joints: Maintain an even joint between units, 1/16" max. Point joints with approved elastic non-staining mastic pointing compound, color to match stone. Tool joints flush. Clean exposed surfaces carefully.

3.2 REPAIR, CLEANING AND SEALING

A. Remove and replace stone units which are broken, chipped, stained or otherwise damaged. Where directed, remove and replace units which do not match adjoining stonework. Patching or hiding chips or cracks in stone will not be permitted. Provide new matching units, install as specified and reseal joints to eliminate evidence of replacement. Reseal defective and unsatisfactory joints to provide a neat, uniform appearance.

B. Clean and seal stonework after completion using sealer specified herein and cleaner as recommended by sealer manufacturer; follow manufacturer's instructions.

3.3 PROTECTION

A. After installation and cleaning, protect stone work from damage during subsequent construction activities.

B. Provide protection for finished work such as exposed edges, corners, and all other stone liable to physical injury or staining. Protection shall include, but is not limited to, non-staining approved coverings.

END OF SECTION

SECTION 124814

FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 LEED BUILDING GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

B. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.3 SECTION INCLUDES

A. Work of this Section includes all labor, materials, equipment and services necessary to complete the floor mats and frames as shown on the drawings and specified herein.

1.4 RELATED SECTIONS

A. Construction and Demolition Waste Management – Section 017419.

B. VOC Limits for Adhesives, Sealants, Paints and Coatings – Section 018113.

C. Construction Indoor Air Quality (IAQ) Management – Section 018119.

D. Concrete recess - Section 033000.

1.5 QUALITY ASSURANCE

A. Manufacturer: Except as otherwise indicated, provide entrance mats and accessories by a single manufacturer for entire project.

B. LEED Building Performance Requirements

1. Adhesives or sealants used for work in this section for interior applications shall meet the requirements of Division 1, Section 018113, "Volatile Organic

Compound (VOC) Limits for Adhesives, Sealants, Paints and Coatings," where applicable.

2. Materials manufactured within a radius of 500 miles from the project site where all or a portion of the raw resources also originate within a radius of 500 miles shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

3. Materials that contain recycled content shall be documented in accordance with the LEED Building Submittal Requirements of this Section.

1.6 SUBMITTALS

A. Product Data: Submit manufacture's specifications and installation instructions or entrance mat. Include methods of installation for each type of substrate.

B. Samples: Submit samples for each type and color of exposed entrance mat, frames and accessories required. Provide 12" square samples of mat including frame.

C. Maintenance Data: Submit manufacturer's printed instructions for cleaning, drying, maintaining and rehandling of removable entrance mat units.

D. LEED Building Submittal Requirements: The Contractor or subcontractor shall submit the following LEED Building certification items:

1. A completed LEED Building Materials Certification Form, per Section 013300, "Submittals," under the LEED Building Submittal Requirements article of these specifications. Information to be supplied includes:

   a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
   b. The manufacturing location for the product(s) and the location (source) of the raw materials used to manufacture the product(s).
   c. Material costs for the materials included in the Contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.

3. Product Cut Sheets for all materials that meet the LEED Performance Requirements this Section.

4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to, adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer's literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content.)

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 - PRODUCTS

2.1 MAT ASSEMBLY

A. Furnish and install SSS Clean Tread Model KD 98 (1-1/8" deep) stainless steel floor grate as manufactured by Kadee Industries. Design is for shallow recess, level bed applications.

B. Tread Material: Type 304 stainless steel 0.071" x 0.177" surface wire, No. 4 satin finish.

1. Wire Spacing: Standard slot openings of 0.125".

C. Support Rods: Type 304 Stainless steel, 0.50" rods spaced 2" on center.

D. Framing: Type 304 stainless steel with unit construction to support 1,500 pounds per sq. ft. Welded frame, stainless steel angle. 1" x1/8" interior members, splice plates and grouting strap anchors for a permanent recessed application.

E. Accessories: Provide hidden locking devices to prevent warping and rattling. Furnish number of lock downs as recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where floor mats and frames are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Install mat frames integrally with principal pour of concrete floor system. Locate, align and level frame members accurately.

B. Waterproof concrete slab with primer.

C. Protection: Upon completion of frame installations and concrete work, provide temporary filler of plywood or fiberboard in mat recesses, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project reaches substantial completion.

D. Delay installation of mats until work on the project reaches substantial completion.

E. Install grating mat in frame and anchor with hidden lock downs.

END OF SECTION

SECTION 125100 LABORATORY DARKROOM CURTAINS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Laboratory darkroom and laser containment curtains attached to ceiling or aluminum slotted framing system and extending to the floor in labs for darkening and to create an eye-safe operating environment for laser systems.

B. Related Section: Aluminum slotted framing system: Section 055117.

1.02 REFERENCES

A. The following standards are cited in this Section. They govern the work of this Section only to the extent specified in each citation.

B. National Fire Protection Association (NFPA): NFPA 701 Standards of Fire Tests for Flame-Resistant Textiles and Fabrics.

C. American National Standards Institute (ANSI): ANSI Z136.1-7.5.

1.03 SUBMITTALS

A. Comply with Section 013000 requirements.

B. Shop Drawings: Show sizes, locations, loads, anchorage requirements, and clearances for each assembly. Show other information necessary to fabricate and install shades and coordinate work of affected trades.

C. Product Data: Details, specifications, and other data necessary to complement shop drawings and describe materials, finishes and construction.

D. Installer Qualification Data:

1. List similar installations with 5-year minimum service histories. Give product makes and models, installation dates, locations, owner/building manager names and addresses.

2. List local service accounts; the location of nearest service office from which proposed equipment would be maintained; and the location of nearest parts inventory for the proposed equipment.

E. Operation and Maintenance Data: Comply with Section 01730 requirements. Describe step-by-step operation and routine maintenance that can be performed by Owner's personnel. Include parts list and location of maintenance service facility.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Curtains shall be standard products of a manufacturer regularly engaged in producing assemblies of the required kind and quality, with a five-

year minimum successful service history.

B. Installer Qualifications: Curtains shall be installed by a manufacturer-approved and/or franchised, locally-based, installation and service agency capable of rendering complete service and providing rapid response to service calls.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 016000 requirements.

1.06 PROJECT CONDITIONS

A. Environmental Conditions:

1. Work of finishing trades shall be completed in and near spaces where curtains are to be installed.

2. Work areas shall be clean. Air shall not be dust-laden prior to, during, or after curtain installation. No dust raising activities shall be carried on in or near areas where curtains are to be installed.

B. Field Measurements: Fabricate work to field dimensions where possible. Where field measurements cannot be made without delaying work, the Contractor shall provide guaranteed dimensions and coordinate work of affected trades/Sections to assure proper execution of adjoining work.

1.07 WARRANTY

A. Warrant assemblies to be free from defect in materials, workmanship, and performance for three years following acceptance. Deliver two copies of written warranties to the Owner. Both copies shall be signed by the installer and the Contractor.

B. This warranty shall be in addition to, not in limitation of, other rights the Owner has under law or Contract Documents.

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

A. Laboratory Darkroom Curtain and Track Assembly:

1. Curtain: Blackout curtain material sewn flat with 10% fullness and with no raw edges visible, and with top grommeted on 8” centers. Bottom edge shall be weighted and overlap floor. Outside vertical edges are supplied with “Velcro” quick seal strips for light-tight attachment to walls. Each curtain section is supplied with light-trap valances made of curtain material, sewn with pleats and mounted to curtain track assembly with light-trap interface.

2. Track Constructed of satin anodized aluminum channel (1-3/8” x ¾”) for mounting to underside of ceiling or to slotted aluminum framing system. Track is slotted on the underside to receive two-wheeled carriers. Track is supplied with

hook carriers, end caps, snap outs, and sleeve-type connectors. Hooks are formed of rustproof wire and ride in a carrier of non-wearing nylon wheels.

3. Provide all necessary hardware, fasteners and accessories for proper mounting.

B. Laser Containment Curtains: Flame retardant, abrasion resistant, laser-rated at 100W/cm^2 for 100 seconds, matte black curtain and track system. Regular Duty RBK Flex-Guard by Kentek Corporation (www.kentek.com), or approved equal, complying with the following:

1. Appropriate for Class IV laser use.

2. Custom sizes and dimensions indicated on the drawings, with hemmed, finished fabric edges and all required grommets, etc., for hanging from black roller rail track.

3. Provide all necessary hardware, fasteners and accessories for proper mounting to suspended aluminum slotted framing system.

C. All curtains shall comply with the fire resistance standards of NFPA 701, and shall be inherently fire resistant without requiring retreatment over time.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Comply with Section 016000 requirements.

B. Verify slotted aluminum framing system dimensions to which curtain track will be mounted. Do not field-fit and fabricate work where it shows in completed installations and/or impairs curtain system operation or service life.

3.02 INSTALLATION

A. Anchor assemblies securely in place, without scratching or otherwise damaging finished surfaces and with all evidence of drilling, cutting, and anchoring concealed by installed assemblies.

B. Use cadmium plated, drill screws to anchor work to metal framing and/or reinforcement.

3.03 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust work so that curtains operate smoothly, without binding.

B. Correct noncomplying and damaged work. Replace work that cannot be satisfactorily field-corrected.

C. Clean assemblies of finger marks and other soil. Protect them from damage and abuse.

END OF SECTION

SECTION 129300 - SITE FURNISHINGS

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. LEED BUILDING GENERAL REQUIREMENTS:
   1. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.
   2. Comply with LEED (Leadership in Energy and Environmental Design) Green Building Rating System BD+C, Version 3, Silver.

1.2 SUMMARY

A. Section Includes:

   1. Benches
   2. Chairs
   3. Tables
   4. Trash receptacles
   5. Recycling receptacles

B. Related Requirements:

   1. Section 017419 Construction and Demolition Waste Management
   2. Section 018113 VOC Limits for Adhesives, Sealants, Paints and Coatings
   3. Section 018119 Construction Indoor Air Quality (IAQ) Management
   4. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts cast in concrete footings.
   5. Section 312000 "Earth Moving" for excavation for installing concrete footings.

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1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Certificates for Credit MR 6: Chain-of-custody certificates indicating that wood components of site furnishings comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

C. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For site furnishings.

1. Wood Preservative Treatment: Include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Bench Replacement Planks: No fewer than two full-size units for each size indicated.

PART 2 - PRODUCTS

2.1 Benches

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following as indicated on drawings:
1. Manufacturer:
Landscape Forms, Inc.,
431 Lawndale Avenue
Kalamazoo, Michigan 49048

2. Type: Palisade
   a. Style: Straight
   b. Length: 96 in
   c. Backed: None
   d. Arms: None
   e. Mounting: on 8ft x10in. x6in. deep concrete slab below permeable pavers with 3/4 in. dia. Stud expansion anchor 10" length.
   f. Wood: Jarrah

B. or approved equal product by one of the following:
   1. Forms+Surfaces
   2. Soheil Mosun International
   3. Streetlife

2.2 Chairs

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following as indicated on drawings:
   1. Manufacturer:
      Landscape Forms, Inc.,
      431 Lawndale Avenue
      Kalamazoo, Michigan 49048
   2. Type: Verona
      a. Style: Armless
      b. Metal Grid: Seat and back panels are constructed of 5/16" diameter perimeter and reinforcing wires space 2-1/2" apart and 1/8" diameter cross wires spaced 3/8"
      c. Stackable: Yes
      d. Mounting: Free Standing

B. or approved equal product by one of the following:
   1. Forms+Surfaces.
   2. Maglin Site Furniture Inc.
   3. Streetlife

2.3 Tables

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following as indicated on drawings:
   1. Manufacturer:
      Landscape Forms, Inc.,
      431 Lawndale Avenue
      Kalamazoo, Michigan 49048
   2. Type: Catena
      a. Table Supports: 3" outer diameter 0.120" wall steel tubing welded to 23" dia. Cast iron base.

1) Mounting: Free Standing
2) Height: 29 inches from grade
3) Color: Silver

b. Table Top: Marneaux
1) Dia: 36 inches
2) Umbrella Hole: No
3) Color: Celery
4) Thickness: Varies from 1-5/16" at the edge and center, tapering to 9/16" minimum across the section.

B. or approved equal product by one of the following:
1. Forms+Surfaces.
2. Maglin Site Furniture Inc.
3. Streetlife

2.4 Trash receptacles

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following as indicated on drawings:
1. Manufacturer:
Landscape Forms, Inc.,
431 Lawndale Avenue
Kalamazoo, Michigan 49048
2. Type: "Chase Park" Litter receptacles
a. Mounting: Surface Mount
b. Style: top-opening, 5-inch diameter
c. Size: 40 gallon
d. Material: Cast aluminum sides and door; spun aluminum top; cast iron base; door hinge and latch stainless steel
e. Liner: Black polyethylene
f. Keyed lock: yes
g. Color: Silver

2.5 Recycling receptacles

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following as indicated on drawings:
1. Manufacturer:
Landscape Forms, Inc.,
431 Lawndale Avenue
Kalamazoo, Michigan 49048
2. Type: "Chase Park" Litter receptacles
a. Mounting: Surface Mount
b. Style: recycling receptacle
c. Size: 40 gallon
d. Material: Cast aluminum sides and door; spun aluminum top; cast iron base; door hinge and latch stainless steel

e. Liner: Black polyethylene
f. Keyed lock: yes
g. Color: Silver

3. MATERIALS

B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:

1. Rolled or Cold-Finished Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
2. Extruded Bars, Rods, Wire, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Structural Pipe and Tube: ASTM B 429/B 429M.
4. Sheet and Plate: ASTM B 209 (ASTM B 209M).
5. Castings: ASTM B 26/B 26M.

C. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53/A 53M, or electric-resistance-welded pipe complying with ASTM A 135/A 135M.
3. Tubing: Cold-formed steel tubing complying with ASTM A 500/A 500M.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500/A 500M; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
6. Perforated Metal: From steel sheet not less than 0.075-inch (1.9-mm) nominal thickness; manufacturer's standard perforation pattern.
7. Expanded Metal: Carbon-steel sheets, deburred after expansion, and complying with ASTM F 1267.
8. Malleable-Iron Castings: ASTM A 47/A 47M, grade as recommended by fabricator for type of use intended.
9. Gray-Iron Castings: ASTM A 48/A 48M, Class 200.

D. Stainless Steel: Free of surface blemishes and complying with the following:

1. Sheet, Strip, Plate, and Flat Bars: ASTM A 666.
2. Pipe: Schedule 40 steel pipe complying with ASTM A 312/A 312M.
3. Tubing: ASTM A 554.

E. Wood: Surfaced smooth on four sides with eased edges; kiln dried, free of knots, solid stock of species indicated.

1. Wood Species: Manufacturer's standard.
   a. Redwood: Construction heart or better.

2. Certified Wood: Fabricate site furnishings with components produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
3. Finish: Manufacturer's standard if applicable.

F. Fiberglass: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.

G. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.

1. Polyethylene: Fabricated from virgin plastic HDPE resin.
2. Recycled Content of Polyethylene: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.

H. Anchors, Fasteners, Fittings, and Hardware: Stainless steel]; commercial quality, tamperproof, vandal and theft resistant. Indicate locations of anchors and brackets on Drawings.

1. Angle Anchors: For inconspicuously bolting legs of site furnishings to grade substrate; as suggested by manufacturer's installation instructions.
2. Anti-theft Hold-Down Brackets: For securing site furnishings to substrate; as suggested by manufacturer's installation instructions.

I. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M; recommended in writing by manufacturer, for exterior applications.

J. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.

K. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:

1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil (0.0076 mm) thick.
2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.6 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment: Pressure-treat wood according to AWPA U1 and the following:

1. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.

2.7 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.

E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

F. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.8 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.10 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

B. PVC Finish: Manufacturer's standard, UV-light stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on, PVC-plastisol finish, with flame retardant added; complying with coating manufacturer's written instructions for pretreatment, application, and minimum dry film thickness.

2.11 IRON FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.12 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run directional finishes with long dimension of each piece.
2. Directional Satin Finish: No 4.
3. Dull Satin Finish: No. 6.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

END OF SECTION 129300

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SECTION 131146 TANK FILTRATION EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: The following tank filtration equipment:

1. Sand filter
2. Pumps
3. Heat Exchanger
4. Chlorine Injector

B. Related Section:

1. Division 22: Plumbing
2. Division 26: Electrical
3. Tank Filtration Equipment: Section 131146

1.02 REFERENCES

A. The following standards are cited in this Section. They govern the work of this Section only to the extent specified in each citation.

B. ASME B31.9 - Building Services Piping

1.03 SUBMITTALS

A. Comply with Section 01-3000 requirements.

B. Shop Drawings: Show sizes, locations, loads, anchorage requirements, and clearances for each element of the filtration assembly. Show other information necessary to fabricate and install tank filtration equipment and coordinate work of affected trades.

C. Product Data: Details, specifications, and other data necessary to complement shop drawings and describe materials, finishes and construction.

D. Installer Qualification Data:

1. List similar installations with 5-year minimum service histories for laboratory research vessels of 10,000 gallons or greater and their filtration equipment. Give volumes, product makes and models, installation dates, locations, owner/building manager names and addresses. Swimming pool experience is not counted and experience must be in laboratory settings.

2. List local service accounts; the location of nearest service office from which proposed equipment would be maintained; and the location of nearest parts inventory for the proposed equipment.

E. Operation and Maintenance Data: Comply with Section 01-730 requirements. Describe step-by-step operation and routine maintenance that can be performed by Owner's personnel. Include parts list and location of maintenance service facility.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Filtration equipment shall be standard products of a manufacturer regularly engaged in producing assemblies of the required kind and quality, with a ten-year minimum successful service history.

B. Installer Qualifications: Filtration equipment shall be installed by a installation and service agency capable of rendering complete service and providing rapid response to service calls in the New England area.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01-6000 requirements.

1.06 PROJECT CONDITIONS

A. Work by others:

1. Tank needs to be fully installed with clear access to all plumbing ports from the basement level.

2. Work areas shall be clean and free of construction debris.

3. A pressurized, clean water source (of not less than 100 gpm) and drain needs to be available for hydrotesting at time of equipment installation.

4. A floor sink that can accommodate a flow rate of 100 gpm.

5. Equipment Pads. Provide housekeeping pads of concrete, minimum 4 inches (100 mm) thick and extending 3 inches (75 mm) beyond supported equipment: sand filters, pumps, and chlorine injector. Filtration contractor to provide locations for pads.

6. Tank Filtration Supplier to provide level sensors for tank alarming, but wiring and connection to BMS (Building Management System) by others.

7. Power supply for filtration equipment and connections to power provided by others.

8. Provide source of heated and chilled water for heat exchanger.

B. Field Measurements: Fabricate work to field dimensions where possible. Where field measurements cannot be made without delaying work, the Contractor shall provide guaranteed dimensions and coordinate work of affected trades/Sections to assure proper execution of adjoining work.

1.07 WARRANTY

A. Warrant assemblies to be free from defect in materials, workmanship, and performance for one year following acceptance. Deliver two copies of written warranties to the Owner. Both copies shall be signed by the installer and the Contractor.

PART 2 - PRODUCTS

2.01 MANUFACTURED UNITS

A. Sand Filter:

1. Approved Manufacturers

   a. Pentair
   b. Hayward
   c. Approved Equal

2. Capable of filtering water at rates of 15 gpm/ft2 (10 lps/m2) and back washing at rates from 15 gpm/ft2 (10 lps/m2) to 20 gpm/ft2 (13.5 lps/m2) of filter media area.

3. Vessel

   a. Constructed of molded colorfast polymeric material or seamless filament wound fiberglass reinforced plastic.
   b. Automatic air-relief valve
   c. Drain port located in bottom of filter.
   d. Inspection cover in top of filter.
   e. Internal distribution piping to direct water evenly across entire sand surface.

B. Pumps:

1. Approved Manufacturers
   a. Pentair
   b. Sta-Rite
   c. Approved Equal

2. Casing: Molded from glass reinforced, corrosion-resistant thermoplastic with Bronze wear ring.
3. Impeller: polycarbonate
4. Mechanical Seal: ceramic
5. Shaft and Shaft Sleeve: stainless steel with neoprene sleeve.
6. Basket Strainer:
   a. Body to be Integral with pump housing.
   b. Transparent acrylic or Plexiglas lid with an ethylene propylene “O” ring.
   c. Quick release to allow strainer basket to be removed quickly and easily.

d. 304 stainless steel or better basket with 3/16 in. (5 mm) rectangular holes and 75% open area. Holes in basket shall not be larger than 50 percent of minimum opening size of the pump it is protecting.

7. Pump and Motor Assembly
   a) Mounted on molded glass reinforced, corrosion resistant thermoplastic supporting both pump and motor ends.
   b) Motor to have class F insulation with temperature rise as specified by NEMA standards for class of insulation used and shall have a 1.15 service factor.

C. Heat Exchanger

1. Approved manufacturers
   a. AquaLogic

2. Heat exchanger to be constructed of titanium. Outer shell to be insulated PVC. Control package to be mounted on standard AquaLogic frame for floor or wall mounting.

D. Chlorine Injector

1. Approved manufacturer
   a. Pentair

PART 3 - EXECUTION

3.01 EXAMINATION

A. Comply with Section 016000 requirements.

3.02 INSTALLATION

A. All plumbing to be SCH 80 PVC.

B. Use only true union or flanged valves.

3.03 HYDROTEST

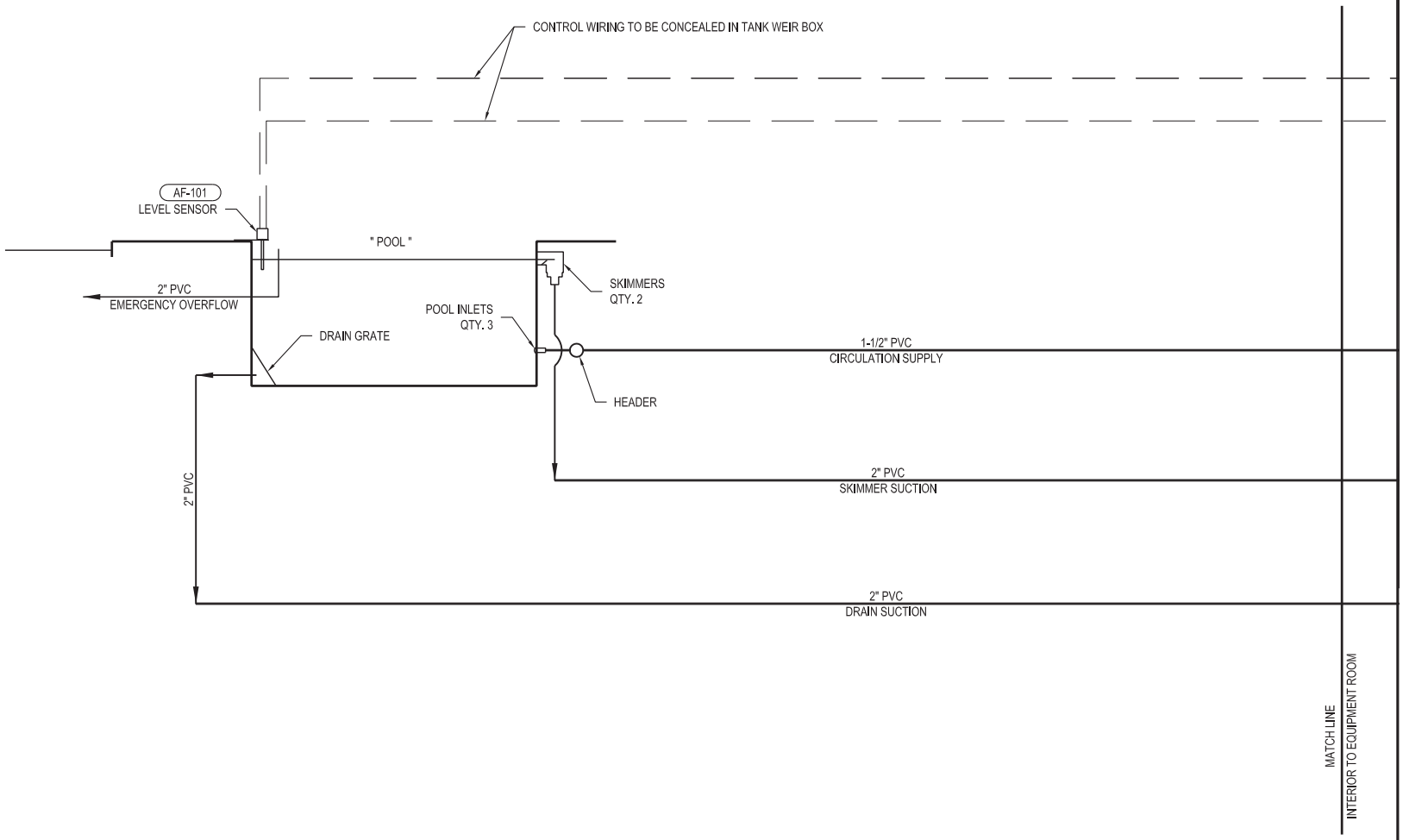
A. Run filtration system for 48 hours (with tank fully filled) to insure that system is fully functioning. Repair any leaks.

B. Test all systems: sand filter (backwash, filter, and drain settings), heat exchanger (test for temperature drop and gain of +/- 5 F from setpoint), and chlorine injection.

C. Drain system.

Diagrams on following pages:

~~END OF SECTION~~



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MECHANICAL EQUIPMENT SCHEDULE

ITEM TAG	DESCRIPTION	SPECIFICATION	kW	HP	RPM	VAC	PHASE	Hz
P-101	CIRCULATION PUMP	PENTAIR WHISPERFLO, WFE-3, 35 GPM @ 65' TDH	0.6	0.75	3450	230	1	60
F-101	CARTRIDGE FILTER	TRITON, TR-50, 2.47 SQ. FT. PER FILTER INCLUDE MULTI-PORT VALVE						
HX-101	HEAT EXCHANGER	AQUALOGIC, TUBE AND SHELL (SIZE AS REQUIRED)						
CL-101	CHLORINE FEEDER	RAINBOW CHLORINATOR, HC-3315 (15 LB CAPACITY)						
OZ-101	OZONE GENERATOR	DEL OZONE, ECLIPSE EC-4, INCLUDE INJECTOR MANIFOLD & MDV	0.04			120	1	60
CF-101	pH FEED PUMP	BLUE WHITE, STAR SYSTEM, C-1500N, 7 GAL.	0.05			120	1	60
CC-101	CHEMICAL CONTROLLER	BECS TECHNOLOGY, BECSYS3, INCLUDE INDUSTRIAL PROBES	1.1			120	1	60
AF-101	AUTOFILL CONTROLLER	FLOWLINE, SMART TRAK AU23 W/ COMPACT LEVEL CONTROLLER				120/240	1	60
FM	FLOW METER	BLUE WHITE, PITOT TUBE OR EQUAL						
CG	COMPOUND GAUGE	WIKA (TYPE PER INSTALLATION), LIQUID FILLED 1 1/2" DIA. 0-30 Hg/0-30 PSI RANGE						
PG	PRESSURE GAUGE	WIKA (TYPE PER INSTALLATION), LIQUID FILLED 1 1/2" DIA.						
TI	THERMOMETER	TRERICE, DIRECT MOUNTED 4 1/2" ADJUSTABLE ANGLE W/ THERMOWELL						
PC-101	POOL CONTROLLER	PENTAIR INTELLITOUCH CONTROL SYSTEM				115/230	1	60

POOL GEOMETRY

AREA	217	SQ. FEET
VOLUME	9,740	GALLONS

TREATMENT INFORMATION

TURNOVER FLOW RATE	35	GPM
TURNOVER TIME	4.6	HOURS
	278	MINUTES

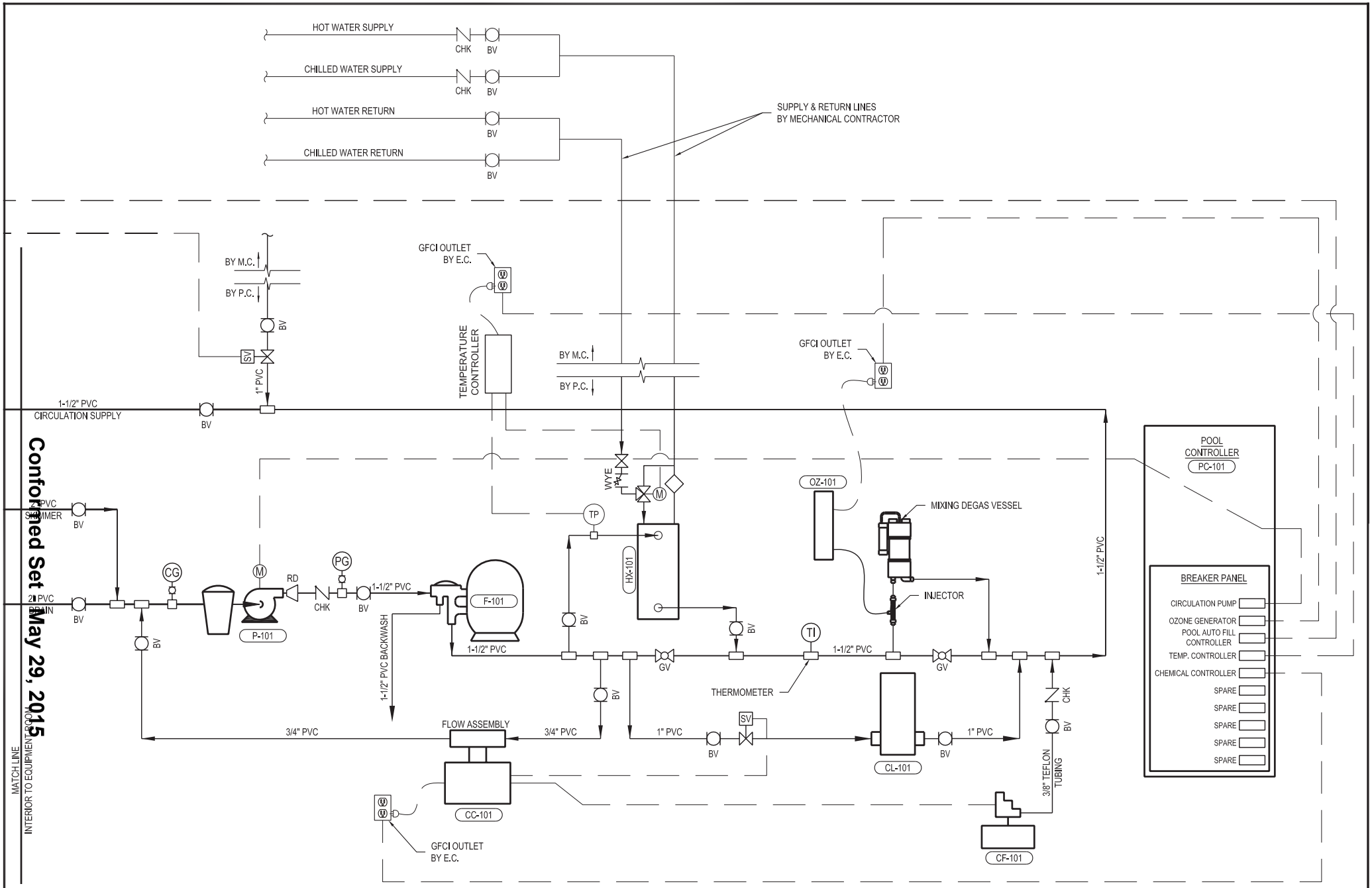
EQUIPMENT TAG LEGEND

EQUIPMENT CALL OUT → EQ-100 ← IDENTIFICATION NUMBER

TANK FILTRATION EQUIPMENT
131146

UCONN RESEARCH POOL
SCHEMATIC DIAGRAM

BID ADDENDUM NO. 03 - APRIL 20, 2015



Conformed Set May 29, 2015

TANK FILTRATION EQUIPMENT
131146

UCONN RESEARCH POOL
SCHEMATIC DIAGRAM
BID ADDENDUM NO. 03 -
APRIL 20, 2015

SECTION 132100 CONTROLLED ENVIRONMENTAL ROOMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Controlled Environmental ~~(Cold)~~ Rooms constructed of pre-molded, modular panels. Each panel shall have dimensions to allow passage through normal doorways. Construction of panels shall allow for easy disassembly for relocation. Room shall be complete with necessary controls, circulation systems, and mechanical and electrical equipment to meet these Specifications.

1.02 SYSTEM DESCRIPTION

A. Control and Performance **For Cold Rooms**:

1. Temperature Range: +4 degrees C.

2. Temperature Control Stability: Plus or minus 1.0 degrees C.

3. Temperature Range: Plus or minus 1.0 degrees C.

4. Humidity Range: None.

5. CFM: NONE

B. Control and Performance For Controlled Environmental Room

1. Temperature Range: +4 degrees C. to +37 Degrees C.

2. Temperature Control Stability: Plus or minus 1.0 degrees C.

3. Temperature Range: Plus or minus 1.0 degrees C.

4. Humidity Range: None.

5. CFM: NONE

1.03 SUBMITTALS

A. Submit under provisions of Section 013000.

B. Product Data: Manufacturer's Product Data indicating compliance with Contract Documents. Include manufacturer's installation instructions.

C. Shop Drawings: Submit Shop Drawings for all components.

1. Include rough-in, clearance and maintenance requirements.

2. Include plans, elevations, and details.

3. Indicate utility requirements and connections.

D. Operation and Maintenance Manual: Submit complete instruction and maintenance manual for each environmental room that includes sequential operating instructions, routine preventative maintenance instructions, and complete schematic drawings of rooms.

E. Warranty: Submit warranty certificate with operation and maintenance manuals for each environmental room.

1.04 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firm that has produced environmental rooms for not less than 10 years, with not less than 50 similar projects that have been in successful use for not less than 5 years.

1. Performance and Payment Bond: Provide products from a manufacturer which has the capability to provide a Performance and Payment Bond for this Project.

B. Installer Qualifications: Minimum 10 years experience in successful installation of systems of type specified.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store in a weather-tight location and protect from corrosive environments, distortion and other damage during delivery storage and handling.

1.06 WARRANTY

A. Provide manufacturer's written one-year warranty for a period of one year against defects. Manufacturer shall agrees to repair or replace items proven to be defective

B. The compressor units are carrying a five (5) year manufacturer’s warranty.

C. The environmental room insulated panels are to carry a fifteen (15) manufacturer’s warranty.

D. Altro Flooring Seven (7) Years

E. LED Lights Minimum of Two (2) Years

1.07 Sustainability Requirements, Standards and Approvals

A. Environmental room shall meet the requirement of 60% (min.) material and components made in the United States and 90% (min.) manufactured in the United States.

B. Standards: The environmental room design and installation shall conform to applicable codes, ordinances and regulations governing the use and safety of refrigerants, including, but not necessarily limited to the following:

1. ASHRAE/ANSI Standard 15-70, ARI 520-78, ANSI B9. 1-1971 and MEMA-70.

2. National Sanitation Foundation Testing Laboratory and Class One Building Type Construction of FM approved standard #4880 for insulated wall construction.

3. Please note controlled environmental room manufacturers that do not have FM approval standard of #4880 will not be acceptable.

4. Approval by Underwriter's Laboratory (UL), labeled and listed, for all components of the environmental room assembly. UL-508A for control panels.

5. Local code approval for panels.

6. Local electrical code approval for doors.

7. Local health, sanitary and safety codes.

8. NSF Approved.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturer: Sterling Environments Inc.; 471 N Broadway #250, Jericho, NY 11753 (800-608-9110), or approved equal by Harris or Environmental Specialties.

B. Requests for substitutions will be considered in accordance with provisions of Section 016000.

2.02 MANUFACTURED UNITS

A. General: Pre-fabricated walk-in rooms, metal clad, sectionals constructed and designed for accurate field assembly with provisions to facilitate disassembly for relocation and to add extra panels to increase size.

B. Panel Construction:

1. Interchangeable panels, UL approved, designed for quick assembly, consisting of interior and exterior metal pans accurately formed with metal dies and checked with gauges for uniformity.

2. Panel Edges: Tongue and groove interfaces to assure a tight joint. Provide flexible vinyl gasket on interior and exterior of each panel along each tongue edge to provide sealing at each joint.

a. Do not use batten strips, pressure clips, or other fastening hardware for covering joints or joining panel sections.

C. Panel Locking Devices: Self-contained, interior cam-lock fasteners locked and released with single hex wrench tool. Distances between locks shall not exceed 46". Cam-Lok joining devices shall be rigidly connected from one joining edge to the other joining edge of the same section by use of double steel straps set into the insulation, forming perimeters of steel for extra strength. Hard Nose/Hard Rail System panels, Wood Rail System Panels are not acceptable.

D. Insulation: 4 inch (102 mm) foamed-in-place urethane insulation, using EPA Montreal Protocol accepted non-toxic, non-flammable fluorocarbon blowing agents, adhered to interior and exterior faces of panels. The resulting cured foam shall be an odorless closed cell product and shall not emit or outgas the fluorocarbon blowing agent.

1. Thermal Conductivity Factor K: No more than 0.12 BTU per hour per square foot between wall faces.

2. Rated U-Factor: 0.03.

3. R-Value: Not less than 30.

4. Flame Spread Rating: 25.

E. Closure Panels: Provide closure panels, matching materials, colors, and finishes of adjacent panel material, to on exterior sides and above cold rooms. All closure pieces to be measured in the field after initial installation of cold rooms

F. Doors:

1. General: In-fitting, flush mounted, constructed similar to wall panels.

a. Door Swing: As required for installation convenience.

b. Door Opening: 36” x 77”.

G. Gasket: Vinyl type with magnetic steel core. Provide gaskets on both sides and top of door. Provide adjustable rubber wiper gasket on bottom of door. Provide gasket with enough magnetic force to form positive airtight seal.

H. Hardware: Heavy-duty door hardware with high luster finish. Incorporate keyed lock cylinders and padlock latches into door latch and handle assemblies.

1. Hinges: Self-closing type with durable stainless steel pins and self-closing nylon cams. Provide three hinges.

2. Door Handle and Latch Assembly: Automatic closing type. Provide safety release mechanism on inside of room preventing personnel from being locked from outside.

I. Window: A glass unit consisting of at least 2 pane non-heated glass, manufactured by Anthony Manufacturing or Norfab with the following minimum viewing area

1. Window Size: 14 inches by 24 inches.

J. Floors: Provide insulated floors with similar construction as wall and ceiling panels. Design floors for 600 pounds per square foot distributed load weight.

1. Interior Floor Surface: 14 gauge galvanized floor panel.

2. Floor Thickness: 2 inches (102 mm).

K. All interior corners to have a radius of ½" - 5/8".

L. Recessed structural backing plates will required to support wall mounted shelving and wall mounted countertops. Review drawing for locations of recessed structural backing. No wood backing will be accepted.

2.03 ROOM SURFACE FINISH:

A. Standard Finishes: Where scheduled, provide panel sections with the following surface finishes:

1. Interior Walls and Ceilings: 26 gauge galvanized steel faced with hard, durable, factory-applied painted finish. The entire interior of the room, walls and ceiling to be factory coated with a smooth white finish.

2. Exterior Walls (exposed surfaces only): 26 gauge galvanized steel faced with hard, durable factory applied painted finish smooth white.

3. Unexposed surfaces: 26 Gauge plain unpainted stucco galvanized (unpainted).

2.04 LIGHTING

A. Lighting Systems: 4' foot long white LED Light fixture: 4' Long Vapor Proof Lights. All lamps and ballast are to be enclosed in vapor proof fixtures. All LED Lights must carry the Energy Star Label.

1. Provide UL-approved fixtures.

2. Mount light fixtures surface mounted to ceiling and provide in sufficient quantity for minimum intensities of 70 foot-candles measured 36 inches above floor.

3. Install lights to provide uniform distribution of light.

B. Low Temperature Electronic Ballasts: Provide low temperature for cold rooms operating below 20 degrees C.

2.05 CONTROL PANEL

A. Provide a Control Panel designed for laboratory environmental rooms. All components inside the control panel shall be UL Approved **and built in a UL508A Approved Facility**.

B. Control panel to be self contained, capable of being remotely mounted should jobsite dictate; **control panel shall have an adjustable User Friendly color digital touch screen adjustable temperature controller to display running and setpoint temperature, including high/low, high/high, low/low alarm set points, and shall include a locally via piazzo electric buzzer for sound indication of alarm. The color digital touch screen shall also have the capability to digitally chart temperature. Controlled Environmental Room contractor to supply software for users to download and print temperature charts when desired**.

C. Outside Finish of control panel cabinet shall be white. The Control panel shall also include a 100-OHM Platinum RTD (Temperature Sensor).

D. **Control Panel shall power evaporator, outlets, lights, door, light switch, controls, alarm, solenoid valves, SCR to modulate for heat, buzzer, etc..**

E. Recessed Moisture Proof Outlets are to be powered by separate circuits with a maximum of 3 outlets per circuit. Control Panel Power shall be 208 Volt/1 Phase/60 Hertz With Neutral.

1. Control Panel shall incorporate lights to display the following:

a. Refrigeration on/off

b. Defrost On/Off

c. High Temperature Alarm and High/High Temperature Alarm

d. Low Temperature Alarm and Low/Low Temperature Alarm

e. Heat On/Off for Room 316EA

F. High/High Temperature Alarm to shut off all heat generating devices inside the controlled environmental room, ie, outlets, door heater, window heater, dehumidifier, etc. Low/Low Temperature Alarm to shut off all cooling devices inside the controlled environmental room ie, evaporator.

G. Alarm to be installed for each compartment and to work in the following manner: When refrigeration failure causes temperature to approach the undesirable range, red indicator Bar/light goes on in the controller and a horn alarms sounds instantaneously.

H. Provide a spare set of contacts for remote monitoring.

I. Label all control functions with descriptive nameplates or lenses on control panel face.

J. All Control panels must have a complete schematic of entire control system mounted on inside face of panel.

2.07 CEILING

A. Environmental room requires the following construction criteria to accommodate the control requirements:

1.. Ceiling Materials: Provide an “egg crate” type white plastic panel ½” thick that has ½” x ½” holes covering 90% of the surface area of the panels.

2.08 PRE-ASSEMBLED REFRIGERATION SYSTEM:

A. Pre-Assembled refrigeration systems consist of two major assemblies. One is the condensing unit assembly with all necessary components. Factory installed and wired, including electrical box, time clock, drier sight glass and necessary tubing. The second component is the refrigeration coil assembly with expansion valve, temperature control and heat exchanger completely factory mounted.

B. CONDENSING UNIT: Shall be provided complete with motor, water cooled and top of Cold Room.

1. Receiver, compressor and all other necessary components mounted in a flexible manner on a common base.

2. Compressor shall be Hermetic or Scroll type. The unit shall be designed for 16 to 18 hours of operation at the specified evaporating temperature in a 95°-degree Fahrenheit ambient temperature. **Systems shall run utilizing Solenoid On/Off Control. Controlled Environmental Rooms shall also incorporate CPR valves.**

3. Where motor starters are required, they shall be furnished for installation on an electrical control board.

4. Units to be remote type. All units to have liquid line assemblies consisting of shut-off valve, moisture indicating sight glass and drier mounted and piped by **controlled environmental** room contractor.

5. Pre-Assembled system controls are supplied pre-wired. Fractional through two (2) horsepower systems are connected directly to the compressor contactor. On medium temperature systems, a solenoid valve is supplied so wiring between evaporator and condensing unit is not necessary. On low temperature systems control wiring is required between evaporator and condensing unit to allow for proper operation especially during the defrost cycle.

6. Water Cooled: The unit shall be equipped with an adjustable head pressure, two-way manual water regulating valve. Controlled Environment Room manufacturer shall provide the two way manual water regulating valve only. HVAC contractor shall install the manual two way water regulating valve along with strainers to provide easy clean out.

7. All condensing units shall operate on process chilled water service at 50°F.to 60°F. (10°C. to 15°C.)

8. The condensing unit shall be designed to operate with R-404A Refrigerant for all units

9. When sizing the condensing units, the manufacturer shall calculate and compensate for all internal heat loads including the following:

   a. Occupancy (2 people 6 hours a day)

   b. Lighting

   c. All door and door frame heaters, window heaters, vapor proof lights and switches.

   d. The Evaporator

10. Electrical requirements for Condensing Units: 208Volt/ 3 Phase/ 60 Hertz.

C. Evaporator/Blower: Shall be forced-convection, unit cooler type, made to be suspended from the ceiling sections. They shall be complete with forced air circulation, arranged so that cooled air is discharged parallel to the ceiling. Air circulating motor, multi-fin and tube type coil and grill (when required for safety) shall all be assembled within a protective housing.

D. The expansion valve, with strainer, heat exchanger, inlet and outlet connections shall also be contained within this housing. Air circulation motors must be lifetime sealed and the entire unit cooler assembly must be readily accessible to cleaning. A drip pan and drain connection shall be provided. Unit coolers shall be equipped with mounting brackets for installation and all controls necessary for safe and satisfactory operation.

E. All Air Defrost Evaporators for Environmental Rooms from +4°C. and up will be at 115Volt/ 1 Phase/ 60 Hertz **and electric defrost evaporators for Environmental Rooms from +4°C. to +37°C. and will be at 208 Volt/1 Phase/60 Hertz**.

F. Vibration isolation: Compressors to be supplied with vibration eliminators.

G. Refrigeration Controls: The temperature of each Environmental Room shall be controlled by means of a thermostat wired to actuate a solenoid valve in the liquid line, with the compressor operation controlled by the low pressure cutout switch. Thermostats and low pressure controls shall be adjusted to maintain the room temperature specified herein**.**

H. Piping:

1. Refrigerant drain piping shall be Type L, Hard-Drawn Seamless copper tubing, with Stay Brite solder by J.W. Harris or braised joints except connection of Expansion Valves. Expansion Valves shall only be connected to evaporator tubing by Stay Brite solder.

2. All refrigerant suction lines outside of Environmental Room shall be insulated with 3/4" Armstrong Armaflex Insulation, applied in accordance with the manufacturer's recommendations.

3. All condensate drain lines outside Environmental Rooms shall be similarly insulated with 1/2" insulation.

4. Each refrigeration system shall include a dehydrator, liquid line sight glass, shut-off valve, liquid line solenoid, thermostatic expansion valve at each evaporator, vibration insulator, and other fittings and accessories as required.

5. Refrigerant lines shall extend vertically from condensing units to above the hung ceiling, then horizontally to the above evaporators, then piped in accordance with manufacturer's instructions and good practice as set forth in ASHRAE Guide and Data Book. All work shall be done in a workmanlike manner.

I. Test**:** Each system shall be cleaned and dehydrated by maintaining a vacuum of 500 Microns, or lower, for a minimum period of five (5) hours. The vacuum pump used shall itself be capable of developing a vacuum of 50 microns with its valve in a closed position. The required operating charge of refrigerant and oil shall then be added and each system shall be tested for performance.

2.09 RECESSED MOISTURE PROOF ELECTRICAL OUTLETS

A. Controlled Environmental Room manufacturer shall provide Recessed Foamed In Place Conduit and GFI 115/1/60, 15 Amp Duplex Outlets with Moisture Proof Covers. Review drawings for exact location and quantity of Recessed Moisture Proof GFI Outlets.

B. Recessed Tele/Dated Outlets: Controlled Environmental Room manufacturer shall provide Recessed Foamed In Place Conduit and empty Boxes for future tele/data outlets. If none shown on drawings, please include one recessed tele/data box per room with blank out cover for future use. All wiring and actual Tele/Data outlet will be installed by others.

2.10 SOURCE QUALITY CONTROL

A. Manufacturer shall perform factory test and inspection on major components to assure basic quality, conformance of design, and functional operation.

B. Each control console shall be bench tested using simulator panel to test logic functions, control systems function, and alarm operations.

C. Each condensing unit and air unit shall be pressure tested for leaks and checked for design conformance.

D. Notify Owner of testing time a minimum of 72 hours in advance.

2.11 SEAMLESS VINYL SHEET FLOORING OVERLAY

A. Floor shall be covered with Altro Walkway 20 Safety Flooring. Crevice free non-absorbent with all seams welded and coved up sides of environmental room 4" and capped with vinyl coving (color to be selected by Owner/Architect).

B. All Seamless vinyl flooring must meet the heat resistance specifications of air temperatures between 140 F. and -5 F.

C. Seamless Vinyl Flooring must have a bacteriostat incorporated in the flooring to give the exposed surface excellent anti-bacterial activity.

D. Seamless Vinyl Flooring must be unaffected by surface water and many chemicals.

E. The flooring also must meet the current slip resistance Static Coefficient of Friction Guidelines of the Americans with Disabilities Act and the Occupational Safety and Health Administration.

F. Color to be selected during submittal process. Please provide color chart for review

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor shall field measure walls and submit size to manufacturer within (2”) two inches plus or minus.

B. Verify construction of substrates, building walls, and floors are in place and ready to receive Work of this Section.

C. Start of installation indicates installer's acceptance of substrate and conditions.

3.02 PREPARATION BY OTHER TRADES

A. Verify the following is in place prior to installation:

1. Area is completely ready for proper and efficient installation of environmental rooms, floor is flat and level, area is clear of partitions, piping, obstructions, and loose articles preventing erection and assembly of environmental rooms and support equipment.

2. Electrical service to area of work including power, transformers, fuses, disconnects are installed and within 5’ of condensing units and control panels

3. Floor drains, condensate removal pump system, or both are installed to remove room drainage.

4. Water supply and return line, if required, are installed and final connections made. Installation of manual two way water regulating valves and strainers. If sink is located inside cold room, all water lines hot and cold. Hot and cold water lines inside the cold room must be insulated.

5. Other special utilities and service connections are in place.

6. Building wall, roof, or floor penetrations are completed. Existing Building Floor must be level and smooth.

7. Sprinkler heads (must be dry pendant heads inside cold rooms), Sealing of Sprinkler heads of exterior and interior ceiling panel, Fire alarm system devices and wiring.

8. BMS/BAS monitoring and control, this includes wiring.

3.03 INSTALLATION

A. Install environment rooms per manufacturer's recommendations and final approved Shop Drawings.

1. Install components straight, plumb, level and true. Install service lines at right angles to walls and floors, except where required to pitch to drains.

2. Seal or otherwise insure that fastenings to rooms do not compromise vapor barriers or insulation. Seal between piping and sleeves.

3. Do not install damaged units. Replace components damaged during shipping, handling, or installation with new identical factory-supplied components.

B. Pressurize and leak test entire system at not less than 100 psig. Clean and dehydrate by maintaining a vacuum of 50 microns, or lower, for a 5 hour period. Add required charge or refrigerant, and oil if necessary, and test entire system for performance. Mark each system clearly as to refrigerant type used and amount of charge.

C. Install filler panels to enclose spaces between top of walk-in room and finished ceiling and sides of unit and construction of surrounding area.

D. Install shelving per manufacturer's instructions, with adjustable shelf heights as indicated on Drawings.

3.04 FIELD QUALITY CONTROL

A. Measure temperature accuracy and uniformity inside completed room using 6 probes. Place probes throughout internal workspace at strategic locations no closer than 12 inches (305 mm) from surfaces.

1. Calibrate probes in 0.1 degree C water bath using NIST traceable thermometer. Record test data on Yokogawa or Fluke Digital Data Acquisition Recorder system and turn over graphical and tabular test reports to operating personnel. Test data shall be in Excel spreadsheet format.

B. Owner's representatives shall be given option of witnessing and confirming test results. Notify Owner's representative in writing, 72 hours prior to test.

3.05 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to completion of performance tests, provide manufacturer's representative to conduct demonstration for designated Owner's personnel with respect to room's controls and related systems. Manufacturer's representative will inform Owner's personnel of proper room operation and maintenance. Notify Owner at least 72 hours in advance to permit Owner's authorized representative to schedule such an instruction period.

3.06 CLEANING AND PROTECTION

A. Repair or remove and replace defective Work, equipment, and accessories as directed upon completion of installation. Remove and refinish damaged or soiled areas.

B. Clean exposed and semi-exposed surfaces, touch-up finish as required. Remove cartons and debris from the Work site and legally dispose of the same. Leave Work area in a clean condition.

C. Protection: Adequately protect the Work from damage until final acceptance by the Owner.

Schedule of Rooms

Cold Rooms

Exterior Dimensions:	10’ 0” X 10’ 0” (or as indicated on plans) X 9’ 4 ½” High
Interior Dimensions:	9’ 4” X 9’ 4” (or as indicated on plans) X 8’ 10 ½” High, Clear User Height 7’ 10”
Condensing Unit:	1.5 H.P. 208/3/60 25 amp Power Requirement 7 GPM
Evaporator:	Air Defrost 115/1/60 Powered thru control panel
Outlets:	115/1/60 15 AMP POWER REQUIREMENT, REVIEW DRAWINGS FOR Locations
Control Panel:	208 Volt/1 Phase/60 Hertz with Neutral 40 Amp Power Requirement

Controlled Environmental Room

Exterior Dimensions:	**10’ 0” X 10’ 0” (or as indicated on plans) X 9’ 4 ½” High**
Interior Dimensions:	**9’ 4” X 9’ 4” (or as indicated on plans) X 8’ 10 ½” High, Clear User Height 7’ 10”**
Condensing Unit:	**1.5 H.P. 208/3/60 25 amp Power Requirement 7 GPM**
Evaporator:	**Electric Defrost 208/1/60 Powered thru control panel**
Outlets:	**115/1/60 15 AMP POWER REQUIREMENT, REVIEW DRAWINGS FOR Locations**
Control Panel:	**208 Volt/1 Phase/60 Hertz with Neutral 60 Amp Power Requirement**

END OF SECTION 132100

SECTION 133413 FIBERGLASS TANK CONSTRUCTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   a. Engineering design and fabrication of Fiber Reinforced Plastic (FRP) components.
   b. Engineering design of acrylic windows.
   c. Installation of the acrylic windows, including sealants and glazing materials.
   d. Onsite assembly and installation of the tank

B. Related Sections: Tank Filtration Equipment: Section 131146.
Ornamental Metals: Section 057000

1.02 REFERENCES

A. The following standards are cited in this Section. They govern the work of this Section only to the extent specified in each citation.
B. American Society of Mechanical Engineers, ASME-RTP-1-95 standard.
C. ASTM 4097-95a standard.
D. American Society of Civil Engineers, Structural Plastics Design Manual, 1984.
E. American Bureau of Shipping, Guide for Classing and Building High Speed Craft, 1990.
F. ASME/ANSI PVHO-1-2007

1.03 SUBMITTALS

A. Shop Drawings:
   a. Plan, elevation, isometric, and section views
   b. Acrylic panel details including thickness and the location of any chemical bonds.
   c. Tank details including all penetrations and fittings, flanges, skimmers, and gelcoat color and other details necessary to fabricate the tank **and coordinate with other tank elements provided by other divisions**.
   d. Drawings to be signed and sealed by a licensed structural engineer.

B. Product Data: Details and specifications necessary to complement shop drawings and describe materials and construction.

C. Maintenance Data: Describe cleaning and routine maintenance that can be performed by Owner's personnel.

D. Samples: 6” x 6” sample of tank wall construction indicating proposed color and texture.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Fabricator must have a minimum of 10 years documented experience in the fabrication of FRP tanks with acrylic viewing windows.

E. Assembly Team Qualifications: Fabricator must have a minimum of 5 years documented experience in the onsite assembly of multi-piece tanks of a similar size.

F. Sole Source Responsibility – Only one source for full responsibility in fulfilling all requirements from fabrication through onsite assembly shall be allowed for this section of the Work.

G. Manufacturers:

a. Waterdog Products, Inc., El Cajon, CA. Phone (619) 441-9688
b. Tenji, Inc., Pacific Grove, CA. Phone (831) 401-9551
c. Cal Aquaria, Ontario, CA. Phone (909) 930-2791

1.05 DELIVERY, STORAGE, AND HANDLING

A. Prior to shipment and onsite assembly, storage and handling of the FRP tank pieces at the Manufacturer's shop shall be accomplished in such a manner as to assure that all the components are in a new and undamaged condition.

B. Each tank will be tagged with the manufacturer's drawing and tank number for ease of identification.

1.06 WORK BY OTHERS

A. The connection with all tank filtration system plumbing will be by the designated Filtration Contractor, but all tank penetrations will be integral to the fabricated FRP tank and provided as such.

B. All adjacent wall, floor, and ceiling construction and related adjacent surfaces and equipment.

1.07 WARRANTY

A. Fiberglass tanks and their related acrylic viewing panels shall be warrantied for a period of two (2) years from the time of onsite delivery to be free of defects of either material or workmanship, and shall be appropriately constructed and engineered for the intended use. The glazing system shall be warrantied for a period of one (1) year from the completion of the onsite assembly of the tank.

1.08 QUALITY CONTROL

A. Allowable Tolerances:
a. Linear dimensions prior to water fill not to exceed +/- 0.25 inches
b. Operating deflection of not more than L/200 with a skin stress of less than 1500 psi.

B. Quality craftsmanship – All fabrication shall conform to this section as to materials, drawings, and dimensions. All gelcoat surfaces shall be solid, smooth, and uniformly colored. All hand lay-up work shall be smooth to the touch, with all glass fibers completely embedded in resin.

1.09 COORDINATION

A. The fabrication and onsite assembly of the tank shall be accomplished in such a manner as to coordinate with other elements and trades such as floors, walls, and plumbing.

PART 2 - PRODUCTS

2.01 FIBERGLASS TANK WITH ACRYLIC WINDOWS

A. FRP Fabrications:
   a. Tanks are to be open molded on male molds
   b. Tank surfaces to be of a high quality isothalic NPG polyester gelcoat with a minimum thickness of 20-30 mil. **Tank interior color to match Benjamin Moore 2129-70 "Silver Cloud". Tank exterior to be black. Color "bleed" from interior to exterior is unacceptable.**
   c. Vertical tank wall to be of a sandwich-type, composite construction with an end grain balsa core with a minimum density of 7.5 lbs/cu. ft.
   d. Laminations to be hand applied and of a sufficient number of layers of chopped strand mat and woven roving impregnated with a resin-rich layer of isothalic corrosion resistant polyester resin to reach the engineered wall thickness with the minimum thickness of each side to be no less than 0.125 inches.
   e. Both laminations and core material are to be of an appropriate thickness to the tank size and operating water level.
   f. No raw fiberglass to be present on any surface.
   g. All window rebates/sills/jambs to be molded into the tank and be designed so that the mounted viewing panels are flush with the interior of the tank.
   h. All fittings are to be FRP type and flush with the interior of the tank.
   i. All cut and trimmed edges will be edge coated and sealed with isothalic polyester resin.
   j. Provide embedded blocking and angles in FRP construction as indicated on the drawings for attachment of ladder and rail.

B. Tank Acrylic
   a. Tank acrylic shall conform to the requirement set forth below and in general the acrylic and its installation of the acrylic into the window rebate of the FRP tank are considered part of this scope.
   b. Acrylic panel material shall be commercial grade polymethyl methacrylate.
   c. Acrylic material shall have a flame spread of 20 or less (Class III) in accordance with ASTM E-84.
   d. Thickness of the acrylic windows shall be engineered to provide a minimum safety factor of 11.2 and shall be based on the minimum allowable physical properties per the latest revision of ASME PVHO-1 standards for monolithic castings.
   e. Each acrylic window must be free of inclusions which either significantly decrease its structural performance or mar its optical appearance.
      i. An inclusion is any non-acrylic material including bubbles within the acrylic panel.
      ii. Only inclusions that would be in the viewing area of the finished window whose diameter or length exceeds the significant dimension of 0.125 inches shall be considered. Inclusions in excess of 0.250 inches in two dimensions or that exceed 0.5 inches in overall length, i.e. a hair, are unacceptable.

iii. Inclusions acceptable to the criteria in paragraph 2.01 (B)(e)(ii) are limited to one per 2 sq. yds.

f. The material must be colorless, clear, with minimal haze (greater than 92% total transmission with a 2” cubed sample per ASTM D-1003).

g. The dry side surface of the panel shall be polished, smooth, without obvious surface irregularities in the form of waviness, ridges, distortions, pits, dimples, and scratches when viewed from 24-36” away.

h. If any panel will require chemical bonds, manufacturer shall show joints on shop drawings and obtain approval from Contractor prior to fabrication.

i. Chemical bonds shall be of Museum Grade with a visual quality that meets or exceeds the minimum requirements in ASTM D-4802. Additionally, chemical bonds shall be:

   i. Wet sanded inside and out yielding a high quality, polished bond joint

   ii. Annealed to remove stress and increase bond strength.

PART 3 - EXECUTION

3.01 ONSITE INSTALLATION

A. Tank will be constructed in the manufacturer’s shop in ~~the largest pieces practical for ease of installation and cost effective freight~~ **sections of the size indicated on the drawings.**

~~B. Offload and rigging and placement of the tank pieces shall be under the scope of Building Contractor. The manufacturer will provide an onsite supervisor for this activity.~~

C. All onsite laminations and gelcoat application to meet the requirements of section 2.01 (A).

END OF SECTION

SECTION 142100 - TRACTION ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. These specifications are intended to cover the complete installation of two (2) Machine-Room-Less (MRL) Traction Elevators.

B. Items specified are for all elevators unless specifically identified otherwise. Refer to all contract documents for additional details and requirements.

1.2 LEED BUILDING – GENERAL REQUIREMENTS

A. Implement practices and procedures to meet the project's environmental goals, which include achieving a LEED™ 2009 New Construction Silver rating. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section and other Sections of the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes substantially compromise the stated LEED Building criteria.

1.3 RELATED WORK

A. A mainline fused disconnect switch or circuit breaker shall be provided for the elevator in the control room and a disconnect switch in the overhead.

B. The mainline disconnect switch shall be located approximately 18 inches (18") from the strike side of the control room door and 52 inches (52") above the floor.

C. A car light disconnecting means shall be provided for the elevator in the control room adjacent to the main line disconnect switch. Three (3) 20 AMP circuits for the elevator are required.

D. Control room lighting with the light switch located directly adjacent to the strike jamb and two (2) 20 AMP G.F.I. outlets in the control room.

E. A phone line circuit in the control room for emergency communications (24 hour emergency communications to an accessible location must be provided.). Phone line to be run in E.M.T. and terminated in a junction box adjacent to the elevator controller. Provide one (1) phone line per elevator.

F. Adequate ventilation of the control room to maintain temperature between 55°F. and 90°F. and not to exceed 85% relative humidity.

G. A weather resistant type lighting fixture and G.F.I. outlet in the elevator pit and overhead. (The bulb must be protected by a grounded metal guard or lexan cover.) The switch shall be located adjacent to the strike side of the pit access door and as shown on the layout drawings for the overhead location. Final locations of light, outlet and switch to be field coordinated in accordance with the elevator layout drawings.

H. Smoke detectors in the control room and hoistway (in accordance with building code requirements) including wiring and activation signals brought to the elevator control room terminating in a junction box located adjacent to the elevator controller. Confirmation of fire return floor.

I. Hoistway smoke exhaust provisions in accordance with local codes. Smoke "vent" shall be located directly under the hoistway roof and shall be open directly to the outside air or through non-combustible ducts to the outside. Provide a minimum of three (3) square foot open area ventilation (a minimum of one-third of which shall be permanently open.)

J. Enclosed and protected control room. Minimum control room height shall be 8' - 0".

K. Access to control room to be a minimum of 3' – 0” wide by 6' – 8” high and should be self-closing and locking. The lock should be non-canceling and operate from within the room without the use of a key.

L. Clear hoistway plumb from top to bottom with variations not to exceed one inch (1”) at any point in the first 100 feet. Tolerance may increase at 1/32 inch for each additional ten (10) feet up to a maximum displacement of two inches (2”).

M. Beveled guards are required for projections, recesses and setbacks in the hoistway that project more than two inches (2”) inside the general line of the hoistway on sides not used for loading or unloading.

N. Hoistway protection in case of fire. (Two (2) hour rated enclosure or as required by local building codes.)

O. Supports for guide rail fastenings at each floor and/or intermediate supports.

P. Supports for machinery and sheave beams.

Q. Recesses, fireproofing and patching, as required, to accommodate hall button boxes, signal fixtures, hoistway entrance frames, etc.

R. Vertical, noncombustible pit ladder for the elevator extending 48 inches (48”) above the sill of the access door.

S. Pit shall include sump pit, grating and pump or drains. Drains connected directly to sewers shall not be installed. Provide covers over sump pits or drains.

T. Pit reinforced to sustain vertical forces from guide rails and buffers.

U. Furnishing, installing and maintaining the required fire rating of elevator hoistway walls, including the penetration of fire wall by elevator fixture boxes.

V. The interface of the elevator wall with the hoistway entrance assembly shall be in strict compliance with the elevator supplier's/contractors supplier's requirements.

W. Support for sills the full width of hoistway.

X. Refer to the drawings for other work associated with and/or related to the elevator installation.

Y. Provide contacts from the emergency power (2 required). The first shall indicate that emergency power is provided. The second shall be a pre-transfer contact to identify the switch back to normal power.

Z. Provide expanded metal partition between pits.

1.4 QUALITY ASSURANCE

A. Approved equipment and component manufacturers:

1. Kone Elevator Company
2. Otis Elevator Company
3. Thyssen Krupp Elevator Company
4. Approved Equal

1.5 STANDARDS

Except as modified by governing Codes and by this Division, the work shall comply with provisions of the latest editions of the following, and in the event of conflict between these standards, the Architect's/Consultant's determination shall be final:

A. ASME A17.1 Safety Code for Elevators and Escalators, latest adopted version and supplements.

B. Uniform Federal Accessibility Standards (UFAS).

C. Title III of the Americans with Disabilities Act (ADAAG)

D. International Building Code (IBC) Adopted Version

E. ANSI A117.1: American National Standards for Buildings and Facilities Providing Accessibility and Usability for Physically Handicapped People.

1.6 SUBMISSION, SAMPLES, CUTS AND DRAWINGS

A. The Shop Drawings shall show material type and gauge, general dimensions, methods of attachment, location and size of reinforcements and openings, and a general arrangement of components. Approval thereof shall not relieve the Contractor of compliance with the specification, unless the attention of the Architect/Construction Manager is called to the non-complying features in writing.

The Drawings submitted shall be as follows:

1. Elevator section showing overhead, pit and floor to floor dimensions. The drawing shall be scaled and shall show all structure and divider beam locations and details. Details shall include the height of the cab, door operator and crosshead, including details of rope shackle.
2. Hoistway plan shall clearly show all typical dimensions to scale. In addition, plan shall identify all structural beam and divider beam locations and sizes; widths and depth of beams as they relate to the clear hoistway and hoistway walls; column pads in the pit and all column intrusions into the shaft. Provide large scale drawings and details of sill support condition and column encroachments.
3. Provide machine room plan showing all typical dimensions and equipment layout. Show clearly all electrical disconnects or switchgear in the code compliant location and to scale. Provide location and size of the machine support including the attachment of the machine beams to the building structure.
4. Provide large scale drawings for the car enclosure showing cab plan, reflective ceiling, wall elevations, front returns and car station integration. Detail section through wall panel from canopy to platform. Detail section through suspended ceiling including attachment to canopy. Detail typical joints, reveals and panel edging, panel attachments, handrail fastening and pad button attachment to shell. Include all gauges of steel components. Provide thickness and type of materials used for wall panels and ceiling along with lamination details.
5. Entrance details with the same specifics and quality of information provided for the cab details.
6. Provide fixture drawings job specific in large scale. Identify all engraving including font, depth of engravings and infill color material. (No applied or recessed plates shall be acceptable except for Braille plates.) Provide gauges of all material used for car stations. Provide faceplate fastener and hinging method and type.
7. Provide cut section through emergency light, position indicator, intercom/telephone, buttons, Braille plates and service cabinet, if requested.
8. Fixture, cab and entrances shall each be provided from a single source manufacturer/supplier for all elevators. Drawings shall be submitted for all elevators at the same time.
9. Car frame and car platform construction details and layout complete. (If requested)
10. Machine isolation foundation fastening details and hydraulic oil line isolation fastening details (as applicable). Include manufacturer's data of all isolation equipment used.

11. Provide any and all sketches, clarifications and drawing modifications requested by the Architect. All ancillary sketches requested shall be scaled and adequately detailed for review.

B. Sample submissions (as requested by the Architect) may include:

1. Cab or fixture material and finishes.
2. Braille plates and jamb designation.
3. Push-buttons, position indicators, emergency lighting fixture

C. Sixty (60) days prior to the completion of the work of the contract, the Contractor shall submit to the Construction Manager six (6) copies of an Operation Maintenance and Parts Manual and six (6) complete sets of as-built. These shall be reviewed, and if approved, shall become the property of the Owner.

1.7 MAINTENANCE

A. Furnish full protective maintenance on the equipment described herein for a period of one (1) year from the date of final acceptance of the entire installation. The maintenance shall include systematic monthly examinations, adjustments and lubrication of all equipment. Also repair or replace any parts of equipment whenever this is required during the maintenance period and shall use only genuine standard parts produced by the manufacturer of the equipment installed.

B. All work under the maintenance provisions shall be performed by competent personnel under the supervision and in the direct employ of the Contractor and 24-hour emergency call back service shall be available at all times and be included in the cost of the contract.

C. Provide full protection interim maintenance on all units from the notice to proceed for the duration of the overall project. Upon completion and acceptance of the installation of all units, the included one (1) year full protection shall commence.

D. Full protective maintenance requirements:

1. Regularly and systematically examine, adjust, lubricate, clean and when conditions warrant repair or replace the following items and all other mechanical or electrical equipment.
2. Machine, drive and deflector sheave, sheave shaft bearings, brake pulley, brake coil, brake contact, shoes and linings, and component parts.
3. Motor, motor drives, motor windings, rotating element, commutator, field coil, brushes, brush holders and bearings, rotors, stators, slip rings.
4. Governor, governors sheave and shaft assembly, bearings, contacts and governor jaws.
5. Deflector or secondary sheave, bearings, car and counterweight buffers, car and counterweight guide rails, top and bottom limit switches, governor tension sheave assembly, compensating assembly, counterweight and counterweight guide shoes, including rollers or gibs.

6. Controller, Selector and Dispatching Equipment: all components including all relays, solid state components, resistors, condensers, transformers, contacts, leads, dashpots, computer devices, selector switches, mechanical or electrical driving equipment, coils, magnet frames, contact switch assemblies, springs, solenoids, resistance grids, hoistway vanes, magnets and inductors.
7. Hoistway door interlocks or locks and contacts, hoistway door hangers and tracks, bottom door gibs, cams, rollers, and auxiliary door closing devices for power operated doors. Chains, tracks, cams, interlocks, sheaves for vertical bi-folding doors.
8. Hoistway limit switches, slowdown switches, leveling switches and associated cams, vanes, and electronic components.
9. Guide shoes including rollers or replaceable gibs.
10. Automatic power operated door operators, door protective devices, car door hangers, tracks and car door contacts for both side slide and vertical bi-folding doors.
11. Traveling cables.
12. Elevator control wiring in hoistway and machine room.
13. Car safety mechanism and Load weighing equipment.
14. Buffers.
15. All car and hoistway operating fixtures including hall lanterns, main Lobby fixtures, car operating panels, car position indicator, car fans, electric door operators, proximity devices, safety edge, photo eyes, door reflectors and starters' panels.
16. The guide rails shall be kept free of rust. Where roller guides are used, rails shall be kept dry and properly lubricated when sliding guides are used. Renew guide shoe rollers and gibs as required to insure smooth and satisfactory operation.
17. Furnish lubricants compounded specifically for elevator usage.
18. After substantial completeness or acceptance, the Contractor shall not be required to make renewals or repairs necessitated by reason of negligence or misuse of the equipment or by reason of any other cause beyond the Contractor's control except ordinary wear and tear unless the Contractor receives just compensation. Negligence, misuse and vandalism shall not be excluded from the Contractor's maintenance responsibilities prior to substantial completeness or acceptance. Misuse during construction shall be the Contractor's responsibility to repair or replace damaged equipment.
19. After substantial completeness or acceptance, the Contractor shall not be responsible for the following items of elevator equipment: cab interior (including removable panels, door panels, car gates, plenum chambers, hung ceilings, light diffusers, light tubes and bulbs, handrails, mirrors and carpets): hoistway enclosure, hoistway door, frames and sills. Negligence, misuse and vandalism shall not be excluded from the Contractor's maintenance responsibilities prior to substantial completeness or acceptance. Misuse during construction shall be the Contractor's responsibility.
20. The Contractor shall check the group dispatching systems (if applicable) and make necessary tests to insure that all circuits and time settings are properly adjusted, and that the system performs as designed and installed.
21. Contractor shall perform the required mandated inspections and tests during the term of the included one (1) year maintenance contract.

E. The Contractor shall keep each elevator maintained to operate at the original contract speed, keeping the original performance time, including acceleration and retardation as designed and installed by the manufacturer. The door operation shall be adjusted as required to maintain the original door opening and door closing times, within legal limits.

F. The Owner reserves the right to make inspections and tests as and when deemed advisable. If it is found that the elevators and associated equipment are deficient either electrically or mechanically, the Contractor shall be notified of these deficiencies in writing, and it shall be his responsibility to make the necessary corrections within 30 days after his receipt of such notice. In the event that the deficiencies have not been corrected within 30 days, the Owner may terminate the Contract and employ a Contractor to make the corrections at the original bidder's expense.

G. Approximately six months prior to the end of the contract term, the Owner may make a thorough maintenance inspection of all elevators covered under the contract. At the conclusion of this inspection, the Owner may give the Contractor written notice of any deficiencies found. The Contractor shall be responsible for correction of these deficiencies within 30 days after receipt of such notice.

H. Working Hours:

1. The maintenance work outlined in this specification shall be performed during normal working hours of 8:00 a.m. to 5:00 p.m., Monday through Friday. Bidder shall submit with his bid a statement of the hourly rates for regular time, time and one-half and double time, both for mechanics and helpers. Bidder shall indicate what constitutes time and one-half as opposed to double time. This time is only for non-contractual repairs due to vandalism after substantial completion or acceptance.
2. The Contractor shall provide emergency call back service for all elevators under which the Contractor agrees to have a workman report to the site of the emergency within one hour after receipt of a request for such service by telephone. This emergency call back service shall be limited to minor adjustments or repairs to provide uninterrupted elevator service. Emergency call back service shall be performed as part of this contract without additional charges. Minor adjustment or repairs shall include those which can be remedied utilizing spare parts listed below.

I. Spare Parts:

1. In addition to the minor spare parts herein specified, the Contractor shall have available at all times, for immediate delivery and installation, sufficient supply of emergency spare parts for the repair of each elevator concerned.
2. The Contractor shall provide at the building a spare parts metal; lockable storage cabinet and metal safety containers for storage of waste and other flammable materials.

J. Items of Preventive Maintenance Work:

1. The preventive maintenance specified herein is considered the minimum for all equipment. If specific equipment covered by this contract required additional preventive maintenance for safe, reliable operation as specified by the manufacturer, the Contractor shall perform the required additional preventive maintenance without added cost to the Owner.
2. Monthly:
   a. Perform general inspection of machinery, sheaves, worm and gear motor, brake, selector or floor controllers. Lubricate as required.
   b. Empty drain pans, discard oil, in an approved manner. Check and maintain oil level.
   c. Replace all burned out lamps in elevator machine room, pit, hall lanterns, etc.
   d. Remove litter, dust, oil, etc. from all machine room equipment.
   e. Clean trash from pit and empty drip pans.
   f. Check governor and tape tension sheave lubrication.
   g. Burned out lamps in hall lanterns, pushbuttons, and corridor position indicators, remote arrival signals, remote dispatch panels, and other signal fixtures shall be supplied and installed by the Contractor. Burned out lamps in elevator, machine rooms and pit shall be supplied by the Owner and installed by the Contractor.
   h. Observe operation of elevator throughout its full range and at all floors it serves to test controls, safety devices, leveling and releveling and other devices.
   i. Check door operation, clean, lubricate and adjust brakes, checks, linkages, gears, wiring motors, check keys, set screws, contacts, chains, cams and door closer.
   j. Check selector. Clean, adjust and lubricate bushings, dashpots, travel cables, chain, pawl magnets, wiring, contacts, relays, tape drive and broken type switch.
   k. Check car. Clean, adjust and lubricate car door and gate tracks, pivots, hangers, ventilation grilles, side and top exits.
   l. Inspect interior of elevator cab. Test intercom/telephone or intercommunication system, normal and emergency lights, fan, emergency call system or alarm. Make needed repairs.
   m. Visually inspect controller, contacts and relays. Check adjustment and replace contacts as required.
   n. Observe operation of signal and dispatching system. Inspect compensating hitches, buffers, rope clamps, slack cable switch, couplings, keyways, and pulleys. Check load weighing device and dispatching time settings. Clean, adjust and lubricate as necessary.
   o. Check oil level in car and counterweight oil buffers and add oil as required.
   p. Check brushes and commutators. Inspect commutators for finish, grooving, eccentricity and mica level. If required, clean, turn or refinish commutator to provide proper commutation. Inspect brushes for tension seal and wear, replace or adjust as required.

q. Check and adjust:
   1) Car ventilation system.
   2) Car position indicators.
   3) Hall and car call buttons.
   4) Hall lanterns.
   5) Main dispatch panels/remote monitoring panel

3. Quarterly:
   a. Check leveling operation. Clean and adjust leveling switches, hoistway vanes, magnets, and inductors. Repair and/or adjust for proper leveling.
   b. Check hoistway doors. Clean, lubricate and adjust tracks, hangers and upthrust eccentrics, linkage gibs and interlocks.
   c. Clean, adjust, and lubricate car door or gate tracks, pivots and hangers.
   d. On hoistway doors, clean, lubricate and adjust tracks, hangers and eccentrics, linkage gibs and interlocks.
   e. Inspect all fastenings and ropes for wear and lubrication. Clean both governor and hoist ropes and lubricate hoist ropes if needed.
   f. Inspect all rope hitches and shackles and equalize rope tension.
   g. Inspect hoist reduction gear brake and brake drum, drive sheave and motor, and any bearing wear.
   h. In the car, test alarm bell system. Clean light fixtures. Inspect, clean and adjust retiring can device, chain, dashpots, commutators, brushes, cam pivots, and fastenings. Test emergency switch (ground case if necessary). Inspect safety parts, pivots, set screws, switches, etc. Check adjustment of car and counterweight gibs, shoes or roller guides. Lubricate and adjust, if necessary.
   i. In the pit, lubricate compensating sheave and inspect hitches. Inspect governor and tape tension sheave fastenings. Empty and clean oil drip pans.
   j. Clean all parts of safeties and lubricate moving parts to assure their proper operation. Check and adjust clearance between safety jamb and guide rails. Visually inspect all safety parts.
   k. Clean and examine governor ropes, replacing if needed. (Do not lubricate governor rope.)

4. Semi-Annually:
   a. Check controllers. Clean with blower, check alignment of switches, relays, timers, contacts, hinge pins, etc., adjust and lubricate. Check oil in overload relays, settings and operation of overloads. Clean and inspect fuses and holders and all controller connections.
   b. In hoistway examine guide rails, cams and fastenings. Inspect and test limit and terminal switches. Check and adjust car shoes, gibs or roller guides. Adjust or replace as required.
   c. Clean all overhead cams, sheaves, sills, bottom of platform, car tops, counterweights and hoistway walls.
   d. Inspect sheaves to ensure they are tight on shafts. Sound spokes and rim with hammer for cracks.
   e. Examine all hoist ropes for wear, lubrication, length and tension. Replace, lubricate and adjust as required to meet code requirements.
   f. On tape drive, check hitches and broken tape switch.

g. Check car stile channels for bends or cracks, also car frame, cams, supports and car steadying plates.
h. Lubricate moving parts of vertical rising or collapsible car gates.
i. Check pivot points, sheaves, guides and track for wear.
j. Lubricate guide shoe stems.
k. Check governor and tape tension sheave fastenings.
l. For bi-parting doors, clean chains, tracks and sheaves, lubricate as required. Check door contacts.
m. Check fastenings and operation of door checks, interlocks, clean and lubricate pivot points as required.

5. Annually:
   a. Thoroughly clean car and counterweight guide rails using a nonflammable or high flash point solvent to remove lint, dust and excess lubricant.
   b. Remove, clean and lubricate brake cores on brakes, clean linings, if necessary and inspect for wear. Correct excess wear and adjust.
   c. Inspect motor generator and hoist motor armatures and rotor clearance. Check motor and MG set connection and lubricate in accordance with manufacturer's instructions.
   d. Drain, flush and refill oil reservoirs of each hoisting motor and motor generator.
   e. Check and reset, if necessary, all brushes for neutral settings, proper quartering and spacing on commutators.
   f. Group supervisory control systems where installed shall be checked out. The system's dispatching, scheduling and emergency service features shall be tested and adjusted in accordance with manufacturer's literature.

K. Safety Inspection and Tests:

1. All service and repair work shall be performed in compliance with the American National Standard Safety Code for Elevators, Escalators and Moving Walks, and shall be subject to safety inspection by the Owner and/or their representatives. Periodic inspection of the elevators as required by the ASME A17.1 Code shall be performed by the Contractor. The Contractor shall provide personnel who are familiar with the equipment to perform tests. The Contractor shall periodically examine and test all safety devices. He shall make formal safety tests and inspections as required and outlined in the ASME A17.1 Code. The tests shall be conducted in the presence of the elevator inspector designated by the local authorities. It will be the responsibility of the Contractor to determine when these tests are due.

1.8 GUARANTEE

A. After award, furnish a written guarantee from the equipment manufacturer which states that replacement parts and/or major components for the equipment installed will be available for a period of ten (10) years after final acceptance.

B. Guarantee in writing that any defects not due to ordinary wear and tear or improper use which may develop within one (1) year from the date of final acceptance of each elevator installation will be made good at no additional cost.

C. Repairs or replacements made under the guarantee shall bear an additional one (1) year guarantee dated from final acceptance of repair or replacement.

D. During the guarantee period, replace or repair any piece of equipment that is found to be defective. The replacement or repair shall be done as soon as notified. Repair all damage to surrounding work caused by defective equipment.

1.9 DEFINITIONS

A. All terms in the specifications shall be as defined in ASME A17.1.

B. The term "Provide" or “New” shall mean furnish and install.

C. The words "or equal", "or approved equal", "equal to", refer to substitution of manufacturer not specified which shall require approval of Architect and Consultant in writing.

D. The terms "Adequate" or "Sufficient" means adequate or sufficient in the opinion of the Architect and Consultant.

E. “Reuse” refers to salvageable components to be cleaned and utilized in the completion of the work specified herein.

1.10 CONDITIONS

A. The Contractor shall examine all drawings relating to this work, and become fully informed as to the extent and character of the work required. All measurements, layouts and the exact conditions of the work shall be verified by the bidder. If any of the conditions conflict with or affect the proposed work, the Contractor shall notify the Architect and Consultant, in writing before the bid date. No allowances will be made for failure to avail himself of such information.

B. Any work that is disturbed by this work, shall be restored to a "like new" condition by the Contractor.

C. The Contractor shall take measurements at the project site so that all of his work will properly fit together and conform to and join the work installed under other sections of this Contract. The Contractor, before commencing work, shall make certain that all adjoining work on which this work is in any way dependent for perfect workmanship, shall be properly in place and in proper order to receive all elevator work.

PART 2 – PRODUCTS

2.1 DESCRIPTION OF ELEVATORS:

A. Machine-Room-Less Traction Passenger Elevator PE-1 & PE-2:

1. Quantity:	Two (2) Passenger Elevators
2. Type:	MRL Type
3. Capacity:	4,500 Pounds (Hospital Shape)
4. Speed:	350 F.P.M.
5. Travel:	94’ – 0”
6. Number of Landings:	7 @ B, 1-5, PH
7. Number of Openings:	Same as Landings
8. Operation:	Group Automatic
9. Control:	Microprocessor with VVVF-AC Drive
10. Number of Push Button Risers:	One (1)
11. Platform:	See Drawings
12. Cab Included:	As Specified Herein
13. Hoistway Door Size:	4’ – 0” Wide x 7’ - 0” High
14. Door Operation:	Two-Speed Side Opening
15. Fixture and Signals:	Vandal Resistant Stainless Steel
16. Machine Type:	MRL Gearless Traction
17. Machine Location:	in Hoistway
18. Power:	480V (To be verified)
19. Ropes:	Traction Ropes or Belts
20. Car Frame Construction:	Structural Steel
21. Platform Construction:	Structural Steel with 2 Layers ¾” Marine Grade Plywood
22. Entrances:	Stainless Steel Frames & Doors
23. Special Operations:	Fire Emergency Service Independent Operation Emergency Power Key Lockout for B and PH Levels Voice Annunciation

2.2 CONTROL ROOM EQUIPMENT

A. Hoist Machine:

1. Gearless traction designed for machine-room-less (MRL) application.

B. Gearless Elevator Hoisting Machine Motor AC:

1. Designed for machine-room-less application.

C. Ascending Car Overspeed Protection Device:

1. Provide a device designed to prevent an ascending elevator from striking the hoistway overhead structure. The device shall decelerate the car with any load up to the rated capacity by applying an emergency brake.
   a. The device shall detect an ascending car overspeed condition of not greater that 10% higher than the speed that the car governor is set to trip.
   b. The device, when activated, shall prevent operation of the car until the device is manually set.
   c. The device shall meet the requirements of Section 2.19 of the ASME A17.1 – 2000 Safety Code.

D. Unintended Car Movement Protection Device:

1. Provide a device to prevent unintended car movement away from the landing when the hoistway doors are not in the closed and locked position and the car doors are not in the closed position.
   a. The device shall prevent such movement in the event of failure of the electric driving machine motor, brake, coupling, shaft or gearing, control system, and any other component upon which the speed of the car depends, except the suspension ropes and the drive sheave of the traction machine.
   b. The device, when activated, shall prevent operation of the car until the device is manually reset.
   c. The device shall meet the requirements of Section 2.19 of the ASME A17.1 – 2000 Safety Code.

E. Solid State Controller:

1. Provide the elevator installation with controllers to fit within the space conditions.
2. The Controller shall be non-proprietary and equipped with solid state components and printed circuit boards to control the hoisting machine and signal functions in accordance with this specification.
   a. Approved manufacturers: Subject to compliance with the requirements of this Section, provide controller equipment of one of the following manufacturers, or approved equal:

b. The controller shall include, but not be limited to the following features:
   1) Password accessible.
   2) Inspection control.
   3) Fireman's service.
   4) Independent service.
   5) Diagnostics.
   6) Remote monitoring.

3. The controller assembly shall provide efficient, smooth, step-less acceleration and deceleration of the elevator hoisting machine, automatically and irrespective of the load in the car. All control equipment shall be enclosed in a metal cabinet with lockable, hinged door(s), and shall be provided with a means of forced ventilation. All non-conducting metal parts in the machine room shall be grounded in accordance with controller manufacturers' specifications and the latest International Electrical Code. Cabinet shall be securely attached to the building structure.
   a. All Controllers shall be identified with 4 inch (4") letters, or as approved by Architect/Elevator Consultant.
4. Modules or Solid State boards for the control of the elevator system, including dispatching, signals, door operation, etc. shall be installed in a NEMA Type I, General Purpose Enclosure. All similar modules or solid state boards shall be interchangeable between controllers of a particular development and interchangeable with other controllers built to the same specifications.
5. Modules or solid state boards shall be fuse protected. Each module or solid state board and fuse (with ampere rating) shall be identified by name, letter or standard symbol in an approved, indelible and legible manner on the device or panel. Coordinate identification markings with identical markings on wiring diagrams.
6. The electrical connections between the printed circuit boards (modules) and the circuit connectors incorporated in the mounting racks shall be made through individual tabs which shall be an integral part of each module. The tabs shall be nickel-gold plated (or of other approved metal of equal electrical characteristics). Modules shall be keyed or notched so as to prevent insertion of the modules in the inverted position.
7. Light emitting diodes (LEDS) shall be used for visual monitoring of individual modules and marked with familiar terminology.
8. Components shall have interlocking circuits to assure fail-safe operation, and to prevent unwarranted elevator movement, should any component fail to function properly.
9. Wiring shall be arranged so that similar voltages are grouped together.
10. If modules are used, they shall be of the type that plug into pre-wired mounting racks. Field wiring or alteration shall not be necessary in order to replace defective modules.
11. Field wiring changes shall be made only to the mounting rack connection points and not to the individual module circuitry or components. Individual modules, requiring design changes shall be returned to the factory where changes shall be made and module design records updated so that correct replacement units shall be available.

a. All shaft and traveling cable wires shall be able to withstand accidental connection to any other shaft or traveling cable connection without causing permanent damage to the equipment. Replacement of fuses or other “low cost” protection devices is acceptable. All outputs shall withstand the application of a short circuit across the output terminals without causing permanent damage to the equipment.

12. Module boards shall be moisture resistant, fabricated from non-conductive, non-corrosive material, and shall be of sufficient strength so as to support all components mounted thereon without warping. Mounting racks shall be spaced sufficiently apart to prevent accidental contact between individual modules.
13. All logic symbols and circuitry designations shall be in accordance with ASME Standards.
14. Solid state components shall be designed to operate normally within a temperature range of 20° F, and 120° F.
15. Wiring connections for operating circuits and for external control circuits shall be brought to terminal blocks mounted in an accessible location within the controller cabinet. Terminal blocks using pierce-through serrated washers are not permitted. Clearly mark and color code the voltages on the terminal strips.
16. A diagnostic testing device shall be permanently installed on each controller, for all trouble-shooting procedures related to the specific type controls installed on this Contract.
    a. Diagnostics shall include but not be limited to the following control circuits:
        1) Interlocks.
        2) Car door gate switch.
        3) Up and down slowdown limits.
        4) Up and down normal limits.
        5) Up and down final limits.
        6) Emergency stop switch in car.
        7) Emergency stop switch on top of car.
        8) Safety plank switch.
        9) Governor overspeed switch(es).
        10) Top and or side emergency exit switch.
        11) Comp sheave switch.
        12) Hoist motor overloads.
        13) Pit stop switch.
        14) Tape switch.
        15) Oil Buffer switch.
        16) Door Operator overload switch.
        17) Generator overload switch.
    b. The Fault Monitoring System shall record and report faults in a sequential fashion. When more than one (1) contact is open, the contact with the highest priority will be displayed first. After this one is satisfied any additional open contacts will be displayed in the same sequential fashion.
    c. Error messages are to be stored in a non-volatile memory for future recall.
    d. If repairs or replacement of the testing device’s become necessary prior to the end of the one (1) year Warranty period, the repairs or replacement shall be provided at no additional cost to the Owner.

17. Controller shall be provided with the capability of having qualified elevator personnel move elevator at inspection speed with safety circuit open. This operation is to be available by operating selective relays on the controller.
18. In addition to printed hard copies, all documentation for wiring diagrams shall be provided on CD ROM disk, in an Acrobat™ Portable Document Format (PDF).
    a. All documentation for wiring diagrams shall be provided on CD ROM disk, in an Acrobat™ Portable Document Format (PDF).
    b. All job parameters, both for the controller and motion control equipment, shall be provided.
19. The use of standard issue communication devices, such as walkie-talkies, from in front of the controllers, with the doors open, should not cause intermittent or permanent problems with the proper operation of the controller equipment.
20. The Contractor shall provide electrical (over-current) protection for each elevator hoist motor. When activated, it shall disconnect power from the elevator hoist motor and hoist machine brake. Activation of the motor protection device shall require a "Manual Reset". The motor protection device shall be clearly labeled and identified at the terminals and a cover plate shall be provided with a light illumination indicating that this device has been tripped with a reset button provided to restore normal operation. The motor protection equipment and its method of connection to the elevator system must be shown on the wiring diagram.
21. In the event of a power outage, the equipment shall be arranged, so that once the normal power supply has been re-established, each elevator will automatically return to service.
22. The Safety circuits shall be designed to individually fuse the following:
    a. Gate switch & secondary gate switch.
    b. Interlocks.
    c. Normal limits (up & down).
    d. Final limits (up & down).
    e. Slowdown limits (up & down).
    f. Pit switch, governor switch, buffer switch, comp switch & pit door switch.
    g. Top emergency exit switch, Car safety switch, top of car inspection stop switch, side exit switch, stop switch in car, safety edge & electric eyes.
23. The control system for the elevators shall be arranged to maintain consistent acceleration and deceleration rate changes and floor leveling accuracy regardless of load.
24. Controller shall incorporate direction switches, reverse phase protection, over current protection, single-phase protection in each phase, and switching to provide smooth acceleration and deceleration.
25. Provide a three-phase voltage monitor (RPR), model PLR240A, as manufactured by SSAC inc., or approved equal.
26. Provide rubber mats in front of all controllers and group supervisory panels.

F. Variable Voltage Variable Frequency - AC Control System:

1. The elevator hoist machine shall be geared traction having an AC motor. The control of the hoisting motor shall be by means of a solid state drive system. The speed, acceleration and deceleration shall be automatically and continuously controlled by varying the frequency and voltage of the motor. A closed loop system shall be provided.
2. The drive shall utilize a 3 phase, full wave rectifier and capacitor bank to provide direct current for the solid state inverter. The control principle shall be based on constant flux control utilizing pulse width modulation. The drive shall be capable of providing not less than 200% of the motor name plate rated current for not less than 60 seconds.
3. A means shall be provided for removing regenerated power from the drive DC power supply. This power shall be dissipated in resistors or returned to the 3 phase AC power line. Failure of the system to remove the regenerated power shall cause the drive output to be removed from the hoist motor.
4. The final stopping shall be performed independent of the machine brake which shall be applied to hold the car at a floor only after the car has stopped.
5. The drive shall not create excessive audible noise in the elevator motor and control system.
6. The drive system shall include but not necessarily be limited to the following features:
   a. Maintain a car speed within +/- 5% of the rated speed.
   b. Protection against excessive motor current in addition to normal overload relays.
   c. Maintain operation within 90 to 110% of nominal line voltage.
   d. Line fault protection to prevent operation under:
      1) Loss of phase.
      2) Low line voltage.
      3) High line voltage.
   e. The transistor protection shall ensure 100% protection of the transistors and prevent fuse blowout.
   f. Continuous supervision of the braking resistors shall be provided.
   g. Motor contacts shall disconnect the motor stator winding during each stop. In normal operation, the contactors shall operate only under zero current conditions, but must be capable of interrupting the line current should an emergency stop be required.
   h. The drive system shall continuously monitor the hoisting motor operation and motor torque in order to ensure 100% safe elevator operation at all times.
   i. The AC variable frequency drive system shall be by Mitsubishi, G.E. or approved equal.

G. Selectors:

1. Provide a selector electronically or magnetically operated and located on Car Top or in Elevator Machine Room. The operation of the selector shall be to govern functions such as direction of travel, automatic stopping and leveling at landings. Selectors shall have a correction feature at least once in each direction of travel and at terminal landings. Cable and/or tape driven selectors shall not be permitted. The selectors shall be IP8300 PLUS or approved equal.

H. Speed Regulation:

1. Speed regulation shall be such that the maximum velocity attained with any load up to full load in the car on either "Up or "Down" motion shall not vary more than 5% plus or minus from normal operation velocity.
2. The acceleration and deceleration of the cars under any condition of load shall be as nearly constant as is possible with the method of control specified and employed, and shall be independent of the operating devices in the car.
3. Entire elevator equipment including hoisting machines and controllers shall operate without noticeable irregularities and as quietly as can be obtained by use of high grade materials, first class workmanship, and adjustment.

I. Speed Governor and Tension Sheave:

1. Provide centrifugal type speed governor with an overspeed switch for each direction of travel. Safety rope grip shall lock in position when governor trips and shall be held in contact with the rope both by springs, and by sliding action and pull of the rope in the grip. The rope grip jaws shall be of the parallel jaw or equivalent type, of such shape and length that the pull-through action of the governor rope as required by the ASME Code will result in a minimum amount of abrasion. Governor jaws shall be machined and so arranged that if worn, they can be replaced. Speed governors shall be located in the overhead.
2. Provide tension frame and sheave. Proper tension in governor rope shall be maintained by a weighted tension sheave located in the pit. This sheave shall be protected with a 16 USSG sheet metal guard to prevent foreign objects from being caught between the governor rope and sheave. Tension sheave shall be provided with a grease gun fitting to receive grease lubrication.

2.3 OPERATIONS

A Group Operation:

1. A microprocessor based group system shall be provided which will evaluate real time data and selects the best car to serve any given hall call demand. The group system assignment of cars shall provide efficient handling of varying traffic demands in terms of passenger waiting time and passenger transit time.

2. The group system shall analyze building traffic conditions including, but not limited to the following: hall call demand, number of assigned hall calls, number of cars in operation, number of car calls, number of car stops, car position, car direction, car's anticipated direction of travel, car loading, car status, car motion status, car door status, call waiting time, door opening time, door closing time, coincidence calls, and estimated time of car arrival.
3. The dispatching algorithm shall use mathematical modeling and queuing theory to optimize elevator service to the building. The dispatching algorithm shall minimize the mean waiting time, the maximum waiting time and the number of late calls.
4. This algorithm shall cover all two-way traffic demands such as light, medium, and heavy traffic situations. The algorithm shall compile the required physical and statistical data and parameters that are necessary to perform the above minimization tasks.

B. Fireman Service Phase I and II:

1. Provide Fireman Service Phase I (Emergency Recall Operation) and Phase II (Emergency In-Car Operation) for the elevators as required by the latest adopted edition of the Building Code.

C. Emergency Power Operation:

1. Provisions shall be included in the new elevator control systems whereby immediately after transferring to the building emergency power system, the elevators automatically return to the main fire recall landing in progressive numerical sequence one at a time at normal operating speed. Car and corridor calls shall become inoperative and all previously registered calls shall be cancelled. In the event an elevator fails to respond to a recall command within forty-five (45) seconds under Emergency Power Operation, that car shall be by-passed in the order of recall progression.
2. Upon completion of the recall process, one (1) car shall remain available for continued operation. (Manual selection shall allow either of the two (2) cars to operate under emergency power.)
3. An emergency power control panel shall be provided at the Main Lobby containing a manual selection keyswitch and an indicator light that becomes illuminated whenever a transfer to emergency power takes place.

2.4 HOISTWAY EQUIPMENT

A. Hoistway Entrance Frames:

1. Provide 14 gauge stainless steel entrance frames, 16 gauge stainless steel doors and 16 gauge stainless steel sight guards. Provide brushed finish for all stainless steel.
2. Entrance frames shall be fully welded and delivered to the jobsite fully assembled. The corners shall be welded with a flush surface, ground smooth and finished so there are no visible joint marks.

3. The Contractor shall provide all labor, material, equipment and service necessary to complete all metal work required by the drawings, and/or herein specified. Provide shop coat of metal protective paint on all steel components.
4. Hoistway Doors shall be U.L. rated, “B” labeled with a 1 ½ hour fire rating.
5. Provide floor number designations, at least 4" high, on each hoistway entrance door (hoistway side). Provide floor designations for the disabled on both door jambs, sixty inches (60") above the floor. Floor number designations, shall be No. 19 gauge (0.042 inch) stainless steel plates with two inches (2") high, characters raised 0.030 inches high, Sans Serif uppercase with a color-contrasting background. Place Braille characters immediately below the regular characters. Install the jamb mounted floor designation plates with the field or background flush with the jamb surface.
6. Hangers and Tracks: All doors shall be hung on heavy duty ball bearing, sheave type hangers, sheaves not less than 3-1/8" riding surface diameter with adjustable upthrust rollers of metal design, running on a polished steel track. Sheave rollers shall be of nylon or equal, with no flat spots. Hangers that are not mounted flush with the top of the door shall be provided with metal stiffeners and shall be installed to eliminate excessive movement. An upthrust safety retainer shall be installed on the door hanger to prevent the door from coming off the track due to vandalism.
7. Removable Guides: Each door panel shall be guided at the bottom by two (2) removable guides, of solid nylon or solid Teflon, mounted in galvanized steel brackets, and fastened with stainless steel machine screws, sliding in the hoistway slide door sill groove.
8. Rubber Bumpers: Provide rubber bumpers on the hoistway slide door hanger tracks, (both front and rear) instead of the hoistway door frame. After their final adjustment, permanently pin so that they cannot be removed.
9. Hoistway Slide Door Sill Mounted Spring Closers: Provide sill mounted hoistway side slide door spring closers for all hoistway entrances manufactured by G.A.L. Manufacturing Corporation.
10. Hoistway Door Safety "Z" Bar Guide: Provide one (1) stainless steel safety "Z" bar guide on the underside of all doors and securely fasten to the underside of the door with stainless steel countersunk machine screws. Mount the safety "Z" guide adjacent to and in between the removable guides.
11. Fascias: Shall be #14 USSG galvanized steel reinforced to insure a flat even surface. Securely fasten to the header and sill above. They shall extend 6 inches (6”) on each side of the jamb opening.
12. Toe Guards: Provide the lowest landing with a toe guard. The guard shall be No. 14 USSG galvanized sheet steel, secured to the lowest sill and gradually beveled to the wall. The guard shall be one foot wider than the door opening.
13. Fascias, cover plates, enclosures, dust covers and toe guards shall be of galvanized steel.
14. Provide extruded nickel silver sills.

B. Hoistway Door Interlock:

1. Provide each hoistway entrance with electro-mechanical interlocks as manufactured by G.A.L. Manufacturing Corporation. Interlock shall prevent the operation of the elevator unless all doors are closed and positively locked. Interlock shall be of a type that shall satisfy the requirements of the ASME Code.
2. Provide all wiring from shaft riser to the new interlock. The wiring shall be type SF-2 Silicon insulated fixture wire with Silicon rubber insulation. Conductors shall have insulation with an operating temperature of 392ºF (200º centigrade). Flexible steel conduit running to shaft conduit boxes shall be properly supported with approved straps.
3. Car and Hoistway Door Clutch Device: Provide each car with a car and hoistway door clutch device. The clutch shall be of a type and design that shall function with the hoistway slide door interlocks to be installed as hereinbefore specified above. The car doors shall be reinforced for mounting of the car door clutches. All hoistway door interlock release rollers shall be properly adjusted so that at no time will the car door clutch device strike the release roller and thus cause the elevator to stop between floors.

C. Terminal Stopping Devices:

1. Provide upper and lower normal terminal stopping devices arranged to automatically stop the car from any speed attained in normal operation within the top and bottom over-travel, independent of the operating devices, final terminal stopping device and buffer devices.
2. Final terminal stopping devices shall be arranged to automatically stop the car and counterweight from speed specified within the top clearance and bottom over travel independent of the operation of the normal terminal stopping device with the buffers operative.
3. Provide top and bottom slowdown devices as required to accommodate the available top and bottom run-bys.
4. Final terminal stopping devices shall be through bolted to the rails.
5. Opening on limit switches shall face down.

D. Counterweights:

1. Provide counterweights and check for proper counterbalance. Test to ascertain that the elevators are properly counterbalanced.
2. Counterweight frame and filler weights shall be cleaned and painted. Paint all surfaces with an enamel, alkyd oil based paint.
3. Provide counterweight guards.

E. Buffers:

1. Provide oil buffers for the car and counterweight.
2. Provide channel support for mounting of the buffers. Channels and ferrous metal shall be painted with enamel, alkyd oil based paint. Pit channels shall be grouted solid with concrete in order to distribute impact loads over the full area of the channel. Provide all blocking as necessary for the pit depths indicated in the contract document.
3. Load test and properly tag the equipment after testing.
4. Properly align all buffers.

F. Alarm Bells:

An electric signal bell shall be provided in or adjacent to the elevator hoistway and on the car top, as directed. This bell shall be connected to the alarm button in the car operating panel.

1. Provide 110 volt alarm bells. One weatherproof bell located in hoistway on the back wall and 8' - 0" from the pit floor; and one bell located underneath the platform. Hoistway bells shall be located so that they are accessible and not obscured by the counterweight frame.
2. Bells shall have a minimum of 90 db at 10 feet.
3. Bells shall be operated from buttons inside the car marked "ALARM".
4. Bells shall be operated by the opening of the car emergency switch.
5. All required bells shall ring whenever either the alarm button inside the car is operated or when the car emergency stop switch is opened.

G. Pit and Overhead Stop Switch:

1. Provide a watertight emergency stop switch for each elevator at the point of access to the pit and in the overhead in accordance with Code. The switch shall have a metal guard to prevent accidental operation. Plastic or fiberglass material of box and faceplate shall not be permitted. When opened, the switch shall cause the electric power to be removed from the driving machine and brake. Final location shall be coordinated in the field.

H. Hoisting Wire Ropes:

1. The hoisting ropes shall be 8 x 19 pre-formed wire rope of traction steel, uncoated, fiber core or coated belts. The hoisting ropes shall be designed for elevator service, compatible with the hoist machine.
2. Attach a metal tag to one of the car wire rope fastenings, in compliance with Rule 212.2 of the ASME Code.
3. Hoist ropes shall be shackled by the following method:
   a. Provide wedge clamp type shackles. The shackle rods shall be provided with threads and compression springs at the crosshead hitch and counterweight header, so that the shackle rod assemblies will permit the tension in all ropes to readily equalize. The installation shall be in accordance with manufacturer's directions.

I. Governor Wire Ropes:

1. During normal operation of each elevator, the governor rope shall run free and clear of the governor gripping jaws, rope guards and all other stationary parts.
2. Attach a metal tag to the top of car release carrier, in compliance with Rule 206.5 of the ASME Code.

J. Traveling Cables:

Traveling cables shall conform to the following:

1. All traveling cables shall be hung in self-locking loops (in an approved manner) on porcelain hanger and bracket or Kellems cable grips. The hanger and bracket shall be provided under the car platform and hoistway junction box, and shall be so located as to make traveling cables inaccessible from any door opening. The hanger and bracket shall be through-bolted to the cab floor.
2. Provide a junction box with terminal blocks at each end of the cable; properly terminate all conductor wires, including spare wires to provide complete circuit continuity. Provide all traveling cables to junction boxes with proper size connectors and properly secure to junction boxes.
3. Locate car junction box on the underside of each platform as close to the safety plank as possible. All terminal blocks shall have indelible identification numbers for each terminal connection and shall match the car junction box, hoistway junction box and controllers. Provide junction box covers with a watertight neoprene gasket. Cover plate screws shall be of the "captive type", stainless steel spanner head.
4. Separate alternating current and direct current conductors into individual travelers.
5. The cable shall be flexible, Type "ETT", with a steel hanger wire or type “ETP” flat elevator traveling cable. The minimum size of the D.C. copper conductors shall be No. 18 AWG. The minimum size of the AC copper conductors shall be No. 14 AWG. Each cable shall have 20 percent spare conductor wires (minimum of six (6) wires) and shall be UL listed. Provide metal eyelet’s, or other approved fasteners for each end of conductor wires.
6. Provide beam padding that is waterproof, oil proof, fireproof, and similar to the material insulating the traveling cable. Beam pads shall be properly secured.

K. Landing Control System Device:

The landing control system for each elevator shall equal to the IP8300-PLUS. The system shall also include the following:

1. A separately fused A.C. Electric Feed & Circuitry for Deactivating the System and shall be independent of the A.C. feed to cab enclosure (i.e. Blower, lights, alarm, etc.).
2. The fuse and fuse clip shall be mounted at the front of the controller in convenient location. The fuse shall be properly identified in a permanent legible manner and labeled, "Landing Control System Fuse".

3. All terminal blocks on controller, hoistway junction box and car junction box shall be labeled in a permanent manner to match.
4. Wiring from landing control system device to car junction box shall have a minimum of four (4) spare conductor wires and connected with liquid-tight connectors having nylon insulated throat.
5. Two additional tape guides (one for the top and one for the bottom).
6. Stainless Steel Tape / Steel Tape Coated with Polyester.
7. Magnets installed on non-perforated tape shall have their locations marked with a permanent ink type marker. The entire perimeter around each magnet shall be done in a color that contrasts with the tape.

L. Electric Wiring:

1. It shall be the responsibility of the Contractor to furnish and install complete, necessary, insulated wiring to connect all parts of the equipment. Wiring, conduit, fittings and installation shall be in accordance with Division 16, and comply with the requirements of applicable codes.
2. Insulated wiring shall have a flame retarding and moisture resisting outer cover and shall run in concealed galvanized metal conduit, metallic tubing or wire ducts.
   a. Flexible metal conduit shall be permitted for short runs only (less than 36”).
3. Traveling cables between car and hoistway shall have a flame retarding and moisture resisting outer cover. They shall be flexible and suitably suspended to relieve strains in the individual conductors. The traveling cable shall also include:
   a. A minimum of 10% spare conductors (ends to be left accessible to facilitate connections at a later date).
   b. Wiring as required for the intercom/telephone and firemen’s communication (as required per local code).
   c. Six (6) pairs of 18 gauge shielded cables, (terminating on terminal strips in the controller and in the car operating station).

M. Main Guide Rails:

1. Provide machine Standard ”T” section guide rails (minimum 18½ lb.) with tongue and grooved joints. Connect rails to fishplates with four (4) bolts. Brackets shall be used to support the rails from the hoistway framing and/or inserts. Rails to be attached to the brackets with clips. Provide rail backing where no intermediate support framing is shown on the drawing. All guide rails shall be erected plumb and parallel to a maximum deviation of 1/8" (plus or minus 1/16").
2. The only structure which shall be provided for rail attachment shall be as shown in the Contract Documents. All additional bracing, rail backing and brackets shall be the responsibility of the Elevator Company.

2.5 CAR EQUIPMENT

A. Car Sling:

1. The car frame shall be constructed of structural steel members of adequate strength. The frame shall consist of two (2) stile members, two (2) cross head members and platform support frame. All members are to be securely fastened together and reinforced to form a unitized section.
2. Refer to the drawings for overall and clear cab heights.
3. Car slings shall be designed for Class “A” Freight Loading.

B. Platform:

1. The platform shall be steel construction (structural steel members) mounted on an auxiliary frame with vibration isolation pads. The floor is to be constructed of two (2) layers of 3/4" marine-grade plywood (finished flooring is By Others). The underside of the platform shall be properly fireproofed with 26 gauge galvanized steel metal in a maximum of two (2) sections.
2. Provide extruded nickel silver sills.
3. Platforms shall be designed for Class “A” Freight Loading.

C Car Safety:

1. Flexible guide clamp safety shall be mounted on bottom members of car frame and operated by a speed governor located over the hoistway. The safety shall be arranged to stop the car when ever excessive descending speed is attained, and means shall be provided to cut off power from the motor and apply the brake within Code requirements after the governor jaws grip the governor rope.
2. The car safety mechanism shall gradually and smoothly bring the car to a stop from governor tripping speed, with an average rate of retardation within the limits given in ASME A17.1 for various loads.
3. The operation of the governor on overspeed shall open a switch disconnecting the power from the elevator, and shall trip the safety mechanism. The safety mechanism when tripped shall engage the rails with sufficient force to stop the car from governor tripping speed with full load in the car. Equalize the pressure of the two pairs of jaws on the rails.

D. Inspector’s Operating Station:

1. An inspector's operating station shall be provided on top of the elevator car consisting of "Up" and “Down” constant pressure buttons, incandescent light with guard, 110 Volt G.F.I. work outlet and an emergency stop switch.
   a. Provide an additional light with guard and G.F.I. work outlet mounted to the bottom of the car and located towards the front for easy access.
   b. Provide audible and visual indicators to identify activation of Phase 1 Firemen’s Service.

E. Car Door Operator:

Provide a D.C. motor driven door operator, install and connect in place, all complete as hereinafter specified. Provide ½ Hp motors.

1. Each door operator control circuit must be complete with accelerating circuits and door motor overload protection (circuit breaker type) in the event of a stall condition. Control circuits shall be protected with properly sized fuses.
2. Provide fuse clips, fuses, and overload protection for door operator units and all necessary additional terminals on control panel.
3. Provide a steel support for the door operator. The support shall be designed so that no part of door operator rests directly on the cab or is supported by car door header.
4. Provide one gate switch of the shielded type, connected in series to a gate contact to prevent operation of the elevator, unless the car door is in the closed position and both devices are activated. The gate contact shall be located in the door operator limit switch mechanism and be an integral part of this mechanism. Cover plate shall have "CAPTIVE" type tamperproof stainless steel machine screws.
5. Provide door operator motors, which shall be D.C., 1140 rpm developing 1/2 HP, and shall be rated for not more than 50˚C. temperature rise when operating for a minimum of five minutes.
6. Provide a recycling device for each car door which will cause car door to open and reclose at approximately 10 second intervals whenever car door is prevented from closing fully by any obstruction. A second timer shall reopen cab door, if for any reason car does not operate after cab door has fully closed.
7. Car door operator shall be mechanically connected to car door. Friction drives will not be permitted.
8. All control relays furnished under this Contract shall be designed to operate quietly and conform to NEMA Standards with respect to size, spacing, voltage, carrying capacity for the contact leads and coils. Control relays shall have fine silver overlay contacts.
9. All gate switches shall be shielded type.
10. Door operator shall be wired in such a manner that when the stop switch is applied and elevator is out of the landing zone, car doors shall not open and door operator shall remain energized. When the stop switch is activated in the landing zone, the cab door shall open and power will be removed by door open limit; and if the door is closed by hand, it shall reopen.
11. The car entrance door shall be arranged so that it can be opened manually in case of emergency only when the car is within the landing zone.
12. Provide wiring and conduit complete.
13. Mount car door header angle in such a way so that if a car door of a down traveling elevator engages a fixed obstruction in the hoistway, the car canopy will not be damaged.
14. Provide car door clutches and all related equipment.

F. Door Edge Protective Device:

1. Provided with a reopening device that will stop and reopen the car door and hoistway door automatically if the door becomes obstructed by an object or person. The device shall be capable of completing these operations without required contact for an obstruction passing through the opening. The device shall be a non-reflective through beam system with a minimum of forty sensors per edge. It shall have a maximum sensor spacing of 1.8" or less. It shall incorporate a microprocessor controlled fail-safe system.
   a. It shall be capable of self adjustment to compensate for varying environmental conditions.

G. Fluorescent Light Fixture with Convenience Outlet (Top and Bottom of Car):

1. Provide fluorescent light fixtures with convenience outlet. Fixture to be mounted above each car roof and under each car platform and shall be wired to the lighting circuit. The light fixtures shall be designed for exterior use with weather tight gaskets between the lenses and the backboxes.

H. Car and Counterweight Guide Shoes:

1. Roller guide shoes. All guide shoes shall be securely fastened to the car and counterweight at the top and bottom of the stiles and/or frame. Provide 6” rollers for the car and 3” rollers for the counterweight. Provide applicable Elsco roller guide shoes.

I. Emergency Exit Contacts:

1. All top emergency exits shall be provided with electric contacts to prevent the operation of the car and sound an alarm when the exit door is opened.

J. Emergency Lighting System:

1. Provide an emergency car lighting system which shall provide emergency lighting using the normal elevator cab lighting and emergency power to the two (2) alarm bells as specified hereinafter.
2. The battery pack shall consist of a minimum of two (2) rechargeable batteries which shall be housed in a 18 USSG galvanized steel box with removable cover. The charger unit shall consist of a charger and inverter, which shall be housed in a separate 18 USSG galvanized steel box with removable cover. Provide a testing circuit and pilot light on the exterior of the charger unit box for testing the batteries, alarm bells and cab lights.
3. Upon interruption of normal power, the fluorescent light tubes located in the cab lighting fixture shall automatically illuminate within ten (10) seconds and permit operation of the alarm bells, subject to the activation of the emergency alarm button. The battery pack shall be capable of providing a minimum of one hour alarm operation (for three alarm bells working simultaneously) and four hours of continuous illumination. Charger shall be capable of restoring the batteries to full charge automatically within 16 hours after resumption of normal power.

4. The power pack and charger unit shall be located in the elevator machine room. Provide steel shelf/shelves of proper adequacy to support the power pack and charger unit and properly secure shelf/shelves to the machine room wall. Properly secure boxes to the steel shelve/shelves.
5. Amount and size of wires and method of connections to be in accordance with manufacturers instructions.

2.6 FIXTURES

A. Car Operating Panel:

1. A car operating panel shall be furnished in the car containing illuminating buttons for each landing, flush-mounted Braille tags, door open and close buttons, L.E.D. digital position indicators, intercom/telephone, emergency stop switch, F.E.R. Phase II keyswitch and indicator lights, alarm button and keyswitches for light, fan and independent service.
   a. All fixture components shall be mounted to a backplate and incorporated into the swing front return panel.
      1) The intercom/telephone unit shall be backplate mounted and concealed behind the swing return. Provide a perforated hold pattern in the swing return for speakers and microphone voice transmission.
      2) The light, fan an independent service keyswitch along with a 110 Volt G.F.I. outlet, shall be located in a key-locked service cabinet below the body of the car station. The service cabinet door shall be flush with the swing front return with concealed hinges.
      3) An L.E.D. position indicator shall be provided in the car above the body of the main car station. The position of the car in the hoistway shall be indicated by illumination of the numeral corresponding to the floor at which the elevator is stopped or passing. Provide 2" (nominal) illuminating numbers or indicators. The lens shall be flush with the swing return.
2. Provide key lockouts for the basement and penthouse levels.

B. Illuminated Call and Car Button:

1. Call registration lights shall be provided in each push-button unit. When a button is pressed, it shall illuminate, signaling to the waiting passenger that the call has been registered. Each button shall remain illuminated until the call has been answered.
2. Buttons shall be stainless steel.

C Hall Lanterns:

1. Hall lanterns with one stroke up, two strokes down gongs shall be provided.
2. As soon as the car has reached a predetermined distance from a landing and is set to stop at that landing, the corresponding lantern shall be illuminated and the gong shall sound whether the hall button has been pressed or not and the lantern shall remain illuminated until the car has left that lending. All visual and audible signal timing shall be in accordance with A.D.A. requirements.

3. Provide solid, sand blasted Plexiglas lenses with brushed stainless steel faceplates and tamperproof fasteners. Faceplate shall have beveled edges. Provide lens type as selected by the Architect.
4. Provide position and direction indicators above each entrance at the main lobby level. Characters shall be segmented LED type and a minimum of 2" high.

D. Hall Call Stations:

1. Provide brushed stainless steel faceplates and tamperproof fasteners. Faceplate shall have beveled edges.
2. Provide Phase 1 key switch, emergency power indicator light and manual selection key switch in a hall station at the 1st Floor.
3. Provide position and direction indicators at each floor.

E. Hoistway Access Switches:

1. Provide a jamb mounted hoistway access keyswitch at the top and bottom terminal floors. Provide keyswitch only at the top terminal floor for PE-1 as it shall have a walk-in pit. Access switches at the bottom terminal floors are not required.
2. Provide switches without faceplates.
3. Install contact switch at the pit door as required by Code.

F. Voice Annunciation System:

1. Provide a voice annunciator in each elevator. The system shall include, but not limited to:
   a. Solid state digital speech annunciator.
   b. A recording feature for customized messages.
   c. Playback option.
   d. Build-in voice amplifier.
   e. Master volume control.
   f. Audible indication for selected floor, floor status or position, direction of travel and nudging.
2. Locate all associated equipment in a single, clearly labeled enclosure located either in the machine room and/or on car top.

2.7 AUTO DIAL TELEPHONE

A. Provide an automatic dialing, hands free telephone in the car station. The system shall be in compliance with ADA requirement for visual and audible communications. Provide a telephone instrument master station in the machine room and front desk for communications to all units. Provide in accordance with Code.

B. The telephone shall be turned on by pressing the emergency alarm or stop switch in the car panels. It shall automatically dial a programmed number to alert the security personnel that there is a problem in the elevator and identify visually which elevator is initiating the call.

C. The system shall have a ring back feature to allow calls to be placed to the elevator. It shall answer the incoming call automatically and shut off after an adjustable programmed time.

D. Provide and audible and visual signal to indicate that a communication link has been established. Provide a circular drill hole pattern in car operating panel faceplate above the floor buttons.

E. Ni Cad batteries shall insure operation under all conditions.

F. Install the instrument in the elevator and wiring within hoistway, terminating the wiring in the elevator machine room. A suitable and identified junction box in the machine room shall be installed.

G. All connections from the junction box to the security room's main telephone system shall be done by others. All electrical shall conform to Division 16 requirements.

2.8 CABS

A. Elevator Cabs:

1. Shell - 14 gauge steel for walls and 12 gauge steel for canopy. Individual panels shall not exceed 18" in width and shall be reinforced to provide for a flat, rigid surface. Apply spray on sound deadening on rear of shell. Sound deadening material shall be non-combustible and applied in accordance with manufacturer's recommendation. Provide a minimum 1/8" consistent thickness on all surfaces. Provide welded re-enforcement grounds (minimum 1/4" thick with weld nut) on the rear of the shell for handrail mounting. Provide all cutouts in the shell as required for ventilation and fixture installation.

2. Interior Panels - ~~Interior panel assembly shall be a plywood backer board covered with brushed textured stainless steel. Provide 3/16" reveals between panels.~~ **Interior panel assembly shall be a 3/4" thick MDF (Class "A" substrate) backer boards with all exposed surfaces covered with stainless steel fabric wall panels: "Square" by GKD Metal Fabrics and plastic laminate color, texture and pattern as selected by Architect from manufacturer's full range. Manufacturer's: ABET Inc or Arpa USA. Refer to the Architectural drawings for details.**

3. Front Return Panels - Provide 14 gauge, brushed stainless steel full front swing return panels for both the main and auxiliary car station locations. The swing return panels shall have a concealed continuous hinge and a substantial locking system. Provide no more than a 1/4" clearance between the swing return panel and the finish floor and a 1/16" between the swing return panel and transom.

   a. The swing return panels and hinging system shall be suitably re-enforced to prevent appreciable or permanent sagging or deflection when opened for maintenance.

4. Transom - 14 gauge brushed stainless steel suitably re-enforced. Apply sound deadening to the back of the transom as specified above.

5. Doors - 16 gauge brushed stainless steel with full height rubber astegral at the leading edge of each door panel. Provide the same construction as for the hoistway doors.

6. Sills - Extruded nickel silver.

7. Ceiling - ~~16 Gauge brushed stainless steel on ¾" MDF backer board. All edges to be stainless steel.~~

   ~~a. Provide downlighting to be integral with the suspended ceiling. One ceiling panel shall be removable for top emergency egress. A substantial, positive locking mechanism shall be utilized to hold the removable panel in place, flush with the adjoining panels and flat throughout. Provide light fixtures as specified by the Architect.~~

   ~~b. Provide one (1) downlight per ceiling panel.~~

   Custom fluorescent light fixtures recessed in stainless steel cover. Plastic laminate on ¾" thick MDF (Class "A" substrate) panels with integral flush stainless steel divider bars.

   a. One ceiling panel shall be removable for top emergency egress. A substantial, positive locking mechanism shall be utilized to hold the removable panel in place, flush with the adjoining panels and flat throughout. Show all details on the shop drawings.

8. Handrails - Provide a flat bar stainless steel handrail along the back wall. Design the handrail to withstand a minimum 500 lb. vertical point load at the center between handrail supports.

   a. Handrail mounting equipment shall be solid brushed stainless steel and spaced no more than 24" apart.

9.	Exhaust Fan -	Two-speed fan, mounted on vibration isolation pads.
10.	Protection Pads -	Provide one (1) set of protection pads per elevator. Provide heavy-duty vinyl impregnated nylon with 1/4" thick padding. Pads are to be fire retardant and treated to be self-extinguishing. Include a metal stiffening bar on top of pads and include retaining clips to hold the pads in place. Provide pads in a color as selected by the Architect.
11.	Pad Buttons -	Provide extended type stainless steel pad buttons bolted through the shell. Provide weld nuts on rear of shell to accept the pad buttons.
12.	Base -	12 Gauge brushed stainless steel.
13.	Concealed Vent Slots -	Design the cab interior to provide for ventilation openings above the base behind the wall panels.
14.	Flooring -	~~To be determined.~~ **12" x 12" black rubber tile with ¼" diameter stainless steel insert at 1" on center.**
15.	Reveals, Frieze and Other Exposed Areas -	All exposed reveals, friezes, etc. shall be stainless steel with a brushed finish.
16.	Engraving -	No applied plates will be accepted. No manufacturer's logos shall be visible.

2.9 OTHER

A. Card Reader/Security Provisions:

1. Elevator/Security Interface Terminal Cabinet:
   a. One (1) lockable interface terminal cabinet within each elevator machine room. The terminal cabinet shall contain all interface terminals required for the elevators served by that machine room.
   b. Terminate all interface cables to dual screw barrier type terminal strips within the interface cabinet.
   c. All wiring required from the elevator control equipment to the interface terminal cabinet.
2. Return Panel Preparation:
   a. The exact card reader location shall be specified by the Architect. The card reader shall be provided by the Security Contractor and installed by the Contractor. The Security Contractor shall provide supervision, wiring details and installation diagrams to the Contractor.
3. Traveling Cable:
   a. Provide six (6) pairs of 20 gauge flexible conductor low voltage cables with an overall braided shield in the traveling cable for the card reader data communication wiring. These conductors shall be terminated to a terminal strip in the junction boxes located in the machine room and on top of the car.
   b. Provide two (2) RG-59/U stranded center conductor coax cables and one (1) Category 5 (DVS Cable Type Q) in the traveling cable for CCTV camera interface. The cable shall extend from the elevator machine room to the camera location in each elevator cab. An excess loop of five (5) feet of cable shall be provided at each end of the cable. Provide cable access from the top of the cab to the camera location.
   c. Traveling cables for card reader interface shall extend from the elevator/security interface terminal cabinet in the elevator machine room to behind the elevator return panel. The Contractor shall terminate the cables including the drain wire to dual screw barrier terminal strips in the interface cabinet and provide 6 feet of excess cable behind the elevator return panel.
   d. The Contractor shall be responsible for connecting the cable behind the return panel to the card reader under the direct supervision of the Security Contractor. The Security Contractor shall be responsible for wiring from the terminal strip in the interface cabinet to the security system card reader interface panel.
   e. All security cables shall be isolated from other traveling cables.
4. Conduit and Power:
   a. The Contractor shall be responsible for providing all conduit and power requirements associated with the installation of the elevator terminal cabinet and interfacing to the elevator control system.
   b. The Contractor shall provide one (1) 120 V duplex unswitched outlet dedicated to security on top of the elevators.

5. Card Reader Bypass Keyswitch:
   a. The bypass keyswitch shall be a maintained contract type keyswitch with the key removable in either the bypass or normal position. All bypass keyswitches shall be keyed alike.
   b. Each bypass keyswitch shall be labeled to identify its function, the secure position, and the bypass position.
6. Fire service shall override all security operations.
7. Provisions shall be made for a CCTV camera to be mounted in the ceiling of each cab. Contractor shall include any cutouts, brackets, 14 gauge tamperproof housing and GFI outlet dedicated for the CCTV camera installation and hook-up.
8. Provide life safety speaker in the cab with wiring to a machine room junction box.

PART 3 - EXECUTION

3.1 DESIGN REQUIREMENTS

A. Electrical Design and Wiring:

1. All wiring shall be Underwriters approved stranded type in accordance with the latest International Electrical Code. Minimum size permitted shall be No. 18 AWG. These wires shall be installed in conduit with steel outlet boxes. All electrical boxes (Hall pushbutton boxes, Car Stations, Terminal boxes, pull boxes, etc.) and other similar items shall be of approved construction, hot-dip galvanized or electroplated with Zinc Dichromate. All electrical boxes exceeding 150 cubic inches shall be supported independently of the conduits.
2. All raceway shall be galvanized EMT and/or trough.
3. Furnish all materials and completely wire all parts of the electrical equipment of the elevator, including electrical devices on hatch doors.
4. Switches, relays, etc. on controller, starter, and signal panels and similar items on other parts of the equipment, shall be the latest model. Any parts showing wear or damage during the guarantee period to the extent that abnormal maintenance is required or indicated shall be replaced by the Contractor as part of his Contract obligations.
5. Contacts in elevator motor circuits, which are intended to be opened by the governors or other safety devices, shall be copper to carbon, or other approved non-fusing type. Relays shall be designed for visual inspection and easy replacement of contacts with minimal disassembly, and keyed parts for ease in reassembly. They shall be equipped with suitable blowout coils, vanes, barriers, etc., to prevent undue arcing and heating. Current ratings for silver-to-silver contacts on relays used in motor circuit applications shall be at least three times the current draw of the running ratings of the motor. Contacts on control and signal relays and switches shall generally be of silver alloy.
6. Conduits shall be run and connected to suitable approved connection boxes at all outlets, apparatus and panels.

7. The conduits shall be of such size that the wires or cables can be readily installed and replaced, if necessary. No conduit or raceway shall be less than 3/4 inch trade size, except that for small devices such as door switches, interlocks, etc. for which, 1/2 inch conduit may be used. The total overall cross-sectional area of the wires contained in any conduit shall not exceed 40 percent of the internal area of the conduit. Approved strain boxes shall be installed for all vertical runs in accordance with Code.
8. Conduits shall be neatly and systematically run. All exposed conduit and boxes shall be supported by straps (wire or plastic ties are not acceptable), hangers, or clamps to the structural steel, reinforced concrete, or other approved supports. Riser conduits and/or trough in hoistway shall be supported at each floor level.
9. Connections of all wires larger than No. 8 AWG shall be made with copper connectors except for Mainline Disconnect switches where UL approved aluminum lugs/connectors may be used. Metal eyelets pressed around the strands shall be used for all connections of smaller stranded conductors.
10. All terminals shall be tagged or identified in a permanent legible manner to match car and hoistway junction boxes and controllers.
11. In all machine rooms, hoistways, etc., install the equipment to allow easy access for maintenance.
12. All screws used for terminal connections of all wiring (machine room, hoistway and pit) shall be of proper size and type as approved.
13. All connections of wires to controller and motor lead terminals from external circuits shall be made with "copper" soldered lugs or "copper" eyelet compression type lugs.
14. All elevator lights (top and bottom of car and pit) and A.C. alarm bells shall be fused and located in the elevator machine room in a separate approved box, or on the controller. The fuses shall be identified (permanent label) “lights and alarm bells”.
15. All receptacles in elevator machine room, pits, and car shall be Ground-Fault Circuit-Interrupter type (GFCI).
16. All grounding shall be done in accordance with the latest International Electrical Code as adopted by local jurisdiction. Grounding of machine to bedplate is not permitted.

B. Mechanical Design Requirements:

1. All bearings, pivots, guides, guide shoes, gearing, door hanger sheaves, door hanger tracks, and elements subject to friction or rolling wear shall be accurately finished and arranged for convenient lubrication. Provide means for flushing and draining the larger bearings and gear cases. All oiling holes shall have dustproof, self-closing caps.
2. All bearings shall be sized for heavy-duty commercial elevator usage.
3. Ball and roller bearings shall be fully enclosed. Loading, lubrication, support and all other conditions of use shall be in accordance with the recommendations of the bearing manufacturer. Bearings for motors shall be of the open (non-sealed) type with approved fittings for grease lubrication or approved sealed bearings. The bearings shall not be part of the end bell housing, but shall be separate for easy removal and replacement.

4. All bolts used to connect moving parts, bolts carrying hoisting stresses, and all other bolts except guide rail bolts, subject to vibration or shock, shall be designed to prevent loosening of the nuts and bolts. Bolts transmitting shearing stresses between machine parts shall have tight body fit in drilled and reamed holes. All bolts subject to vibration shall be provided with split ring lock washers. All guide rail vane brackets shall be through bolted and provided with proper bolts, nuts and lock washers.
5. All parts shall be manufactured to high precision standards so that wearing parts will be readily interchangeable with stock repair parts with a minimum of field fittings.
6. All bearing and sliding surfaces of shafts, pins, bearings, bushings, guides, etc., shall be smoothly and accurately finished. During the maintenance period, all bearings shall be regularly checked for any tendency to run hot and any defects corrected.
7. Protection for moving parts: Belts, pulleys, chains, gears, couplings, projecting set screws, keys, and other rotating parts located so that any person can come in close proximity thereto, shall be fully enclosed or properly guarded.
8. All exposed hardware on public hall side shall be of tamperproof design constructed of stainless steel with brushed finish.
9. Tamperproof stainless steel spanner head screws shall be used for all exposed locations, for all landing button panels, certificate frames, interlocks and car lighting fixtures. Supply one Spanner head wrench for each size screw. Tamperproof screws shall be of the "captive type". Self-tapping screws or self-tapping machine screws shall not be permitted.
10. All locks and key operated switches shall be five (5) pin tumbler type. All keys where permitted shall be of the captive type. Furnish two (2) keys for each lock and/or switch for each elevator. All locks shall be mastered to one master key. Furnish four (4) master keys. Firemen's Service keys shall meet Local Code requirements.

3.2 WORKMANSHIP AND INSTALLATION

A. Inspection and Tests:

1. Failure to keep the shutdown time within the specified limit may result in cancellation of the contract by the Owner. Any delays in the approved schedule shall be brought immediately to the attention of the Owner, in writing, along with the proposed revised schedule.
2. Arrange and schedule final inspection of all work and notify the Owner in writing that the work has been thoroughly checked and is ready for final inspection. Testing shall be performed under the direction of authorized Inspectors.
3. When the elevator work is completed, conduct operating tests to the satisfaction of the Owner and the appropriate City Agencies having jurisdiction. The inspection procedure outlined in the ASME A17.2 for the Inspection of Elevators, Escalators and Moving Walks, Inspector's Manual will form a part of the final inspection.
4. Furnish all test instruments, labor and materials, required at the time of final inspection. They shall include, but not necessarily be limited to, standard 500 pound test weights.

5. Certificates: Before final acceptance, furnish all certificates required by all Public Agencies having jurisdiction. All certificates shall be turned over to the Owner with copies to the Architect and Consultant.
6. If requested by the Consultant, the following tests shall be made by the Field Engineer or Adjuster of the Elevator Company in the company of the Consultant or the Consultant's Representative, at the time of final inspection:
   a. FULL LOAD-RUN TEST: Shall be for one hour continuous run, with full specified rated load in the car. During the test run, the car shall be stopped at all floors in both directions of travel for a standing period of ten (10) seconds per floor.
   b. SPEED TEST: The actual speed of the elevator car shall be determined in both directions of travel and with full contract load and no load in the elevator car. Speed tests shall be made before and also after the full load run test. Speed shall be determined by applying a tachometer to the car hoisting cables. The actual measured speed of elevator car with full load in "UP" direction shall be within 5 percent of specified rated speed.
   c. TEMPERATURE RISE TEST: The temperature rise of the hoisting motor shall be determined during the full load test run. Temperatures shall be measured by the use of thermometer on top of windings and shielded by cotton waste or putty. Temperature rise of the equipment shall not exceed the temperature rise for the class of insulation used in the motor tests, shall be started only when all parts of the equipment are within 5° centigrade of the ambient temperature at time of starting test.
   d. CAR STOPPING ACCURACY: Elevator stopping shall be tested for accuracy of landing within 1/2 inch plus or minus (from finished floor) at all floors with no load in car, balanced load in car and full load, in both directions of travel. Accuracy of floor landing shall be determined both before and after the full load run test.
   e. INSULATION RESISTANCE TEST: The complete wiring systems of elevator shall be free from short circuits and grounds, and the insulation resistance of systems determined by use of a "Megger", shall be not less than one megohm. (Solid State Controllers are excluded from this test).
   f. CAR SAFETY AND GOVERNOR TESTS: The car safety and governor shall be tested as outlined in Section 1003 ASME A17.1 Code.
   g. STATIC CAR BALANCING: The car shall be statically balanced in its sling so that the total lateral force on top car guide assemblies shall be a maximum of forty pounds (40 lbs.) for all positions of the car in the shaftway.
   h. DYNAMIC SYSTEM BALANCING: Car and counterweight suspension system shall be dynamically balanced so that total weight of counterweight and its frame shall be equal to total weight of unloaded car and its sling, plus forty percent (40%) of contract load with an accuracy of plus or minus fifty pounds (50 lbs).
   i. ELECTRICAL PROTECTIVE DEVICES: All electrical protective devices in the wiring system (Fuses, Overloads, etc.) shall be tested for proper operation.
   j. The FIREMAN'S SERVICE SYSTEM shall be tested for proper operation.

k. PASSENGER OVERLOAD TEST: The car shall be tested with 125% of rated load and shall conform to all passenger overload regulations in ASME A17.1. In addition, the car shall be subjected to the Acceptance and 5 Year Tests for Drive Machine Brakes in ASME A17.2.1, Inspectors' Manual for Electric Elevators.

l. BUFFER TEST: Car and Counterweight Oil Buffers shall be tested in accordance with the requirements for Acceptance and 5 Year Tests for Oil Buffers, as described in ASME A17.2.1, Inspectors' Manual for Electric Elevators.

B. Cleaning, Adjustment, and Final Acceptance:

1. At the end of each day, remove and legally dispose of all refuse and dirt resulting from work of this contract. All work areas shall be left "broom clean". After completion of work, thoroughly clean and adjust elevators so that they are in proper operating condition. Remove from site, all materials which are not required as part of finished work.

C. Safety of Persons and Property:

1. Plan the work and execute in an organized and orderly manner. Danger and warning signs shall be prominently displayed, and exercise every precaution to protect pedestrians.
2. Erect construction barriers around the work area. Keep dust and noise at a minimum. Barricades shall not have protruding nails or sharp jagged edges.
3. If there are two (2) cars in a common shaft, furnish and install temporary wire screening between elevator hoistways. The screening shall be full depth and height of the elevator hoistways and shall be fastened to wood blocking which, in turn, is securely fastened to the Building structure. Wire screening shall be ½ " x ½ " #19 (.041 dia) galvanized wire mesh. All wire screening, wood blocking, protruding nails, etc. shall be removed after completion of work. Damaged concrete shall be repaired.

D. Protection:

1. Protect all items against dirt and damage. The Contractor shall be held fully responsible for all damage until final acceptance. Any equipment or property of the Owner damaged by this Contractor or his employees shall be restored to its original condition or replaced without cost to the Owner.

E. Contractor's Shop:

1. The successful bidder, shall, before being awarded this Contract, prove to the Owner to its satisfaction that he maintains or has access to an adequate shop within a twenty (20) mile radius of Manhattan, carry in stock, all spare parts furnished under this Contract which are subject to periodic failure.

F. Storage:

1. The Owner will designate a suitable area where the Contractor may store equipment until the work is completed. All equipment shall be stored at the sole risk of the Contractor.
2. The Contractor shall provide his own lock and key. The assigned storage area shall be left clear and unencumbered of material or debris and shall be left in a broom-clean condition at the completion of the work. An approved Type "C" fire extinguisher shall be provided and installed on a wall, for each storage area assigned to the Contractor.

G. Access to Elevator Equipment:

1. The Contractor shall provide keys for access to all the elevator equipment.

H. Punch List Items:

1. All punch list items shall be completed within thirty (30) consecutive calendar days of receipt of Punch List items.

3.3 SHAFT CLEANING

A. The entire shaft, from the pit floor to the underside of the machine room slab, shall be thoroughly cleaned of all debris, lint, grease, dust, etc.

3.4 HOISTWAY PROJECTIONS

A. Provide seventy-five (75˚) degree concrete bevels on all ledge projections in excess of two inches (2”) of all elevator hoistways on all floors.

3.5 PAINTING

A. Summary of Work Included:

1. Clean all ironwork and paint with one shop coat of primer coating. Do not paint galvanized steel with enamel coating. After erection, touch up bare spots on iron work. Apply final field coat of paint similar to shop coat.
2. Touch up any wall and ceiling surfaces damaged by work of this project with at least two coats of paint to match finish.
3. Paint metal with one coat of an oil based rust inhibitive primer and one coat of an enamel alkyd paint.

B. Samples:

1. Before placing orders for materials, submit the name or names of manufacturers for approval.

2. Upon approval of the manufacturer, submit samples of all materials. Approval of the samples will be based upon manufacturers certifying that the products proposed are the standard best or top brands produced by them and are readily obtainable as such in "over the counter" sales. Do not proceed until all samples are approved.
3. All materials shall be further subject to field tests from time to time as the work progresses.

C. General Painting Requirements

1. Delivery: Deliver all material in their original containers with seals unbroken. Order in advance, in large enough quantities and in ample time to facilitate the work.
2. Storage of Materials: Store materials where directed. Keep storage space clean and accessible at all times. Remove paint or oil-soaked rags, waste, etc. from the premises at the close of each day's work. Absolutely no flammable or combustible materials are to be stored on the Owner’s property.
3. Protection: Provide suitable coverings to protect all work and all adjacent surfaces and objects.
4. Cleaning Up: Upon completion of the work, remove all surplus materials, empty containers, rags, and other debris from the premises. Touch up finished work where directed. Remove daubs or spatters of paint from all surfaces.

D. Workmanship:

1. Carefully prepare all surfaces to be painted. Do not apply paint until the surfaces are absolutely dry and clean.
2. Shop or priming coats shall be put in good condition; touch up any bare or abraded spots.
3. Wire brush all metal surfaces. Remove all abrasions in the prime coat, rust, scale, etc. Clean and touch up damaged areas to match prime coat. Clean metal work with solvent to remove all dirt and grease.
4. Clean concrete and masonry surfaces to be painted of all grit, dirt and loose material. Patch scratches, cracks, holes and similar defects in wall and ceiling surfaces to provide a smooth flush surface. Patched portions shall be given a coat of primer sealer in addition to all other specified coats.
5. Allow each coat of paint to dry before subsequent coat is applied. The finished work shall be free from runs or sags, defective brushing or brush marks, and clogging of lines and angles. Exposed surfaces shall be left clean.

3.6 WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess materials are Contractor's property. At completion of work, remove from Project site.

B. Excess Waste: Disposal and recycling of waste shall comply with requirements of Division 01 Section "Construction Waste Management And Disposal". Provide documentation of compliance."

END OF SECTION