PROJECT MANUAL
VOLUME 1 OF 2

Additions and Alterations
HC WILCOX REGIONAL VOCATIONALTECHNICAL SCHOOL
298 Oregon Road, Meriden, Connecticut

Project No.: BI-RT-843 – CMR

State Of Connecticut
Department Of Public Works
Bureau of Design and Construction
Jonathan P. Holmes - Commissioner

Prepared By:
Tai Soo Kim Partners, LLC
146 Wyllys Street
Hartford, Connecticut 06106

Bid Due Date/Time:
Day of Week, Date, Year 1:00 P.M.

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HC Wilcox Regional Vocational Technical School

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Seals & Signatures		Seals & Signatures	
	TAI SOO KIM PARTNERS, LLC *Print Consultant Name*		SPIEGEL ZAMECNIK & SHAH *(Print Consultant Name)*
	MILONE & MACBROOM *(Print Consultant Name)*		KOHLER RONAN *(Print Consultant Name)*
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	(Print Consultant Name)		*(Print Consultant Name)*

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M1.07	SECOND FLOOR PLAN-AREA A & C-MECHANICAL
M1.08	SECOND FLOOR PLAN-AREA A-MECHANICAL
M1.09	SECOND FLOOR PLAN-AREA B-MECHANICAL
M1.10	ROOF PLAN-AREA A & C-MECHANICAL
M1.11	ROOF PLAN-AREA A -MECHANICAL
M1.12	ROOF PLAN-AREA B & C-MECHANICAL
M1.13	ROOF PLAN-AREA B & C-MECHANICAL
M1.14	ROOF PLAN-AREA C-MECHANICAL
M1.15	ROOF PLAN-AREA D-MECHANICAL
M2.01	FIRST FLOOR PIPING PLAN-AREA A & C-MECHANICAL
M2.02	FIRST FLOOR PIPING PLAN-AREA A-MECHANICAL
M2.03	FIRST FLOOR PIPING PLAN-AREA B & C-MECHANICAL
M2.04	FIRST FLOOR PIPING PLAN-AREA B & C-MECHANICAL

M2.05	FIRST FLOOR PIPING PLAN-AREA C-MECHANICAL
M2.06	FIRST FLOOR PIPING PLAN-AREA D-MECHANICAL
M2.07	SECOND FLOOR PIPING PLAN-AREA A & C-MECHANICAL
M2.08	SECOND FLOOR PIPING PLAN-AREA A -MECHANICAL
M2.09	SECOND FLOOR PIPING PLAN-AREA B-MECHANICAL
M2.10	SECOND FLOOR PIPING PLAN-AREA C-MECHANICAL
M3.01	FIRST FLOOR MECHANICAL ROOM PART PLANS
M3.02	SECOND FLOOR MECHANICAL ROOM PART PLANS
M3.03	SECOND FLOOR MECHANICAL ROOM PART PLANS
M4.01	MECHANICAL COORDINATION SECTIONS-DEMOLITION
M5.01	AIR HANDLING UNIT DETAILS-MECHANICAL
M5.02	AIR HANDLING UNIT DETAILS-MECHANICAL
M5.03	AIR HANDLING UNIT DETAILS-MECHANICAL
M5.04	AIR HANDLING UNIT DETAILS-MECHANICAL
M5.05	AIR HANDLING UNIT DETAILS-MECHANICAL
M5.06	AIR HANDLING UNIT DETAILS-MECHANICAL
M6.01	FLOW AND CONTROL DIAGRAMS-MECHANICAL
M6.02	FLOW AND CONTROL DIAGRAMS-MECHANICAL
M6.03	FLOW AND CONTROL DIAGRAMS-MECHANICAL
M6.04	FLOW AND CONTROL DIAGRAMS-MECHANICAL
M6.05	AIR FLOW DIAGRAMS-MECHANICAL
M6.06	AIR FLOW DIAGRAMS-MECHANICAL
M7.01	MECHANICAL DETAILS
M7.02	MECHANICAL DETAILS
M7.03	MECHANICAL DETAILS
M7.04	MECHANICAL DETAILS
M7.05	MECHANICAL DETAILS
M7.06	MECHANICAL DETAILS
M7.07	MECHANICAL DETAILS
M8.01	MECHANICAL SCHEDULES
M8.02	MECHANICAL SCHEDULES
M8.03	MECHANICAL SCHEDULES
M8.04	MECHANICAL SCHEDULES
P0.01	PLUMBING SYMBOLS, DRAWING INDEX, NOTES & ABBREVIATIONS
PD1.01	FIRST FLOOR DEMOLITION PLAN-AREA A & C-PLUMBING
PD1.02	FIRST FLOOR DEMOLITION PLAN-AREA A -PLUMBING
PD1.03	FIRST FLOOR DEMOLITION PLAN-AREA B & C-PLUMBING
PD1.04	FIRST FLOOR DEMOLITION PLAN-AREA B & C-PLUMBING
PD1.05	FIRST FLOOR DEMOLITION PLAN-AREA C-PLUMBING
PD1.06	FIRST FLOOR DEMOLITION PLAN-AREA D-PLUMBING
PD1.07	SECOND FLOOR DEMOLITION PLAN-AREA A-PLUMBING
PD1.08	SECOND FLOOR DEMOLITION PLAN-AREA A-PLUMBING
P1.01	FIRST FLOOR PLAN-AREA A & C-PLUMBING
P1.02	FIRST FLOOR PLAN-AREA A -PLUMBING
P1.03	FIRST FLOOR PLAN-AREA B & C-PLUMBING
P1.04	FIRST FLOOR PLAN-AREA B & C-PLUMBING
P1.05	FIRST FLOOR PLAN-AREA C-PLUMBING
P1.06	FIRST FLOOR PLAN-AREA D-PLUMBING
P1.07	SECOND FLOOR PLAN-AREA A -PLUMBING
P1.08	SECOND FLOOR PLAN-AREA A -PLUMBING
P1.09	SECOND FLOOR PLAN-AREA B -PLUMBING

P1.10	ROOF PLAN-AREA A & C-PLUMBING
P1.11	ROOF PLAN-AREA A -PLUMBING
P1.12	ROOF PLAN-AREA B & C-PLUMBING
P1.13	ROOF PLAN-AREA B & C-PLUMBING
P1.14	ROOF PLAN-AREA C-PLUMBING
P1.15	ROOF PLAN-AREA D-PLUMBING
P3.01	FIRST FLOOR PART PLANS-PLUMBING
P3.02	FIRST FLOOR PART PLANS-PLUMBING
P3.03	FIRST FLOOR PART PLANS-PLUMBING
P3.04	SECOND FLOOR PART PLANS-PLUMBING
P4.01	DETAILS - PLUMBING
P4.02	DETAILS - PLUMBING
P5.01	SCHEDULES - PLUMBING
P5.02	SCHEDULES - PLUMBING
E0.01	NOTES & SYMBOLS-ELECTRICAL
E0.02	LIGHT FIXTURE SCHEDULE-ELECTRICAL
ED1.01	FIRST FLOOR DEMOLITION PLAN-AREA A & C-ELECTRICAL
ED1.02	FIRST FLOOR DEMOLITION PLAN-AREA A-ELECTRICAL
ED1.03	FIRST FLOOR DEMOLITION PLAN-AREA B & C-ELECTRICAL
ED1.04	FIRST FLOOR DEMOLITION PLAN-AREA B & C-ELECTRICAL
ED1.05	FIRST FLOOR DEMOLITION PLAN-AREA C-ELECTRICAL
ED1.06	FIRST FLOOR DEMOLITION PLAN-AREA D-ELECTRICAL
ED1.07	SECOND FLOOR DEMOLITION PLAN-AREA A-ELECTRICAL
ED1.08	SECOND FLOOR DEMOLITION PLAN-AREA A-ELECTRICAL
ED1.09	SECOND FLOOR DEMOLITION PLAN-AREA C-ELECTRICAL
ED1.10	ROOF DEMOLITION PLAN-AREA A & C-ELECTRICAL
ED1.11	ROOF DEMOLITION PLAN-AREA A -ELECTRICAL
ED1.12	ROOF DEMOLITION PLAN-AREA B & C-ELECTRICAL
ED1.13	ROOF DEMOLITION PLAN-AREA B & C-ELECTRICAL
ED1.14	ROOF DEMOLITION PLAN-AREA C-ELECTRICAL
ED1.15	ROOF DEMOLITION PLAN-AREA D-ELECTRICAL
E1.00	SITE PLAN-ELECTRICAL
E1.01	FIRST FLOOR PLAN-AREA A & C-ELECTRICAL
E1.02	FIRST FLOOR PLAN-AREA A -ELECTRICAL
E1.03	FIRST FLOOR PLAN-AREA B & C-ELECTRICAL
E1.04	FIRST FLOOR PLAN-AREA B & C-ELECTRICAL
E1.05	FIRST FLOOR PLAN-AREA C-ELECTRICAL
E1.06	FIRST FLOOR PLAN-AREA D-ELECTRICAL
E1.07	SECOND FLOOR PLAN-AREA A & C-ELECTRICAL
E1.08	SECOND FLOOR PLAN-AREA A-ELECTRICAL
E1.09	SECOND FLOOR PLAN-AREA B-ELECTRICAL
E1.10	ROOF PLAN-AREA A & C-ELECTRICAL
E1.11	ROOF PLAN-AREA A -ELECTRICAL
E1.12	ROOF PLAN-AREA B & C-ELECTRICAL
E1.13	ROOF PLAN-AREA B & C-ELECTRICAL
E1.14	ROOF PLAN-AREA C-ELECTRICAL
E1.15	ROOF PLAN-AREA D-ELECTRICAL
E2.01	FIRST FLOOR PLAN-AREA A & C-LIGHTING
E2.02	FIRST FLOOR PLAN-AREA A -LIGHTING
E2.03	FIRST FLOOR PLAN-AREA B & C-LIGHTING
E2.04	FIRST FLOOR PLAN-AREA B & C-LIGHTING

E2.05	FIRST FLOOR PLAN-AREA C-LIGHTING
E2.06	FIRST FLOOR PLAN-AREA D-LIGHTING
E2.07	SECOND FLOOR PLAN-AREA A & C-LIGHTING
E2.08	SECOND FLOOR PLAN-AREA A -LIGHTING
E2.09	SECOND FLOOR PLAN-AREA B-LIGHTING
E3.01	FIRST FLOOR MECHANICAL ROOM PART PLANS-ELECTRICAL
E3.02	SECOND FLOOR MECHANICAL ROOM PART PLANS-ELECTRICAL
E4.01	RISER DIAGRAM-ELECTRICAL
E4.02	RISER DIAGRAM-FIRE ALARM
E4.03	RISER DIAGRAM-PUBLIC ADDRESS/CLOCK
E5.01	DETAILS-ELECTRICAL
E5.02	DETAILS-ELECTRICAL
E5.03	DETAILS-ELECTRICAL
E6.01	SCHEDULES-ELECTRICAL
E6.02	SCHEDULES-ELECTRICAL
E6.03	SCHEDULES-ELECTRICAL
E6.04	SCHEDULES-ELECTRICAL
E6.05	SCHEDULES-ELECTRICAL
E6.06	SCHEDULES-ELECTRICAL
E6.07	SCHEDULES-ELECTRICAL
E6.08	SCHEDULES-ELECTRICAL
T0.01	NOTES & SYMBOLS-TELECOMMUNICATIONS
T1.01	FIRST FLOOR DEMOLITION PLAN-AREA A & C- TELECOMMUNICATIONS
T1.02	FIRST FLOOR DEMOLITION PLAN-AREA A - TELECOMMUNICATIONS
T1.03	FIRST FLOOR DEMOLITION PLAN-AREA B & C- TELECOMMUNICATIONS
T1.04	FIRST FLOOR DEMOLITION PLAN-AREA B & C- TELECOMMUNICATIONS
T1.05	FIRST FLOOR DEMOLITION PLAN-AREA C- TELECOMMUNICATIONS
T1.06	FIRST FLOOR DEMOLITION PLAN-AREA D- TELECOMMUNICATIONS
T1.07	SECOND FLOOR DEMOLITION PLAN-AREA A & C- TELECOMMUNICATIONS
T1.08	SECOND FLOOR DEMOLITION PLAN-AREA A - TELECOMMUNICATIONS
T1.09	SECOND FLOOR DEMOLITION PLAN-AREA B- TELECOMMUNICATIONS
T3.01	ONE LINE DIAGRAM-TELECOMMUNICATIONS
T4.01	DETAILS-TELECOMMUNICATIONS
FP0.00	NOTES & SYMBOLS-FIRE PROTECTION
FPD1.01	FIRST FLOOR DEMOLITION PLAN-AREA A & C-FIRE PROTECTION
FPD1.02	FIRST FLOOR DEMOLITION PLAN-AREA A -FIRE PROTECTION
FPD1.03	FIRST FLOOR DEMOLITION PLAN-AREA B & C-FIRE PROTECTION
FPD1.04	FIRST FLOOR DEMOLITION PLAN-AREA B & C-FIRE PROTECTION
FPD1.05	FIRST FLOOR DEMOLITION PLAN-AREA C-FIRE PROTECTION
FPD1.06	FIRST FLOOR DEMOLITION PLAN-AREA D-FIRE PROTECTION
FPD1.07	SECOND FLOOR DEMOLITION PLAN-AREA A & C-FIRE PROTECTION
FPD1.08	SECOND FLOOR DEMOLITION PLAN-AREA A-FIRE PROTECTION
FPD1.09	SECOND FLOOR DEMOLITION PLAN-AREA B & C-FIRE PROTECTION
FP1.01	FIRST FLOOR PLAN-AREA A & C-FIRE PROTECTION
FP1.02	FIRST FLOOR PLAN-AREA A -FIRE PROTECTION
FP1.03	FIRST FLOOR PLAN-AREA B & C-FIRE PROTECTION
FP1.04	FIRST FLOOR PLAN-AREA B & C-FIRE PROTECTION
FP1.05	FIRST FLOOR PLAN-AREA C-FIRE PROTECTION
FP1.06	FIRST FLOOR PLAN-AREA D-FIRE PROTECTION
FP1.07	SECOND FLOOR PLAN-AREA A & C-FIRE PROTECTION

FP1.08	SECOND FLOOR PLAN-AREA A -FIRE PROTECTION
FP1.09	SECOND FLOOR PLAN-AREA B & C-FIRE PROTECTION
FP1.10	SECOND FLOOR PLAN-AREA C-FIRE PROTECTION
FP2.00	RISER DIAGRAM-FIRE PROTECTION
FP3.00	DETAILS-FIRE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Survey Information can be found on drawing L1.01 and L1.02.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION **00 31 21**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Existing hazardous material information can be found in Appendices 1, 3, and 4.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION **00 31 26**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Geotechnical Data can be found in Appendix 2.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION **00 31 32**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Number: BI-RT-843.

B. Project Title: Additions and Alterations, HC Wilcox Regional Vocational Technical School.

C. Project Location: 298 Oregon Road, Meriden, Connecticut.

D. The Project Description: The Work includes but is not limited to the following and as Work shown on drawings and specified on specification sections.

1. Construction of approximately 76,400 gross square feet of new building construction and 99,000 gross square feet of building renovation.
2. The building shall be constructed of materials that include but are not limited to the following:
   a. The structure shall consist of steel columns, beams and girders. Elevated slabs are concrete on metal deck.
   b. Exterior wall construction shall consist of brick cavity wall with both CMU and light gage metal framing back-up. Fenestration shall consist of aluminum storefront, curtainwall, and operable windows.
   c. Roof construction shall consist of EPDM on polyisocyanurate insulation over metal deck.
   d. Foundations shall consist of concrete spread footings.
   e. Interior finishes include CMU, brick, ceramic tile, linear channel glazing, and gypsum board.
   f. Floor coverings include VCT, ceramic tile, carpet, wood strip and wood block flooring, terrazzo tiles, and resinous flooring.
   g. Ceilings shall be acoustic panel, gypsum board, and linear metal.
3. A portion of this project **exceeds** the Threshold Limits as defined by Connecticut General Statutes and/or is a CSUS 2020 Project as identified by the Connecticut General Statutes and the enforcement of the Connecticut State Building and Fire Code is under the jurisdiction of the Office of State Building Inspector and the Office of State Fire Marshal.
4. A portion of this project **does not exceed** the Threshold Limits as defined by the Connecticut General Statutes and the enforcement of the Connecticut State Building and Fire Code is under the jurisdiction of the Connecticut Department of Public Works, Code Unit.

E. Owner:

1. **Owner's Name:** The Owner is the Department of Public Works, State of Connecticut.
2. **DPW Project Manager Name: Barbara Cosgrove**.
   a. **DPW Project Manager's Location:** The Project manager is located in Room 465, at 165 Capitol Avenue, Hartford, CT, 06604.
   b. **Phone:** (860) 713-5644;
   c. **Fax:** (860) 713-7264
   d. **Email(s):** barbara.cosgrove@ct.gov.
3. **Authority:** The DPW Project Manager is the only authorized representative for the Department of Public Works Commissioner to act in matters involving revoking, altering, enlarging or relaxing any requirement of the contract documents.
   a. **Related Section:** Article 25, All Work Subject To Control Of The Commissioner, Division 00 General Conditions Of The Contract For Construction For Construction Manager At Risk (CMR).

F. Agency:

1. **Name:** The Connecticut State (User) Agency is The Department of Education.

2. **Agency Representative Name and Title:** Al Richmond. The Agency Representative's Title is Facility Planning Consultant.
   a. **Agency Representative Location:** The representative is located at 25 Industrial Park Road, Middletown, Connecticut, 06457.
   b. **Phone:** (860) 807-2181
   c. **Fax:** (806) 807-2196
   d. **Email(s):** al.Richmond@po.state.ct.us
3. **Authority:** The Agency Representative has the administrative authority for the facility and or site where the work is being performed but does not have the authority to change the contract documents or direct the Construction Manager.

G. **Architect and Engineer:**

1. **Architect's Name:** The Architectural Firm is Tai Soo Kim Partners, LLC. The Architect representing the firm for this project is Randall Luther.
   a. **Architect's Location:** The Architect is located at 146 Wyllys Street, Suite 1-203, Hartford, CT, 06106.
   b. **Phone:** (860) 547-1970;
   c. **Fax:** (860) 249-0695;
   d. **Email(s):** rluther@tskp.com.
2. The Architect and Engineer or their accredited representative is referred to in the Contract Documents as "Architect" or "Architects" or "Engineer" or "Engineers" or by pronouns which imply them. As information for the Construction Manager, the Architect's or Engineer's status is defined as follows:
   a. The Architect and Engineer will not make interpretations or decisions directly to the ~~r~~ Construction Manager. All interpretations or decisions will be conveyed through the Owner's Representative to the Project Manager.
   b. As the authorized representative of the Department of Public Works Commissioner, the Architect and Engineer is responsible for review of shop drawings, materials, and equipment intended for the work, in accordance with the "General Conditions - CMR", and the "Supplementary Conditions."
3. Wherever the Architect or Engineer is mentioned in the documents in connection with an administrative function, it shall include the Owner's Representative in that function except for shop drawings.
4. **Related Section:** Article 25, Division 00 General Conditions Of The Contract For Construction For Construction Manager At Risk (CMR).

H. **Owner's Representative (OR):**

1. **Owner's Representative Name:** Downes Construction.
   a. **Owner's Representative Location:** The Owner's Representative is located at 200 Stanley Street, New Britain, Connecticut, 06050.
   b. **Phone:** (860) 229-3755.
   c. **Fax:** (860) 225-3617.
   d. **Email(s):** DownesCo@DownesCo.com
2. **Authority:** As information to the Construction Manager, the Owner's Representative status is defined as follows:
   a. The Owner's Representative is referred to in the Contract Documents as Owner's Representative or by pronouns which imply it. All communications concerning the project will be directed through the Owner's Representative or a designated representative(s).
   b. The Owner's Representative is the Owner's Agent who will, among other thing's, monitor and analyze the Construction Manager's performance, scheduling and construction, process shop drawings, material, and equipment submittals, review and process periodic billings, review, analyze, and recommend cost changes.
5. **Related Section:** Article 26 "Authority of the Owner's Representative", Division 00, General Conditions of the Contract for Construction for Construction Manager at Risk (CMR).

J. **Construction Manager (CMR):**

1. **Construction Manager's Name (CMR): [Insert]**

a. **Construction Manager's Firm's Location:** The Construction Manager is located at **[Insert]**, **[Insert]**, **[Insert]**.

b. **Phone: [Insert]**;

c. **Fax: [Insert]**;

d. **Email(s): [Insert]**.

2. **Authority:** Construction Manager is under direct Contract with the Department of Public Works, responsible for performing the Work under the Contract Documents. Whenever the words "Contractor" or "General Contractor" are used it shall be understood to mean Construction Manager.

3. **Related Sections:** Article 1 "Definitions" of Division 00, General Conditions of the Contract for Construction for Construction Manager at Risk (CMR). and Article 2, Construction Manager At Risk Responsibilities, 2.3, Construction Phase of Section 00 52 23 Standard Form of Agreement Between Owner and Construction Manager-At-Risk (CMR) For Guaranteed Maximum Price (GMP).

K. Work Includes but is not limited to the following:

1 Site Construction, Landscaping, Site Utilities;

2 Cast-in-Place Concrete;

3 Masonry;

4 Structural Steel, Miscellaneous Metals;

5 Rough Carpentry, Architectural Woodwork;

6 Insulation, Sprayed-on Fireproofing, Firestopping, Roofing, Sheet metal, and Joint Sealants;

7 Doors and Frames, Overhead Doors, Aluminum Windows, Hardware, and Glazed Aluminum Curtain Wall;

8 Drywall, Floor Coverings, Acoustical Ceilings, and Painting;

9 Visual Display Boards, Toilet Compartments, Louvers and Vents, Signage, Lockers, Fire Extinguishers, and Toilet Accessories;

10 Projection Screens, Laboratory Furnishings, Fume hoods, Fittings and Fixtures, and Equipment;

11 Window Shades and Floor Mats;

12 Elevators;

13 Plumbing, Fire Protection, HVAC, and Controls;

14 Electrical and Fire Alarm Systems; and

15 Special Equipment.

L. The Construction Manager will include in his bid, all items required in order to carry out the intent of the Work as described, shown and implied in the Contract Documents.

M. It shall be the Construction Manager's responsibility upon discovery to immediately notify the Owner's Representative, in writing, of errors, omissions, discrepancies, and instances of noncompliance with applicable codes and regulations within the documents, and of any work which will not fit or properly function if installed as indicated on the Contract Documents. Any additional costs arising from the Construction Manager's failure to provide such notification shall be borne by the Construction Manager.

N. The Work will be constructed under a Construction Manager-At-Risk (CMR) For Guaranteed Maximum Price (GMP contract.

1.3 WORK SEQUENCE (PHASES):

A. The Project shall be constructed in three Phases. Work of this Phase shall be substantially complete, ready for occupancy within 1,125 days of commencement of the Work.

B. The intent of Phase one is to install portable classrooms, temporary parking, demolish the northernmost classroom wing allowing, begin construction of the northern additions, and renovate the southern end of the existing shop wing. All utilities, both inside and outside necessary to complete the work of this phase must occur during this phase. To accomplish this work, the following sequence must be followed.

1. Install site utilities necessary to support portable classrooms, renovations, trailer(s), and new construction.

2. Install temporary parking lot.
3. Install shop wing temporary partitions and temporary corridor, begin renovation work, and install portable classrooms.
4. Students and staff relocate to portables.
5. Install temporary partitions and corridor in academic wing(s).
6. Abate then demolish classroom wing.
7. Begin northern addition.

C. The intent of Phase two is to continue with the construction of the northern addition, including the construction of temporary offices in A169, while at the same time, renovating another section of the shop wing. All utilities, both inside and outside necessary to complete the work of this phase must occur during this phase. Allow one week between phase one and phase two to allow the Owner to move out of the phase two work area.

D. The intent of Phase three is to renovate the existing western academic building, and complete the associated additions. Simultaneously, the remaining existing shop areas are to be renovated and the eastern annex building is also to be renovated. At the completion of the western academic building renovations and additions, the portables are to be removed and all work that is remaining in order to fully complete the entire project, as shown on the drawings and/or as specified hereinafter, shall be completed. To accomplish this work, the following sequence must be followed.

1. Students and staff relocate to completed addition and/or completed shops. Service garage equipment relocated to storage containers (by Owner) and hairdressing relocates off site. Allow two weeks.
2. Begin renovations of remaining areas.
3. Complete the western academic renovation and addition(s).
4. Relocate students and staff from portables and temporary administration to completed renovation and addition(s). Allow one week.
5. Complete room A169, remove portable classrooms, and remove temporary parking lot.
6. Complete sitework within portable classroom footprint, restore site, and complete all remaining scope not yet completed.

1.4 CONSTRUCTION MANAGER AT RISK USE OF PREMISES:

A. General: During the construction period the Construction Manager shall have full use of the newly constructed premises for construction operations, including use of the site. The Construction Manager's use of the premises is limited only by the Owner's right to perform work or to retain other Contractors on portions of the Project.

B. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

8. **Owner Occupancy:** Allow for Owner occupancy and use by the public of the existing facility.
9. The Construction Manager shall confine his operations including storage of materials, supplies, equipment, and apparatus to the areas bounded by the contract limits indicated and as directed in the Contract Documents.
10. Existing roads, drives, walks, and parking areas which are not within the contract limit line are to be kept free and clear at all times. All deliveries for the project are to enter the property from the temporary Contractor gates located along Oregon Road. The Construction Manager shall check all roadways for accessibility and clearances for deliveries of all large material and equipment. The Construction Manager shall inform the Owner's Representative at least seventy-two (72) hours in advance of these deliveries so they can be coordinated with the Agency so appropriate traffic control, etc. can be provided. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
11. The Construction Manager shall be responsible for keeping the premises clean and shall pick up rubbish and debris and promptly remove from site.
12. Parking for the Construction Manager's employees will be limited to an area designated by the Owner's Representative, and the Construction Manager may be required to provide identification stickers for all employees' cars.
13. Special precautions shall be taken to protect all wetland areas designated to remain. Prevent any and all sediment, debris, or other materials from getting into these areas. Should any sediment, debris, or

other materials get into these areas or if any damage occurs to the vegetation therein, the Construction Manager shall immediately contact the Owner's Representative for direction.

14. The Construction Manager shall comply with local working hour restrictions, unless specifically approved otherwise in writing by the Owner.

15. No signs, other than those approved by the Owner's Representative, will be visible on the premises.

C. **Use of the Existing Building:** Maintain the existing building in a weather-tight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period. Note: Check with Agency special types of conditions. The Construction Manager's personnel are not allowed to use the Cafeteria or vending machines within the existing buildings unless authorized in writing by the Agency and Owner.

1.5 OCCUPANCY REQUIREMENTS:

A. **Full Agency Occupancy During Construction:** The Owner reserves the right to allow the Agency to occupy the site and existing building during the entire construction period. Cooperate with the Agency during construction operations to minimize conflicts and facilitate Agency usage. Perform the Work so as not to interfere with the Agency's operations.

1. Provide adequate building and fire code egress from the buildings during the renovation process and/or as indicated on the Contract Documents. The Construction Manager will be responsible to maintain and protect egress ways during the construction sequence as required and/or indicated in the Contract documents. The Construction Manager shall be responsible for preparing egress plans for Owner approval and for Office of State Building Official and Office of State Fire Marshal for approval if required.

B. **Partial Agency Occupancy:** The Owner reserves the right to allow the Agency to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion, provided 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.

C. **No Occupancy:** Agency will not occupy the building or any completed portions thereof prior to Substantial Completion of the Work.

1.6 OWNER-FURNISHED PRODUCTS:

A. The Owner may furnish various products such as indicated in the construction documents. The Work includes providing support systems to receive Owner's equipment, and mechanical and electrical connections.

1. The Owner will arrange for and deliver necessary shop drawings, product data, and samples to the Construction Manager.

2. The Owner will arrange and pay for delivery of Owner-furnished items according to the Construction Manager CPM Schedule.

3. Following delivery, the Owner will inspect items delivered for damage.

4. If Owner-furnished items are damaged, defective, or missing, the Owner will arrange for replacement.

5. The Owner will arrange for manufacturer's field services and for the delivery of manufacturer's warranties to the Construction Manager.

6. The Construction Manager shall designate delivery dates of Owner-furnished items in the Construction Manager CPM Schedule.

7. The Construction Manager shall review shop drawings, product data, and samples and return them to the Architect noting discrepancies or problems anticipated in use of the product.

8. The Construction Manager is responsible for receiving, unloading, and handling Owner-furnished items at the site.

9. The Construction Manager is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements. The Construction Manager shall repair or replace items damaged as a result of his operations.

1.7 MISCELLANEOUS PROVISIONS:

A. **Examination of Site:**

1. It is not the intent of the Documents to show all existing conditions. All Subcontractors are advised to attend the Construction Manager's Pre-bid Conferences prior to submitting their Bid Proposals to the

Construction Manager. This is the only official opportunity to visit and examine the site with the Owner, Agency, Architect, Engineer and Owner's Representative.

2. The Construction Manager should investigate and satisfy themselves as to the conditions affecting the work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, uncertainties of weather, roads or similar physical conditions of the ground, the character of equipment, and facilities needed preliminary to and during the prosecution of the Work. The Construction Manager should further satisfy themselves as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the Contract Documents. Any failure by the Construction Manager to acquaint themselves with the available information shall not relieve them from the responsibility for estimating properly the difficulty and cost of successfully performing the Work.

3. If tests have been done for Asbestos containing Material (ACM), and/or Lead Containing Material (LBP), the results are in Appendix 1.

4. Tests have been done for Work Involving "Products Containing Persistent Bioaccumulative Toxic Chemicals" (PBT's) such as Polychlorinated Biphenols (PCB's), Di-2-ethylhexyl Phthalate (DEHP) and Mercury, the results are in a separate volume of this Project Manual. Division 01 Section 01 35 16 "Alteration Project Procedures - CMR" states exposure limits and removal responsibility.

5. **Subsurface Geotechnical Investigations:**
   a. Boring logs have been prepared for the site of this work and are in the Contract Documents.
   b. Geotechnical Reports(s) have been prepared for this project and are in Appendix 2. The Owner shall be responsible for the remediation and disposal of all Contaminated Soils indicated. The Construction Manager shall be responsible for the excavation, staging, loading, transportation, and disposal of the Contaminated Soils indicated in this report. See Division 2 Section 02 02 26, "Excavation of PCB Remediation Waste Soils" for additional technical specifications and Contractor responsibilities.

      i. The Construction Manager must interpret the Geotechnical Report (s) according to their own judgment and acknowledges that he is not relying upon the data as accurately describing the subsurface conditions which may be found to exist.

      ii. The Construction Manager further acknowledges that he assumes all risk contingents upon the nature of the subsurface conditions, which shall be actually encountered by them in performing the Work of this Contract.

      iii. The Construction Manager should visit the site and become acquainted with all existing conditions and may make their own subsurface investigations to satisfy themselves as to the subsurface conditions. Such investigations shall be conducted only under time schedules and arrangements approved in advance by the Owner.

   c. **Subsurface Contaminated Soils Investigations:**

      i. If the Construction Manager should encounter any material suspect or known to contain Contaminated Soils, that was not previously assigned as the Construction Manager's responsibility, the Construction Manager should immediately notify the Owner of same. It is the State's responsibility to have the material tested and abated (if necessary). The Owner will respond within two (2) Calendar Days after receiving the Construction Manager written request for testing the suspect material. The Construction Manager shall arrange for the remediation and disposal of all discovered Contaminated Soils (if necessary) within a reasonable time period, i.e. within seven (7) Calendar Days.

      ii. No attempt has been made to locate hazardous material associated with existing site utilities, though it is presumed that at least some asbestos may be discovered associated with underground piping during the course of site and site utilities work. If and when such materials appear, the Construction Manager shall notify the Owner, who shall approve additional work to this Contract to assist in cutting up and disposing of same. The Construction Manager shall assist the hazardous materials Subcontractor(s) with excavating, heavy lifting, and the like at no additional cost to the Owner.

B. **Pre-Bid Conference:**

1. Pre-Bid Conferences and tour of the site will be conducted as scheduled by the-Construction Manager. This scheduled conference is the only official opportunity for the bidders to tour the site with the Owner, Agency, Architect, Engineer, Owner's Representative.

E. Project Documents:

1. The Specifications and Drawings are intended to describe and illustrate the materials and labor necessary for the work of this Project.
2. Throughout the Technical Specifications, the Connecticut Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction Form 816, current edition including any interim and supplemental specifications are referenced. Where so referenced the requirements set forth therein are applicable and made a part hereof. Copies of Form 816 are available from the Connecticut Department of Transportation at a nominal charge.

D. Site Logistics Plan(s): Site Logistics Plan(s) for this Project are in the Contract Documents. The Site Logistics Plan(s) describe in detail the proposed use of the Site and Building, both inside and outside the Contract Limit Area.

1. **Related Section:** Section 01 31 00, Project Management And Coordination – CMR, 1.5 Submittals, A, (4).
2. The **Site Logistics Plan(s)** include, but are not be limited to the following information:

   a. phasing requirements;
   b. proposed vehicle and equipment access routes;
   c. locations of proposed staging/lay-down and storage areas, utility connections;;
   d. building egress, proposed pedestrian traffic flows in the interior and exterior of the building;
   e. temporary access-ways;
   f. office trailer locations;
   g. location of perimeter construction fencing and gates;
   h. other protection measures around and in the building(s);
   i. temporary partitions, proposed pedestrian traffic flows around and in each building;
   j. proposed building access points;
   k. coordination of activities that relate to building occupants and other field applied measure to protect and coordinate the work including any relocation of utilities.

F. Scope Review:

1. Prior to signing ~~a~~ Subcontracts with the Construction Manager will conduct a full Scope Review Meetings with each of the apparent Subcontractor Lowest Qualified Subcontractor Bidders to ensure that all of the requirements have been included within their bid. This scope review will highlight all of the specific requirements of the project, a review of the Construction Manager's procedures and all of the Technical sections of the contract documents. The Construction Manager's Scope Review Meetings shall be held with the DPW Project Manager, Architect/Engineer, and Owner's Representative in attendance.
2. This process will ensure that all of the Scope of Work included in the contract documents has indeed been included.

G. Drawings, Disks and Specifications Furnished:

1. The Construction Manager shall receive one (1) set of AutoCAD compatible (latest version) Floor Plans on disks at no cost on or about the time of execution of the Contract from the Architect. Additional sets of AutoCAD compatible (latest version) Floor Plans on disks from the Architect at the cost of their reproduction, to the Construction Manager.
3. The Construction Manager will be given one (1) set-of the Contract Documents on or about the time of execution of the Contract, free of charge. If additional copies are wanted, they will be available at the direct additional cost of their reproduction, to the Construction Manager.

H. Construction Responsibility:

1. The Construction Manager shall be responsible for all construction means, methods, techniques, sequences, and procedures employed in the performance of all the of the Work and shall have full responsibility for any failures to carry out any part of the Work in accordance with the Contract Documents.

I. Overtime:

1. The Construction Manager shall request approval from the Owner to work overtime. Said request shall be made forty-eight (48) hours in advance. All costs for overtime are included in the Guaranteed Maximum Price as stated in Amendment 1 to the Agreement Between Owner and Construction Manager.

J. Prolog Project Management:

1. The State of Connecticut Department of Public Works (CTDPW) is using Meridian Systems Prolog Manager as the project management collaborative software tool for this project.

2. The Construction Manager is required to utilize Prolog Manager for the duration of this project and shall provide all project information via this program. This includes, but is not limited to contracts, applications for payment, change orders, change order proposals, requests for information, etc.

3. The Construction Manager is required to purchase five (5) concurrent licenses to be utilized on the CT DPW Prolog Hosted System from Meridian Systems, through PSS Consulting Group and maintain the licenses, software support, and hosting services through the duration of this project. At end of the project, these licenses shall be turned over to the CTDPW. The cost for the licenses, support of the licenses, and hosting fees shall be included by the Construction Manager in the General Conditions costs for this project.

4. The Construction Manager shall provide for training as directed by the Owner's Representative or DPW Project Manager for the Owner's Representative, Owner, and their representatives. The cost for the training shall be included by the Construction Manager in the General Conditions costs for this project.

5. The Construction Manager shall contact PSS Consulting Group, the authorized Meridian reseller, for the licenses and training at http://www.pssgroup.com | david@pssgroup.com or **Phone:** (978) 440-7060 | **Fax:** (508) 653-5080.

6. Connecticut Department of Public Works (CTDPW) will be establishing a project specific email "file" address for this project. The Construction Manager shall send an electronic "file" copy of all project documents to this email address, to include but not limited to all project correspondence, project emails, forms, etc.

7. The Construction Manager is required to scan all documents that contain wet (ink) signatures and send a copy of those documents electronically to the DPW Project Manager and the project specific email "file" address. The hard copy of the wet signature documents shall be transmitted as directed by the DPW Project Manager. This includes, but is not limited to all contracts, change orders, applications for payment, etc.

K. Pursuant to C.G.S. Sec. 4a-101, the Construction Manager shall compile evaluation information during the performance of the contract on each of its subcontractors who are performing work with a value in excess of five hundred thousand dollars ($500,000.00). The Construction Manager shall complete and submit to the State of Connecticut Department of Public Works (CTDPW) evaluations of each such Subcontractor upon fifty percent (50%) completion of the project and upon Substantial Completion of the project. The Construction Manager acknowledges that its failure to complete and submit these evaluations in a timely manner may, by statute, result in a delay in project funding and, consequently, payment to the Construction Manager. The Construction Manager agrees to indemnify and hold the State harmless from any loss, damage, or expense that results from or is caused by the Construction Manager's failure to complete and submit the evaluations to CTDPW in accordance with this provision.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 11 00 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Contract Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions, other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Unit Prices.

B. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 26 00 – CMR, "Contract Modification Procedures".

2. Division 01Section 01 29 76 – CMR, "Progress Payment Procedures".

3. Division 01 Section 01 77 00 – CMR, "Closeout Procedures".

1.3 OWNER'S CONTINGENCY ALLOWANCE:

A. This Section includes administrative and procedural requirements for Owner's Contingency Allowance~~s~~.

B. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 26 00 – CMR, "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

2. Division 00 Section 00 72 23 General Conditions Of The Contract For Construction For Construction Manager At Risk (CMR).

3. Division 00 Section 00 52 23 Standard Form of Agreement Between Owner and Construction Manager-At-Risk (CMR) For Guaranteed Maximum Price (GMP) and Amendment 1.

C. **Owner's Allowance:**

1. The Construction Manager's costs for unloading and handling, labor, installation costs, storage, insurance, overhead and profit and other expense related to ~~the~~ Owner's CONTINGENCY Allowance items are included in the CMR's Guaranteed Maximum Price ("GMP").

2. **Change Orders:** All Owners' CONTINGENCY Allowance items shall follow the same procedures for submitting and handling of Change Orders in Division 01 Section 01 26 00 "Contract Modification Procedures".

1.4 QUANTITY ALLOWANCES:

A. The Contractor's costs for unloading and handling, storage, insurance, overhead and profit and other expense related to the Allowance item shall be included in the Lump Sum Bid Amount and not in the Allowance unless stated otherwise in the Allowance Schedule of this section.

B. Architect/Engineer Responsibilities:

1. Review Change Order.

C. Construction Administrator Responsibilities:

1. Assist Architect/Engineer, Project Manager and Agency Representatives with verifying quantities.

2. Review/Prepare Change Order.

D. Contractor Responsibilities:

1. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.

2. If the actual quantities of an Allowance item are more or less than the specified amount, the Contract Sum will be adjusted by Change Order utilizing the quantity allocation to establish an add/deduct unit price. This unit price will be determined by dividing the allowance value by the specified number of units. The unit price established will be used for deduct changes. The unit price plus 10% will be used for add changes. The quantity allowance must appear as a separate line item in the schedule of values.

1.5 UNIT PRICES – GENERAL:

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

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 26 00 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

2. Division 01 Section 01 29 76 "Progress Payment Procedures" for procedures for submitting Application for Payments.

3. Division 00 Section 00 72 23 General Conditions Of The Contract For Construction For Construction Manager At Risk (CMR).

4. Division 00 Section 00 52 23 Standard Form of Agreement Between Owner and Construction Manager-At-Risk (CMR) For Guaranteed Maximum Price (GMP) and Amendment 1.

5. Division 02 Section 02 82 13 “Asbestos Abatement” for unit prices associated with asbestos.

6. Division 02 Section 02 82 15 “Abatement of PCB Contaminated Building Materials” for unit prices associated with PCB’s.

C. Definitions: The monetary value stated by the Owner, as a price per unit of measurement for materials or services as described in Division 01 Section 01 20 00 Contract Considerations – CMR) and as accepted by the CMR in Section 00 42 23 CMR Fee Proposal Form.

1. Unit Price: The Construction Manager acknowledged in the submittal of their Section 00 42 23 CMR Cost Proposal Form acceptance of the price per unit of measurement for materials or services as described in the Bidding Documents or in the Contract Documents.

D. Procedures:

1. Unit Prices included in the Contract Documents are to be used for determining compensation to the Construction Manager or Owner for changes to the scope of the work indicated in the Contract Documents, and are included in the Guaranteed Maximum Price (GMP). Special Unit Prices are for items complete, in place, and shall be inclusive of furnishing and installing of all material, labor, trucking, overhead, profit, equipment, hoisting, engineering, scaffolding, power hookups, protection, shop drawings, taxes, permits, appliances, delivery, insurance, supervision, cost of bond, etc. and shall remain in effect until completion of the Contract.

2. Unit Price: Is identified by the Owner as a price per unit of measurement for materials or services added to or deducted from the Guaranteed Maximum Price (GMP) by appropriate modification, if the estimated quantities of Work required by the Contract Documents are increased or decreased.

a. Should the amount of the Work required be increased or decreased because of changes in the work ordered in writing by the DPW Project Manager, the Construction Manager agrees that the following supplemental UNIT PRICES will be decreased **ten percent (10%)** for a reduction of work. Each Unit Price shall include all equipment, tools, labor, permits, fees, etc., incidental to the completion of the work involved. All items marked with an asterisk (*) in the unit price schedules shall include the completion of the excavation, formation and compaction of sub-grade and the disposal of surplus or unsuitable materials in accordance with the Plans and Specifications or as directed by the DPW Project Manager.

3. The Owner reserves the right to reject the Construction Manager’s measurement of work-in-place that involves use of established unit prices, and to have this work measured, at the Owner's expense, by an independent surveyor acceptable to the Construction Manager.

4. Defect Assessment: Replace the Work, or portions of the Work, not conforming to the specified requirements. If, in the opinion of the Architect/Engineer, it is not practical to remove and replace the work the Architect/Engineer will direct an appropriate remedy or adjust the payment.

5. Unit Price Schedule: A "Unit Price Schedule" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials described under each unit price.

1.6 UNIT PRICE/QUANTITY ALLOWANCE SCHEDULES

A. Unit Price Schedule - Earth and Rock Excavation: This Section includes administrative and procedural requirements for the following unit prices and provisions are to be included in and become part of this Contract to be used in evaluating additions to or deductions from the work called for in the specifications and/or plans.

1. Unless otherwise specified elsewhere in these documents, the Construction Manager shall assume that all excavation is earth; however, if unspecified rock is encountered, it will be paid for at the given unit prices listed in Paragraph "C". Rock prices are net in that allowances for reduced quantities of earth are also included in the unit prices. The prices given include all costs for overhead, profit and rock surveys.
2. Wherever rock to be excavated is encountered, the Construction Manager shall strip or expose the rock to such an extent that in the Owner's opinion the necessary measurements can be taken. The Construction Manager shall provide the Owner with a survey by a licensed land surveyor indicating top of rock elevations at points of intersection on a rectilinear grid with lines spaced sufficiently close to show accurately the rock surface contours. At the Owner's option, an additional survey may be furnished by the Owner from a licensed surveyor.
3. If the conditions of the excavation work indicated are clearly of a special nature, the Construction Manager may ask the Owner for reconsideration of the established unit prices and if granted, the unit prices will not apply, and prices will be negotiated in accordance with Article 13 of the General Conditions.

B. Definitions:

1. **"EARTH**": Is defined as excavation shall include removal of all materials other than 'water' and 'rock'.
2. **"ROCK":** Is defined as a boulder of one cubic yard or more in volume (1/2 cubic yard for a boulder in trenches), and rock in definite ledge formation and masonry structures of one cubic yard or more in volume, the removal of which requires the use of mechanical equipment or the use of explosives. Rock removed by scarification or ripping method is considered as a separate classification under Paragraph 4.c.(1).
3. **"ORIGINAL GRADE":** Is defined as being the grade which exists at the time of Contract Award.
4. **"ROUGH GRADE":** Is defined as being the completed surface of required excavations greater than 13' in width.
5. **"MASS":** Excavation is to be considered as an open area whose minimum horizontal dimensions exceed 13'.
6. **"TRENCH":** Is defined as excavation is defined as the removal of material from areas 13 feet or less in its minimal horizontal dimensions and below the elevation of rough grade or original grade, whichever is lower.

C. Procedures:

1. **Rock Excavation in Trenches:** Basis for Horizontal Measurement:
   - **a.** Horizontal Measurements: Will be taken between the vertical planes as defined below.
   - **b.** **The Minimum Width of Trenches in Rock:** Will be taken as 3' 0".
   - **c.** **Excavation For Walls Or Piers With Footings:** The measurements will be taken parallel to and one foot outside of the edges of the concrete footings as called for in the plans (i.e. for 4' 0" footing, rock will be taken as 6' 0" in width).
   - **d.** **Excavation For Walls Or Piers Without Footings:** The limits of the excavation will be 1' 6" outside of the line of concrete at bottom as shown or called for in the plans (i.e. for a wall with a bottom thickness of 1' 0", the width of the trench will be considered to be 4' 0"). (Caissons are excluded from these measurements).
   - **e.** **Excavation for Pipe Lines:** Will be measured at 2' 0" more than the nominal inside diameter of the pipe but in no case less than 3' 0" wide.
   - **f.** **Excavation For Tanks, Vaults, Manholes, Pits, Etc.:** Will be measured as 2' 0" greater in both length and width or diameter than the actual exterior dimensions of the structures and this excavation is considered to be trench only if any measured horizontal dimensions is 13' or less.
   - **g.** No allowance will be made for rock removed beyond the above limits.
2. **Rock Excavation in Trenches - Basis for Vertical Measurement:**
   - **a.** To determine depth of trench, vertical measurements will be taken from original grade or rough grade, (whichever is applicable), to the bottom of required excavation. These measurements will define the maximum depths for payments.
   - **b.** To determine quantity of rock in trench, vertical measurements will be taken from the top of rock as encountered in the trench to 12" below the bottom of required rock excavation. Any over excavation below the required elevation shall be filled with concrete or other material as specified at no cost to the Owner.

c. No allowance will be made for rock removed beyond the above limits.

3. Earth Excavation in Trenches - Basis of Measurement: (Horizontal & Vertical): The basis of measurements and allowance limit for earth excavation in trenches is identical to that indicated for rock excavation in trenches, except that there will be no allowance for 12" below the required elevation. In addition the following will prevail:

a. Maximum allowable widths for earth excavation in trenches without shoring:

Trench Depth - Classification	Add To Nominal ID Of Pipe Or To Footing Width
0 ft. - 6 ft.	3 ft.
Over 6 ft. - 10 ft.	5 ft.
Over 10 ft. - 15 ft.	7 ft.
Below 15 ft. deep the width of the trench shall be based on the individual case. The final depth of trench will determine the actual width for payment.	

b. If shoring is required the measurement shall be taken between the exterior walls of the shoring not to exceed 4' plus the I.D. of the pipe (for all depths).

c. To determine quantity of earth in trench, vertical measurements will be taken from the original or rough grade to actual bottom of earth excavation required.

4. Unit Prices - Earth and Rock Excavation (Basis for Payment): These unit prices are to be used for additional earth and rock excavation in CLASSIFIED areas identified elsewhere in the Contract Documents. Prices include backfill with excavated material if it is suitable. Prices also include all excavation and disposal of all surplus or unsuitable material. Where replacement with the excavated material is prohibited or a particular backfill material is specified, the cost of the delivered replacement material in a volume equal to the above excavation pay limits minus the volume of the items installed in the trench shall be paid for a prior negotiated price. Prices do not include costs of shoring and de-watering but do include sloping for sides of excavation. Payment and credit amounts shall be determined in the following manner: Widths and depths of trench excavation as indicated. The total quantity of earth or rock excavation encountered in each depth payment category shall be paid for at its respective unit price as shown below. For example, in a 15' trench the first 6' will be paid for at the 0' - 6' price; the next 4' will be paid for at the over 6' - 10' price and the next 5' will be paid for at the over 10' - 15' price. Thus three different price brackets will prevail.

a.	**Earth Excavation - Hand**			**Unit**	**$ Add**	**$ Deduct**
	(1)	In Trenches - 0'. - 6'.		C.Y.	36.00	28.80
	(2)	In Trenches Below 6' Deep,		Prices Must Be Negotiated Before Work Is Started.		
b.	**Earth Excavation - Machine**			**Unit**	**$ Add**	**$ Deduct**
	(1)	Open Area	All Depths	C.Y.	18.81	15.05
	(2)	In trenches	0' - 4' deep	C.Y.	14.27	11.40
		Over	0' - 10' deep	C.Y.	19.71	15.75
		Over	0' - 15' deep	C.Y.	35.00	28.00
		Over	0' - 20' deep	C.Y.	75.00	60.00
c.	**Rock Excavation**			**Unit**	**$ Add**	**$ Deduct**
	(1)	Open Areas, Rock Removed By Ripping (Any Amount),				
		Net Rock		C.Y.	103.50	82.80
	(2)	Open Areas, With Explosives -				
		Net Rock -	Total Quantity Up To 100	C.Y.	126.00	100.80
			Total Quantity Up To 1,000	C.Y.	60.00	48.00
			Total Quantity Up To 1,000 or more	C.Y.	28.00	22.40

c.	**Rock Excavation** (Continued)		**Unit**	**$ Add**	**$ Deduct**
	(3)	In Trenches, Boulders, Remove By Machine	C.Y.	45.00	36.00
	(4)	In Trenches, Ripping Of Rock By Machine	C.Y.	105.00	84.00
	(5)	In trenches, with explosives			

		Net Rock	0' - 4' Deep	C.Y.	95.60	76.50
	(6)	In trenches, with explosives				
		Net Rock	0' - 10' Deep	C.Y.	125.00	100.00
	(7)	In trenches, with explosives				
		Net Rock	0 - 15' Deep	C.Y.	150.00	120.00
	(8)	In trenches, with explosives				
		Net Rock	Over 15' - 10' Deep	C.Y.	200.00	160.00
	(9)	In trenches, with explosives -				
		Net Rock	0 - 20' Deep,	Prices Must Be Negotiated Before Start Of Work.		
	(10)	Jack Holes (For Hydraulic Lift/Elevators)		L.F.	95.00	76.00
	(11)	Open Or Mass Areas - If Explosives Are Prohibited				
		Net Rock		C.Y.	125.00	100.00
	(12)	Trench Excavation - If Explosives Are Prohibited				
		Net Rock/With Rock Splitters And Jack Hammer or Hoe Ram		C.Y.	150.00	120.00

D. Unit Price Schedule - Miscellaneous:

1. Unit Price - Miscellaneous:

a.	Miscellaneous Items		Unit	$ Add	$ Deduct
	(1)	Structural fill (material only)	C.Y.	35.00	28.00

E. Quantity Allowance - Alterations: These allowances are in *addition* to work identified in the Contract Documents. Steel roof deck and moisture emission reduction control systems allowances as well as work identified in the Contact Documents shall be included in the Base Price

1. Unit Price/Allowance - Alterations:

ALTERATIONS		BASE BID QUANTITY ALLOWANCE
a.	Remove and dispose of existing steel roof deck and provide new 18 gage, 1-1/2" roof deck.	1,000 SF
b	Provide Moisture Vapor Emission Reduction Control System For Resinous Flooring Locations.	14,000 SF
c	Provide Moisture Vapor Emission Reduction Control System For Non-Resinous Flooring Locations.	14,000 SF

F. Quantity Allowance – Lead Based Paint (LBP) Removal: These unit prices and allowances are in *addition* to LBP removal identified in the Contract Documents. LBP quantity allowances as well as work identified in the Contact Documents shall be included in the Base Price.

1. Unit Price/Allowance – Lead Based Paint:

LEAD BASED PAINT REMOVAL		BASE BID QUANTITY ALLOWANCE
a.	Containment Area – Set up containment area (up to 400 SF area) including barriers and decontamination unit for removal of LBP. This price to be used in conjunction with the unit prices listed below.	12 EA
c.	Strip LBP from flat surfaces.	100 SF
d.	Disposal of hazardous waste containing lead.	1 CY

G. Unit Price Schedule - Abatement:

7. Unit Price – See Division 02, Section “Asbestos Abatement” for unit prices associated with asbestos.

8. Unit Price – See Division 02 “Abatement of PCB Contaminated Building Materials” for unit prices associated with PCB’s.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 20 00 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for handling requests for equals and substitutions made after award of the Contract.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 33 00 "Submittal Procedures - CMR" specifies requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule.
2. Division 01 Section01 42 20 "Reference Standards and Definitions - CMR" specifies the applicability of industry standards to products specified.
3. Division 01 Section 01 60 00 "Product Requirements - CMR" specifies requirements governing the Contractor's selection of products and product options.

1.3 DEFINITIONS

A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.

B. **Equals or Substitutions General:** Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Construction Manager after award of the Contract.

1.4 SUBMITTALS

A. **Equals and Substitution Request Submittals:** The Owner will consider requests for equals or substitutions if made prior to the Receipt of the Construction Manager's Subcontractor Competitive Bid. The information on all materials shall be consistent with the information herein. After the Construction Manager's Subcontractor contract award, substitutions will be considered for materials or systems specified that are no longer available. It will not be considered if the product was not purchased in a reasonable time after award. The Construction Manager shall submit all equal and substitutions requests on the ***"Equal or Substitute Product Request"*** Form, an example is shown at the end of this Section and the Form is available from the Owner's Representative (OR). See Article 15 in the General Conditions for further refinement and information.

1. The Construction Manager's is required to prepare and submit three (3) copies of the required data for the first manufacturer listed or procedure listed in the specifications section with reference to all of the following areas: the substance and function considering quality, workmanship, economy of operation, durability and suitability for purposes intended including the size, rating performance, LEED® compliance and cost. All submissions must include all the required data for the first listed manufacturer or procedure as specified, as well as the required data for the proposed Equal or Substitution. This will enable the Owner and Architect to determine that the proposed Equal or Substitution is or is not substantially equal to the first listed manufacturer or procedure.

2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.

3. Provide complete documentation showing compliance with the requirements for equals or substitutions, and the following information, as appropriate:

a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors that will be necessary to accommodate the proposed Equal or Substitution.

b. A detailed comparison chart of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.

c. Product Data, including Shop Drawings and descriptions of products and fabrication and installation procedures.

d. Samples, where applicable or requested.

e. A statement indicating the effect on the Construction Manager's CPM Schedule compared to the schedule without approval of the Equal or Substitution. Indicate the effect on overall Contract Time.

f. Cost information, broken down, including a proposal of the net change, if any in the Guaranteed Maximum Price (GMP).

g. The Construction Manager's certification that the proposed Equal or Substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.

h. The Construction Manager's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the Equal or Substitution to perform adequately.

4. **Architect's Action:** If necessary, the Architect will request additional information or documentation for evaluation within **seven (7)** Calendar Days of receipt of the original request for equal or substitution request. The Architect will notify the Owner's Representative who will notify the Owner of recommended acceptance or rejection of the proposed equal or substitution, within **fourteen (14)** days of receipt of the request, or **seven (7)** days of receipt of additional information or documentation, whichever is later. The Owner's Representative will give final acceptance or rejection by the Owner not less than **seven (7)** days after notification.

   a. Any request deemed an "Equal" and accepted by the Owner's Representative, Architect, Owner, and Agency will result in written notification to the Construction Manager and will not be in the form of a change order for an "Equal".

   b. Any request deemed a "Substitution" and rejected or approved by Owner's Representative, Architect, and Owner may result in written notification to the Construction Manager and may be in the form of a change order if the "Substitution" is approved.

PART 2 - PRODUCTS

2.1 EQUAL OR SUBSTITUTIONS

A. **Conditions:** The Architect will consider the Construction Manager's request for Equal or Substitution of a product or method of construction when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests to the Owner's Representative without action except to record noncompliance with these requirements.

1. The proposed request does not require extensive revisions to the Contract Documents.
2. The proposed request is in accordance with the general intent of the Contract Documents.
3. The proposed request is timely, fully documented, and/or properly submitted.
4. The proposed request can be provided within the Contract Time. However, the Architect will not consider the proposed request if it is a result of the Construction Manager's failure to pursue the Work promptly or coordinate activities properly.
5. The proposed request will offer the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. However, if the proposed request requires the Owner to incur additional responsibilities, including but not limited to, additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or similar considerations, then the Owner will have just cause to reject the request for Equal or Substitution.
6. The proposed request can receive the necessary approvals, in a timely manner, required by governing authorities having jurisdiction.
7. The proposed request can be provided in a manner that is compatible with the Work as certified by the Construction Manager.
8. The proposed request can be coordinated with the Work as certified by the Construction Manager.
9. The proposed request can uphold the warranties required by the Contract Documents as certified by the Construction Manager.

B. The Construction Manager's submission and the Architect's review of Submittals, including but not limited to, Samples, Manufacturer's Data, Shop Drawings, or other such items, which are not clearly identified as a request for an Equal or Substitution, will not be considered or accepted as a valid request for an Equal or Substitution, nor does it constitute an approval.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 25 00 – CMR

Connecticut
Public Works

7001
Equal or Substitute Product Request

Page 1 of 1

Request Phase Pre-Bid ☐ Post Bid ☐ *(See Article 15 Materials: Standards, General Conditions)*

(If Pre-bid only) Current Bid Due Date: _____ **Request No.:** _____ **Dated:** _____

To: State of Connecticut
Department of Public Works

CTDPW Project No.: _____
Project Name / Location:

References: Specification(s): Section(s): _____ Paragraph(s): _____
Drawing(s): Drawing(s) No(s): _____ Detail(s) No(s): _____

Contractually Specified Product: _____
Contractor Proposed Product: _____

Proposed Product is : Equal: ☐ Substitute: ☐ Model No.: _____

*See attached data for **both** specified and proposed products as required by Article 15 General Conditions.*

Data attached: Drawings: ☐ Product Data: ☐ Reports: ☐ Samples: ☐
Tests: ☐ Other: _____

Reason(s) for not providing the Specified Product:

Similar Installation:
Project: Architect.
Address: Owner:
Date Installed:

Will proposed substitution impact other parts of the Work? No ☐ Yes ☐ *If yes attach explanation.*
Will proposed substitution increase Contract Time? No ☐ Yes ☐ *by number of Days* _____

Actual Dollar Savings to the State of Connecticut if substitution is accepted: $ _____

The Undersigned Certifies that the proposed Request for an Equal or Substitute Product conforms to all of the requirements of Division 01 General Requirements, Section 01 25 00 Substitution Procedures

Request Submitted By General Contractor / CMR: _____
(Firm's Typed Name)

By: _____ _____ _____ _____
(Typed Name) *(Title)* *(Signature)* *(Date)*

CONTRACTOR / CMR Send copies to DPW PM: ☐ CA /OR: ☐

Consultant's Review – This Substitution Request is: Request Received on (Date): _____

☐ **Approved:** *(Submittals in accordance with Div. 01 General Requirements, Section 01 33 00 Submittal Procedures.)*
☐ **Approved as Noted:** *(Submittals in accordance with Div. 01 General Requirements, Section 01 33 00 Submittal Procedures.)*
☐ **Rejected:** **Use Specified Materials.**
☐ **Rejected:** **Request Not Received Within Specified Time Period - Use Specified Materials.**

Reviewed Issued By: _____ _____ _____
(Typed Name) *(Signature)* *(Date)*

CONSULTANT Send copies to: DPW PM: ☐ CA /OR: ☐ Chief Architect ☐ Chief Engineer ☐

If Approved: As noted by Consultant,
DPW Director of Project Management: _____ _____
(Signature) *(Date)*

Copies: Project File Red R2

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 20 00 "Price & Payment Procedures– CMR" for administrative requirements governing use of Unit Prices.

2. Division 01 Section 01 25 00 – CMR, "Substitution Procedures", for administrative procedures for handling requests for substitutions made after award of the Contract.

3. Division 01 Section 01 29 76 "Progress Payment Procedures– CMR", for administrative procedures governing Applications for Payment.

4. Division 01 Section 01 32 16.13 "CPM Schedules– CMR", for requirements for CPM scheduling and reporting progress of work.

6. Division 01 Section 01 33 00 "Submittal Procedures – CMR", for requirements for submittal of the Construction Progress Schedule or CPM Schedule.

7. Division 00 General Conditions of the Contract for Construction - CMR, Article 13 "Change Orders".

1.3 REQUESTS FOR INFORMATION

A. In the event that the Construction Manager or their Subcontractor, at any tier, determines that some portion of the drawings, specifications, or other contract documents requires clarification or interpretation by the Architect, the Construction Manager shall submit a "Request for Information" in writing to the Architect and copy the Owner's Representative. "Requests for Information" may only be submitted by the Construction Manager and shall only be submitted on the ***"Request for Information"*** Forms as required by the Owner.

1. In the "Request for Information", the Construction Manager shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed from the Architect.

2. In the "Request for Information", the Construction Manager shall set forth an interpretation or understanding of the requirement along with reasons why such an understanding was reached.

3. The Owner acknowledges that this is a complex project. Based upon the owner's past experience with projects of similar complexity, the Owner anticipates that there will probably be some "Requests for Information" on this project.

4. The Architect will review all "Requests for Information" to determine whether they are valid "Requests for Information". If it is determined that the document is not a valid "Request for Information", it will be returned to the Construction Manager, unreviewed as to content, for resubmittal on the proper form and in the proper manner.

5. A "Requests for Information Response" shall be issued within **seven (7)** Calendar Days of receipt of the request from the Construction Manager unless the Owner determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Owner, the Owner will, within **seven (7)** Calendar Days of receipt of the request, notify the Construction Manager of the anticipated response time. If the Construction Manager submits a "Request for Information" on an activity with **seven (7)** Calendar Days or less of float on the current project schedule, the Construction Manager shall not be entitled to any time extension due to the time it takes the Architect to respond to the request provided that the Architect responds within the **seven (7)** Calendar Days set forth above.

6. A "Request for Information Response" from Architect will not change any requirement of the Contract Documents. In the event the Construction Manager believes that the "Request for Information Response" will cause a change to the requirements of the Contract Documents, the Construction Manager shall within **five (5)** Calendar Days give written notice to the DPW Project Manager and copy the Owner's Representative stating that the Construction Manager believes the "Request for Information

Response" will result in a "Change Order" and the Construction Manager intends to submit a "Change Order Proposal" request. Failure to give such written notice five (5) Calendar Days shall waive the Construction's Manager right to seek additional time or cost under the requirement these Requirements.

1.4 MINOR CHANGES IN THE WORK

A. The Architect, with a copy to the Owner's Representative, will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Guaranteed Maximum Price (GMP) or Contract Time, on the ***"Supplemental Instructions"*** Form as required by the Owner.

1.5 PROPOSAL REQUEST

A. Architect/Owner-Initiated Requests For Proposals: The Architect or Owner will issue a detailed description of proposed changes in the Work to the Construction Manager with a copy to the Owner's Representative that will require adjustment to the Guaranteed Maximum Price (GMP) or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications. Such requests shall be on a ***"Proposal Request"*** Form as required by the Owner.

1. "Proposal Request" is issued for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.

2. Within **fourteen (14)** Calendar Days of receipt of a "Proposal Request", submit a "Change Order Proposal" with the required information necessary to execute the change to the Construction Manager with a copy to the Owner's Representative for the Architect's/Owner's review.

a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.

b. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.

c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.

d. The Agency is tax exempt. All Construction Managers and their Subcontractors services provided under your Contract with the State of Connecticut may not be exempt from taxes. The Department of Revenue Services can guide you as to which services are exempt and which are not. Please contact the State of Connecticut, Department of Revenue Services at 1-800-382-9463 or 860-541-3280.

e. Dollar values shown on the Schedule of Values shall not be the governing (or deciding) final amounts for change orders involving either additional charges or deletions.

1.6 CHANGE ORDER PROPOSAL

A. When either a "Request for Information" from the Construction Manager or a "Proposal Request" from the Architect or Owner results in conditions that may require modifications to the Contract, the Construction Manager may propose changes by submitting a request for a "Change Order Proposal" to the Architect with a copy to the Owner's Representative on forms as required by the Owner. These forms shall also include "Change Order Proposal Worksheets" as required by the Owner.

1. Include statements outlining the 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 Guaranteed Maximum Price (GMP) and Contract Time.

2. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities as directed by of the Division 00 General Conditions of the Contract for Construction – CMR, Article 13.

3. Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.

4. Comply with requirements in Division 01 Section 01 25 00 "Substitution Procedures - CMR" if the proposed change requires an equal or substitution of one product or system for a product or system specified.

5. The State of Connecticut construction contract has the following tax exemptions:

a. Purchasing of materials which will be physically incorporated and become a permanent part of the project.

b. Tools, supplies and equipment used in fulfilling the construction contract are not exempt.

C. Services that are resold by the Construction Manager are exempt, i.e. if a Construction Manager hires a plumber, carpenter or electrician, a resale certificate may be issued to their Subcontractor because these services are considered to be integral and inseparable component parts of the building contract

C. **"Change Order Request" Forms:** Use ***"Change Order Proposal"*** and ***"Change Order Proposal Worksheets"*** fForms as required by Owner.

D. A "Change Order Proposal" cannot be submitted without either prior submission of a "Request for Information" from the Construction Manager or as a response to a "Proposal Request" submitted by the Architect or Owner.

E. Any "Change Order Request" submitted without a prior submittal of a "Request for Information" or as a response to a "Proposal Request" will be immediately rejected and returned to the Construction Manager.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. **"Construction Change Directive":** When the Owner and the Construction Manager disagree on the terms of a "Change Order Proposal" resulting from either a "Request for Information" or "Proposal Request", then the Architect through the Construction Manager with a copy to Owner's Representative may issue a "Construction Change Directive" on a ***"Construction Change Directive"*** Form as authorized by the Owner. The "Construction Change Directive" instructs the Construction Manager to proceed with a change in the Work, for subsequent inclusion in a "Change Order".

1. The "Construction Change Directive" contains a complete description of the change in the Work. It also designates the method to be followed to determine change in the Guaranteed Maximum Price (GMP) or Contract Time.
2. Construction Manager must proceed with the Work once a "Construction Change Directive" is issued.
3. The change in the Guaranteed Maximum Price (GMP) and Contract Time resulting from the issuance of a "Construction Change Directive" will be based on "Time & Material" or "Unit Prices".
4. Issuance of "Construction Change Directive" does not guarantee payment for the Work described in the "Construction Change Directive".

B. **Documentation:** The Construction Manager shall maintain detailed records on a time and material basis of work required by the "Construction Change Directive".

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
2. The final value shall be negotiated based on the supporting data to determine the value of the work.

1.8 CHANGE ORDER PROCEDURES

A. Upon the Owner's approval of a Construction Manager's "Change Order Proposal", the Construction Manager with a copy to the Owner's Representative will issue a "Change Order" for signatures of the Architect, Owner and the Construction Manager on a ***"Change Order"*** Form as required by the Owner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 26 00 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies procedures for preparation and submittal of the Construction Manager's Applications for Payment.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Division 00 General Conditions of the Contract for Construction – CMR: Articles: 27 "Schedule of Values, Application for Payment"; 28 "Partial Payments"; 31 "Final Payment"; and 32 "Owner's Right to Withhold Payments".
. Division 01 Section 01 32 16.13 "CPM Schedules - CMR" for requirements for CPM scheduling and reporting progress of work.
3. Division 01 Section 01 33 00 "Submittal Procedures - CMR" ".
4. Division 01 Section 01 77 00 "Closeout Procedures - CMR" for requirements for Final Payment.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the "Schedule of Values" with preparation of the CPM Schedule. Use "Schedule of Values" form as required by the Owner

1. Submit the "Schedule of Values" to the Owner's Representative at the earliest possible date but no later than **twenty-one (21)** Calendar Days after Contract Start Date.
2. **Sub-schedules:** Where Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the "Schedule of Values". Provide at least one line item for each Specification Section on electronic media printout.

1. **Identification:** Project identification on the Schedule of Values shall include, but not be limited to, the following:
   - **a. Owner**
   - **b. Project Number**
   - **c. Project Name**
   - **d. Project Location**
   - **e. Construction Manager's name and address.**
2. Arrange the "Schedule of Values" in tabular format as required by the Owner, containing separate columns including, but not limited to, the following Items:
   - **a. Item Number.**
   - **b. Description of Work with Related Specification Section or Division Number.**
   - **c. Scheduled Values broken down by description number, type material, units of each material.**
     - **1) Include break down of General Condition requirements, i.e. bonds, insurance premiums, taxes, job mobilization, temporary facilities, field supervision and layout, operation and maintenance manuals, punch list activities, project record documents, demonstration and training, overhead, and profit as separate line items.**
   - **d. Name of Subcontractor.**
   - **e. Name of manufacturer or fabricator.**
   - **f. Name of supplier.**

g. **Retainage.**

h. **Guaranteed Maximum Price in sufficient detail.**

3. Percentage of Guaranteed Maximum Price to nearest one-hundredth percent, adjusted to total 100 percent.

4. Provide a breakdown of the Guaranteed Maximum Price in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual Table of Contents. Break principal subcontract amounts down into several line items. In addition, the following items listed below must be included.

   a. **Site Logistics Plan (01 29 76- CMR)** a lump sum at 1/20 of one percent of the base bid total project cost at the time of submission of this plan.

   b. **Coordination Drawings (01 31 00 - CMR)** a lump sum of this cost for payment at the submittal of this product a minimum cost of 1/10th of one percent of the base bid total project cost or $5,000 whichever is greater.

   c. **Photographic Documentation (01 32 33- CMR)** a monthly cost of $1,000 per month to be paid each month upon receipt of the photographs or forfeit of that month's payment.

   d. **Submittal Schedule (01 33 00- CMR)** a lump sum payment calculated at 1/20th of 1% of the base bid total project cost upon receipt of the schedule.

   e. **Waste Collection & Cleaning (01 50 00- CMR)** a monthly cost. A minimum payment of $1,000 to $3,000 (based on size & complexity of the project) with forfeit of that monthly payment if not done.

   f. **As-Built Updates (01 31 00- CMR)** a monthly cost, a minimum payment of $1,000 with forfeit of that monthly payment if not done.

   g. **Start-up and Adjusting (01 75 00 - CMR)** a lump sum cost upon completion. (to be determined by PM with A/E & OR advice)

   h. Schedule (01 32 16.13 - CMR) a lump sum payment upon receipt of the base line schedule. A payment of 40% of the total amount of the total cost which is to be calculated at 1/8th of one percent of the base bid total project cost. Monthly updates using the remainder of the cost divided evenly over the accepted schedule duration with a forfeit of the monthly payment of the update is not received on time.

   Any forfeited amounts being withheld by the Owner's Representative for non-performance will be adjusted at the final payment by a credit change order to the owner.

5. Round amounts to nearest whole dollar; the total shall equal the Guaranteed Maximum Price.

6. **Unit-Cost Allowances:** Show the line-item value of unit-cost allowances, as a product of the unit cost, multiplied by the measured quantity. Estimate quantities from the best indication in the Contract Documents.

7. **General Conditions:** Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.

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

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and Owner's Representative and paid for by the Owner.

   1. The initial "Application for Payment", the "Application for Payment" at time of "Substantial Completion", and the final "Application for Payment", involve additional requirements.

B. **Payment-Application Terms:** The Owner will process monthly progress payments. The Construction Manager may submit applications for payment on a monthly basis.

C. **Payment-Application Forms:** Use the "Application for Payment" form as required by the Owner. Present the required information on electronic media printout or Owner approved form; multiple pages should be used if required.

   1. For each item, provide a column including but not limited to the following items:

a. Item Number.

b. Description of Work and Related Specification Section or Division.

c. Scheduled Value, break down by units of material and units of labor.

d. Work Completed from previous application.

e. Work Completed this period.

f. Materials presently stored.

g. Total Completed and stored to date of application.

h. Percentage of Completion.

i. Balance to Finish.

j. Retainage.

D. **Application Preparation:** Complete every entry on the Application form. At the time of Final Payment only, include an executed Application form by a person authorized to sign legal documents on behalf of the Construction Manager. The Owner's Representative will return incomplete Applications without action.

1. Entries shall match data on the "Schedule of Values".

2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application.

E. **Transmittal:** Except for final payment, submit to the Owner's Representative by a method ensuring receipt within **forty-eight** (48) hours. **One** (1) complete, signed and notarized original of each Application for Payment, including lien waivers and similar attachments when required, along with **six** (6) copies. For Final Payment, **nine** (9) complete, signed and notarized copies shall be submitted.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Architect.

F. **Applications for Payment:** Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment and all subsequent Application for Payments including, but not limited to, the following items:

G. **Application for Payment at Substantial Completion:** Following issuance of the Certificate of Substantial Completion submit an Application for Payment form; use the form as required by the Owner. Present the required information on electronic media printout as applicable that include, but are not limited, to the following:

1. List of Subcontractors and suppliers' name, FEIN/Social Security numbers, and Connecticut Tax Registration Numbers.

2. List of principal suppliers and fabricators.

3. Schedule of Values.

4. Construction Manager's CPM Schedule (preliminary if not final).

5. Schedule of principal products.

6. Submittal Schedule (preliminary if not final).

7. List of Contractor's staff assignments.

8. List of Contractor's principal consultants.

9. Copies of all applicable permits.

10. Copies of authorizations and licenses from governing authorities for performance of the Work.

11. Proof that Subcontractors have been paid amounts included on the Construction Manager's Application for Payment within thirty (30) days after the Owner has paid the Construction Manager for the particular Application for Payment in accordance with Connecticut General Statute § 49-41a (a)(1).

12. Releases of Lien from Subcontractors with amounts included on the Construction Manager's Application for Payment when Construction Manager has been paid by the Owner for the particular Application for Payment but the Subcontractors have not been paid.

13. Proof that as-built documents are updated as required by Section 01 77 00- CMR "Closeout Procedures.

14. Initial as-built survey and damage report, if required.

15. Update the Construction Manager's Master Subcontract Agreement List" and submit copies all recently executed Subcontract Agreements in accordance with CGS § 4b-96.

15.1 . The Construction Manager's Master Subcontract Agreement List" shall list all Subcontract Agreements in order of Guaranteed Maximum Price magnitude (from high to low) in the following format:

Construction Manager's Master Subcontractor Agreement List"				
Subcontractor Name	**Minority Or Small Business Designation**	**Trade**	**Address**	**Guaranteed Maximum Price**

16. In accordance with CGS § 42-158j (b):
Each payment requisition submitted shall include a statement showing the status of all pending construction change orders, other pending change directives and approved changes to the original contract or subcontract. Such statement shall identify the pending construction change orders and other pending change directives, and shall include the date such change orders and directives were initiated, the costs associated with their performance and a description of any work completed. As used in this section, "pending construction change order" or "other pending change directive" **means an authorized directive for extra work that has been issued to a contractor or a subcontractor and identified by an official Change Order Number or Construction Change Directive Number assigned by the State of Connecticut.**

G. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion submit an Application for Payment form; use the form as required by the Owner. Present the required information on electronic media printout as applicable that include, but are not limited, to the following:

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

2. Administrative actions and submittals that shall precede or coincide with this application include, but are not limited to, the following:

2.1 Occupancy permits and similar approvals.

2.2 Warranties (guarantees) and maintenance agreements.

2.3 Test/adjust/balance records.

2.4 Maintenance instructions.

2.5 Meter readings.

2.6 Startup performance reports.

2.7 Changeover information related to Owner's occupancy, use, operation, and maintenance.

2.8 Final cleaning.

2.9 Application for reduction of retainage and consent of surety.

2.10 Advice on shifting insurance coverage.

2.11 Final progress photographs.

2.12 List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

H. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include, but are not limited, to the following:

1. Completion of Project Closeout requirements.

2. Completion of list of items remaining to be completed as indicated on the attachment to the Certificate of Substantial Completion.

3. Ensure that unsettled claims will be settled.

4. Ensure that incomplete Work is not accepted and will be completed in accordance with a schedule prepared by the Construction Manager which is acceptable to the Owner.

5. Transmittal of required Project construction records to the Owner (including as-built documents specified in Section 01 77 00 "Closeout Procedures - CMR".
6. Certified property survey.
7. Proof that taxes, fees, and similar obligations were paid.
8. Removal of temporary facilities and services.
9. Removal of surplus materials, rubbish, and similar elements (Reference Section 01 74 19 "Construction Waste Management & Disposal – CMR".
10. Change of door locks to Owner's access.
11. The requirements of the Division 00 General Conditions - CMR and Supplementary Conditions for Final Acceptance, Final Completion, Final Inspection, and Final Payment.
12. Asbestos, lead or other hazardous material manifests.
13. Completion of "Building Contractor Reporting Form" as supplied by Department of Public Works, for all Construction Manager's Subcontractors, Vendors, Suppliers, etc. who work on the Contract. The form includes the following information:
    a. Construction Manager / Subcontractor name.
    b. FEIN/Social Security Numbers
    c. Connecticut Tax Registration Numbers
    d. Type of work
    e. Name of business and address
    f. Remittance address.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 29 76 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Coordination Drawings, including Site Logistics Plans.
4. Administrative and supervisory personnel.
5. Cleaning and protection.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division Section 01 01 11 00 "Summary of Work - CMR" 1.10 Miscellaneous Provisions, (D) Site Logistics Plans.
2. Division 01 Section 01 29 76 "Progress Payment Procedures - CMR" for Schedule of Values items
3. Division 01 Section 01 31 19 "Project Meetings - CMR" for progress meetings, coordination meetings, and pre-installation conferences.
4. Division 01 Section 01 32 16.13 "CPM Schedules - CMR" for requirements for CPM scheduling and reporting progress of work.
5. Division 01 Section 01 50 00 "Temporary Facilities and Controls- CMR".
6. Division 01 Section 01 60 00 "Product Requirements – CMR" for coordinating general installation.
7. Division 01 Section 01 71 23 "Field Engineering – CMR" specifies procedures for field engineering services, including establishment of benchmarks and control points.
8. Division 01 Section 01 77 00 "Closeout Procedures - CMR" for coordinating contract closeout.
9. Division 01 Section 01 91 00 "Commissioning - CMR" defines the commissioning process.

1.3 OWNER'S REPRESENTATIVE

A. Owner's Representative:

1. The Owner's Representative is identified in Division 01 Section 01 11 00 "Summary of Work - CMR".
2. **Construction Mobilization:**
   a. Cooperate with the Architect and DPW PM in the allocation of mobilization areas of the site, for field offices and sheds, for agency facility access, traffic, and parking facilities.
   b. During Construction, coordinate use of site and facilities through the Architect and DPW PM.
   c. Comply with Architect and DPW PM procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
   d. Comply with instructions of the Architect and DPW PM for use of temporary utilities and construction facilities.
   e. Coordinate field engineering layout as specified in Division 01 Section 01 71 23 "Field Engineering" for work under the instructions of the Architect and DPW PM.
3. **Commissioning**
   This project will have selected building systems commissioned. The Commissioning process and equipment and systems to be commissioned are specified in Division 01, Section 01 91

00. The Commissioning process will be directed by a Commissioning Agent whose services will be provided by the Owner. The CMR shall coordinate all their Commissioning responsibilities through the Owner's Representative.

1.4 COORDINATION

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

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

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Construction Manager, Owner and separate contractors where coordination of their work is required.

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

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.
6. As-Builts coordinate monthly meetings to assure up-dates being performed

1.5 SUBMITTALS

A. Coordination Drawings: Prepare coordination drawings to complete detailed coordination of systems and components and to integrate information about fabrication and installation.

1. Thoroughly prepare coordination drawings, as further stipulated in Part 3 "Execution", reviewing all contract documents and consulting with all entities contributing to or involved with each portion of the work under consideration.
   - **a.** Show the relationship of all components shown on any separate Shop Drawings.
   - **b.** Indicate required desired installation sequences.
   - **c.** Comply with requirements contained in Division 01 Section 01 33 00 "Submittal Procedures".
2. Prepare coordination drawings for installation of all products and materials fabricated by separate entities.
3. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components, including but not limited to: all site-utility entry points; all ceiling and roof cavities in all areas; all electrical, telecommunications and mechanical rooms; all stage-boundary interface areas; all laboratories, animal-handling rooms and data rooms; all classrooms and seminar rooms; all lecture halls and their support spaces; all video studios, broadcast classrooms and their support facilities; and all such other conditions required to coordinate the work.
4. **Prepare a Site Logistics Plan(s) showing:** The entire project area and limits; all routes into and out of site; all staging and stockpiling and lay-down areas; all aspects of phasing/staging; all parking, paving and fencing; and all specific provisions to satisfy requirements of Division 01 Sections, including but not limited to Field Engineering and Temporary Facilities and Controls. The Site Logistics Plan shall coincide with and complement the general staging plans and site plans outlined in the contract bidding documents. It is intended that the Construction Manager shall present this refined plan for approval by the Owner's Representative. The fencing shown on this plan is required for all phases. Exact placement and timing of installations and removals will be reviewed and approved by the Architect and DPW PM prior to implementation. An additional allotment of various fencing is specified in Division 32,

which the Construction Manager shall provide, install, and relocate at various intervals, for installation and removal by the Construction Manager per the direction of the project's Owner's Representative. This staging and logistics plan will require refinement and change for each phase/stage of the project. The Site Logistics Plan(s) shall be drawn at a scale no smaller than 1"=40' and shall be submitted as stipulated in Division 01 Section 01 29 76 "Progress Payment Procedures", but in no case later than (30) days after Notice to Proceed.

5. Prepare coordination drawings showing locations of surface recesses and voids, as well as offsets and breaks, requiring filling and/or feathering, both those initially visible and those discovered during the course of work. Review with Owner and Architect to obtain direction for filling and feathering. Revise drawing(s) to record directions for same for field and record purposes.

B. **Staff Names:** Prior to the contract start date, submit a list of the Construction Manager's principal staff assignments, including the superintendent, project safety officer, and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.

1. Post copies of the list in the Project meeting room, the temporary field office, and at each temporary telephone.
2. Provide resumes of each staff member proposed for the Project. This shall include the Project Manager, Project Superintendent and Safety Officer.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

A. **Inspection of Conditions:** Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed and coordinate such inspections with the Architect and DPW PM and authorities having jurisdictions. If unsatisfactory conditions exist notify the Architect and DPW PM immediately. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. The Construction Manager shall coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

C. **Coordination Drawings:** Before construction work can begin, the Construction Manager shall submit to the Architect coordination drawings in the form of (a) reproducible (vellum) transparencies at not less than 1/4-inch scale and (b) CAD files of the coordination drawings on CDROM. Such drawings will be required throughout all areas for trades as described below. These drawings shall show resolutions of trade conflicts in congested areas. The Architect will supply base drawings (with the title blocks removed), including floor plans, reflected ceiling plans, and structural framing plans, in the form of electronic CAD files on CDROM, using the AutoCAD release edition specified with the files, to the Construction Manager for distribution to the trades for use in developing the coordination drawings. Each trade Construction Manager's Subcontractor shall create separate layers within the CAD files to show the work of their trade. Prepare coordination drawings as follows:

1. The Construction Manager's HVAC Subcontractor shall initiate 1/4-inch scale drawings done on AutoCAD (latest version) showing ducts and piping in plan and section. Sheet metal shop drawings must be approved prior to starting coordination drawings.
2. The Construction Manager's Sprinkler Subcontractor shall then add layers to superimpose his piping layout on the coordination drawings.
3. The Construction Manager's Electrical Subcontractor shall then add layers to superimpose all the electrical information on the coordination drawings. Said information is to include but not necessarily be limited to cable trays, equipment, lighting, conduits, bus duct, etc. Show space allowances reserved for work under other contracts, such as audio-visual wiring and equipment.
4. The Construction Manager's Plumbing Subcontractor shall then add layers to complete the coordination drawing by drawing his piping (including pitch) on the coordination drawings.
5. Construction Manager's Subcontractors for specialties, furnishings, equipment and special construction shall add layers to show their work to assure full coordination of all systems.

6. The Owner's Representative shall review the completed coordination drawings for general compliance and then submit them to the Architect for his review. All Construction Manager's Subcontractors shall rework the drawings until all systems are properly coordinated.
7. The Construction Manager's Ceiling Subcontractor shall utilize the drawings to prepare acoustic panel ceiling drawings and any other suspended ceiling drawings, and shall indicate areas of conflict with the work of other trades by drafting the location of grids, panels and tiles.
8. The Construction Manager shall indicate Architectural/Structural conflicts or obstacles and coordinate to suit the overall construction schedule. The Construction Manager shall locate all precut and prefabricated holes and openings in structural steel on the CAD coordination drawing files as required for HVAC, plumbing, fire protection and electrical work. The Construction Manager shall coordinate these holes and openings with the structural steel fabricator during the structural steel shop drawing development phase. Coordination to take place on schedule so as to permit shop fabrication of all structural steel holes and openings. The Owner will not be held responsible for the costs associated with field fabrication of structural openings resulting from the lack of timely and thorough coordination.
9. The Construction Manager shall expedite all drawing work and coordinate to suit the construction schedule. The Construction Manager shall then review these drawings and compare them with the Architectural, Structural, Equipment, and other drawings and determine that all of the work can be installed without undue interference. Prior to the submittal to the Architect, areas of potential conflict shall be brought to the attention of the Construction Manager who shall convene a coordination meeting of all parties involved, for the purpose of resolving all utility conflicts. The Construction Manager shall supervise and direct corrective measures and have all trades sign acceptance of the drawings. Submit **four (4)** hard copies of each drawing to the Architect and **two (2)** copies to the Owner's Representative for the record, and only after all conflicts have been accommodated.
10. If the coordination meeting fails to resolve coordination conflicts, the Construction Manager shall indicate the nature of such conflicts in a detailed RFI, proposing the most economical solution.
11. The Construction Manager shall not permit work by trades to proceed in a given bay or area until all trade foremen agree on the exact arrangements for each room or area. If a given trade proceeds prior to trades approval, then if necessary, that trade shall revise their work, if necessary, at no extra cost, in order to permit other trades to proceed.
12. Submit all coordination drawings on CD-ROM, in addition to hard copy.

D. The Owner's Representative will meet with the Construction Manager on all major items of coordination.

3.2 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering, where required, to assure protection from damage or deterioration.

B. Clean and provide maintenance on completed construction as construction per manufacturers requirements through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. 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. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.

13. Abrasion.
14. Heavy traffic.
15. Soiling, staining, and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High-speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 01 31 0 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Start Date meeting (establishes start date)
2. Pre-construction conferences.
3. Pre-installation conferences.
4. Progress meetings.
5. Safety
6. Coordination
7. As-built drawings review
8. And as required

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 31 00 "Project Management and Coordination - CMR" for procedures for coordinating project meetings with other construction activities.
2. Division 01 Section 01 32 16.13 "CPM Schedules - CMR" for requirements for CPM scheduling and reporting progress of work.
3. Division 01 Section 01 33 00 "Submittal Procedures - CMR" for submitting the Construction Schedule or CPM Schedule.
4. Division 01 Section 01 35 26 "Government Safety Requirements- CMR" specifies the requirements for safety plans, reports, and investigation submittals.
5. Division 03 Section 03 45 00 "Precast Architectural Concrete" for pre-installation/erection conferences.
6. Division 07 Section 07 50 00 "Membrane Roofing" for pre-construction conferences.

1.3 PRE-CONSTRUCTION CONFERENCE

A. The Construction Manager will attend a pre-construction conference before starting construction, as scheduled by the Owner's Representative convenient to the Owner, the Owner's Representative, Architect, and Construction Manager. This meeting will take place at least fourteen (14) Calendar Days prior to official Start Date. Hold the conference at the Project Site or another convenient location as directed by the Construction Manager.. The Construction Manager shall conduct the Pre-construction Conference to review the Construction Manager and their Subcontractor responsibilities and personnel assignments.

B. Attendees: Authorized representatives of the Owner's Representative, Owner, Architect, and their consultants; the Construction Manager and its superintendent; major subcontractors; agency; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Discuss items of significance that could affect progress, including the following:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Progress meeting schedule.
4. Designation of responsible personnel.
5. Procedures for processing field decisions and Change Orders.

6. Procedures for processing Applications for Payment.
7. Distribution of Contract Documents.
8. Submittal of Shop Drawings, Product Data, and Samples.
9. Preparation of record documents.
10. Use of the premises.
11. Parking availability.
12. Office, work, and storage areas.
13. Equipment deliveries and priorities.
14. Safety procedures.
15. First aid.
16. Security.
17. Housekeeping.
18. Working hours.
19. Coordination with Audio Visual and Telecommunications.

1.4 PRE-INSTALLATION/CONSTRUCTION CONFERENCES

A. The Construction Manager will schedule a pre-installation conference(s) at the Project Site before each construction activity that requires coordination with other construction. The Construction Manager shall be responsible to notify in writing the Owner's Representative and the appropriate Subcontractor(s), etc., of the date and time of all Pre-installation/Construction Conferences. Notification shall be at least seven (7) Calendar Days, prior to the Conference. The Construction Manager shall be responsible for coordination and attendance of all Subcontractors, etc., involved in or affected by the installation for all Pre-installation/Construction Conferences.

B. **Attendees:** The Owner's Representative, Construction Manager, Subcontractors, Owner and Architect, the installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. The Construction Manager shall advise all attendees of the scheduled Pre-installation/Construction Conferences dates.

C. Review the progress of other construction activities and preparations for the particular activity under consideration at each Pre-installation/Construction Conference, including but not limited to the following requirements:

1. Contract Documents.
2. Options.
3. Related Change Orders.
4. Purchases.
5. Deliveries.
6. Shop Drawings, Product Data, and quality-control samples.
7. Review of mockups.
8. Possible conflicts.
9. Compatibility problems.
10. Time schedules.
11. Weather limitations.
12. Manufacturer's recommendations.
13. Warranty requirements.
14. Compatibility of materials.
15. Acceptability of substrates.

16. Temporary facilities.
17. Space and access limitations.
18. Governing regulations.
19. Safety.
20. Inspecting and testing requirements.
21. Required performance results.
22. Recording requirements.
23. Protection.

D. The Owner's Representative will record significant discussions and agreements and disagreements of each Pre-installation/Construction Conference, and the approved schedule. The Owner's Representative will promptly distribute the record of the Pre-installation/Construction Conference to all attendees.

E. The Construction Manager shall not proceed with the installation/construction if the conference cannot be successfully concluded. The Construction Manager shall be responsible to initiate whatever actions are necessary to resolve impediments to performance of Work and schedule and reconvene another Pre-installation/Construction Conference at the earliest feasible date. Failure of the Construction Manager to resolve impediments to the performance of the work will not result in an extension of days.

1.5 PROGRESS MEETINGS

A. The Construction Manager will conduct progress meetings, bi-weekly, at the Project Site or at regular intervals as agreed upon at the Pre-construction Conference. The Construction Manager will notify the Owner, the Architect, and the Owner's Representative of the scheduled Progress Meeting dates. Coordinate dates of Progress Meetings with preparation of Application for Payment requests.

B. **Attendees:** In addition to representatives of the Construction Manager, Owner's Representative, Owner and the Architect, subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities may be requested to attend these meetings on an as needed basis. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work. The Construction Manager shall include the site superintendent as a minimum.

C. **Agenda:** Progress Meetings shall review and correct or approve minutes of the previous Progress Meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

1. Construction Schedule or CPM Schedule: Review progress since the last Progress Meeting. Determine where each activity is in relation to the required Construction Manager's "Construction Schedule" or "CPM Schedule" and whether each activity is on time or ahead or behind Schedule. Determine how Work that is behind Schedule will be expedited; secure commitments from parties involved to do so. Discuss whether Schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.
2. Review the present and future needs of each entity present, including the following:
   a. Interface requirements.
   b. Time.
   c. Sequences.
   d. Status of submittals.
   e. Deliveries.
   f. Off-site fabrication problems.
   g. Access.
   h. Site utilization.
   i. Temporary facilities and services.
   j. Hours of work.
   k. Hazards and risks.
   l. Housekeeping.

m. Quality and work standards.

n. Change Orders.

o. Documentation of information for payment requests.

D. Reporting: The Construction Manager will distribute minutes of the meeting to each party present, promptly and before the next scheduled meeting, and to parties who should have been present.

1.6 SUBCONTRACTOR/COORDINATION/SAFETY MEETINGS

A. The Construction Manager shall conduct Subcontractor/coordination meetings.

B. The Construction Manager shall conduct a separate safety meeting after the safety plan is submitted. The Construction Manager shall take meeting minutes. These minutes shall be made available upon request. The Construction Manager shall notify the Owner's Representative of the times and dates of these meetings, who may elect to attend these meetings as an observer when necessary. A minimum of one safety meeting will be held per month.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 31 19 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the preparation, submittal, and maintenance of the Construction Manager's computerized progress schedule, reporting progress of the Work, and Contract time adjustments, including the following:

1. Preliminary schedule.
2. Baseline schedule.
3. Two (2) week look ahead schedules.
4. Schedule revisions.
5. Recovery schedules.
6. Narratives.
7. Schedule time extensions.

B. The above listed Project schedules shall be used for evaluating all issues related to time for this Contract. The Project schedules shall be updated in accordance with the requirements of this Section to reflect the actual progress of the Work and the Construction Manager's current plan for the timely completion of the Work. The Project schedules shall be used by the Owner and Construction Manager for the following purposes as well as any other purpose where the issue of time is relevant:

1. To communicate to the Owner the Construction Manager's current plan for carrying out the Work;
2. To identify work paths that are critical to the timely completion of the Work;
3. To identify upcoming activities on the Critical Path(s);
4. To evaluate the best course of action for mitigating the impact of unforeseen events;
5. As the basis for analyzing the time impact of changes in the Work;
6. As a reference in determining the cost associated with increases or decreases in the Work;
7. To identify when submittals will be submitted to the Owner;
8. To prioritize the Owner's review of submittals;
9. To document the actual progress of the Work;
10. To evaluate resource requirements of the Construction Manager and the Owner;
11. To integrate the Work with the operational requirements of the Owner's facilities;
12. To facilitate efforts to complete the Work in a timely manner.
13. To document the history of the Work.

B. Refer to the General Conditions and the Agreement for definitions and specific dates of Contract Time.

C. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 11 00 "Summary of Work - CMR" specifies the scope of work for the various phases, requirements regarding the Construction Manager's use of premises, occupancy requirements, products ordered in advance, and Owner furnished products.
2. Division 01 Section 01 25 00 "Substitution Procedures - CMR" specifies requirements for handling requests for equals and substitutions.
3. Division 01 Section 01 26 00 "Contract Modification Procedures- CMR" specifies requirements for handling and processing contract modifications.

4. Division 01 Section 01 29 76 "Progress Payment Procedures - CMR" specifies requirements for submitting Schedule of Values and Application for Payments.
5. Division 01 Section 01 31 00 "Project Management and Coordination - CMR" specifies requirements for coordinating construction operations.
6. Division 01 Section 01 31 19 "Project Meetings- CMR" specifies requirements for submitting and distributing meeting and conference minutes.
7. Division 01 Section 01 33 00 "Submittal Procedures - CMR" specifies requirements for submitting the monthly computerized progress schedule.
8. Division 01 Section 01 45 00 "Quality Control - CMR" specifies requirements for submitting inspection and test reports.
9. Division 01 Section 01 50 00 "Temporary Facilities and Controls - CMR" specifies requirements for temporary utilities, support facilities, and security protection.
10. Division 01 Section 01 60 00 "Product Requirements- CMR" specifies requirements for submitting the list of products.
11. Division 01 Section 01 77 00 "Closeout Procedures- CMR" specifies requirements for Contract closeout.

1.3 DEFINITIONS

A. **Critical Path Method (CPM):** A method of planning and scheduling a construction project where activities are arranged based on activity relationships and network calculations determine when activities can be performed and the critical path of the Project.

B. **Critical Path:** The longest continuous chain of activities through the network at a given data date for the Schedule to a Contract Milestone or Contract Completion. Where the path to a specific Milestone has become negative, the Critical Path shall be the longest continuous chain of activities with the greatest amount of negative float.

C. **Near Critical Path:** Any continuous series of activities through the network to the Contract Milestone or the Contract Completion Date where the Total Float of the activity at the data date along that path is within 15 days of the Total Float possessed by the activity at the data date along the Critical Path.

D. **Network Diagram:** A graphic diagram of a network schedule, showing the activities and activity relationships.

E. **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 activities are activities on the critical path.
2. Predecessor activity is an activity that must be completed before a given activity can be started.

F. **Event:** An event is the starting or ending point of an activity.

G. **Milestone:** A key or critical point in time for reference or measurement.

H. Float is the measure of leeway in activity performance. Accumulative float time belongs to the Owner.

1. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
2. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned project completion date.

I. **Total Float:** The number of days from the late finish date (LF) to the early finish date (EF) of an activity at a given data date for the Schedule. When the LF is later than the EF, the Total Float shall be positive. When the LF and the EF are the same, the Total Float shall be zero. When the LF is earlier than the EF, the Total Float shall be negative. Unless otherwise specified all references to "float" shall mean "Total Float."

J. **Fragnet:** The sequence of new activities and/or activity revisions, logic or resource changes that are proposed to be added to the existing schedule to demonstrate the influence of impacts to the schedule. The Fragnet shall identify the predecessors to the new activities and demonstrate the impacts to successor activities.

1.4 QUALITY ASSURANCE

A. **Construction Scheduler:**

1. The Construction Manager is required to employ or retain the services of an individual skilled in construction scheduling ("Construction Scheduler"). For projects with a Contract value greater than five (5) million

dollars, the Construction Scheduler shall have at least **five (5)** years of verifiable experience as the person primarily responsible for preparing and maintaining detailed project schedules on projects of the same or similar size and nature as this project. The Construction Scheduler is required to attend meetings pertaining to scheduling and progress of the work including all progress meetings.

2. Within **five (5)** days after the Notice of Award, the Construction Manager shall resubmit the following to the Owner from it's original CMR QBS Submittal Booklet and CMR Proposal:
   a. Identification, qualifications, and experience of the Construction Manager's Construction Scheduler and all other members of the Construction Manager's scheduling staff.
   b. References of not less than **two (2)** previous projects on which the Construction Manager's Construction Scheduler has utilized CPM scheduling.
3. The Owner reserves the right to disapprove any Construction Scheduler candidate proposed for the project and/or remove, without rights to work on the project, any member of the Construction Manager's scheduling staff that is, in the Owner's opinion, not qualified. In case of disapproval, the Construction Manager shall resubmit the qualifications and references of the proposed alternate Construction Scheduler within 10 days. The Construction Manager must have its Construction Scheduler approved prior to the issuance of the Notice to Proceed and the submission of any schedule.
4. Should the Construction Scheduler leave the employ of the ~~r~~ Construction Manager or be re-assigned or relieved of his/her responsibilities as the Construction Scheduler on the project, the Construction Manager will be required to submit the qualifications of the proposed replacement Construction Scheduler within 10 days after the date the former Construction Scheduler is no longer responsible for his/her duties on this Project.

B. Scheduling Software:

1. For Contracts greater than **five (5)** million dollars, the Construction Manager shall use the latest version of **Primavera Project Planner** as the scheduling software system for use on this Project.
2. The Construction Manager shall provide **one (1)** licensed copy of the scheduling software to the Owner's Representative for their use, registered in the Owner's name, complete with the entire manufacturer's manual, within **five (5)** days after the Contract award. The software manuals and license shall become the permanent property of the Owner.

1.5 CPM SCHEDULE FORMAT/CONTENT

A. Format: All Schedules required by this section shall be computer generated, critical path method (CPM) networks utilizing the precedence diagram method of scheduling.

B. Electronic Schedule Naming: The Construction Manager shall not submit any two (2) schedule files with the same file name. File names shall be in accordance with the following requirements:

1. Proposed/Final Preliminary Schedules shall be named P001, P002, P003, etc.
2. Proposed/Final Baseline Schedules shall be named B001, B002, B003, etc.
3. Final Updated Schedules shall be named U001, U002, U003, etc. Any revisions that are required at a particular update on a data date shall be numbered UA01, UB01, UC01, etc.

C. Activity Identification: Each activity in the Project schedules shall have an activity Identifier (activity ID). The Construction Manager is encouraged to utilize the activity ID to contain a structure enabling easy identification of work type, location, subcontractor, etc. The activity ID of an existing activity shall not be modified or assigned to another activity.

D. Activity Description: The activity description shall identify the scope of the activity and shall include a verb or work function (i.e. form, pour, execute, etc.), an object (i.e. slab, footing, wall, etc.), and location (i.e., first floor, roof, etc.). There shall not be any two activities with the same activity description. It shall not be necessary to investigate activity code assignments or logic relationships to identify the scope of an activity. For example, the description "Pour Footing" will not be acceptable. The description "Pour Footing West Wall, Section 2" will be acceptable. The terms "Miscellaneous," "Misc." and other vague adjectives shall not be used in an activity description. The Construction Manager shall standardize the use of terms and their spelling in all activity descriptions. Abbreviation used in activity descriptions shall be consistent with the abbreviations used throughout the Contract Documents and summarized on the Contract Drawings.

E. Work Activities: The Construction Manager shall include activities for work in the following list:

1. Mobilization.

2. All required submittals and submittal review.
3. Equipment and materials procurement/fabrication/delivery.
4. Installing/operating temporary heat and utilities.
5. Preliminary testing of equipment, instrumentation and controls.
6. Final testing, including preparation time.
7. Substantial Completion: Substantial completion activity shall meet all requirements set forth in Division 01 Section 01 77 00 "Closeout Procedures - CMR".
8. Punch list work.
9. Operation and maintenance training.
10. Demobilization.
11. Final cleaning.
12. Issuance of Certificate of Occupancy.
13. Project Specific Issues (If Warranted).

F. **Maximum Activity Durations:** The Construction Manager shall prepare schedule utilizing activity durations in terms of days. Do not exceed 21 day duration on activities except concrete curing, submittal review and equipment fabrication and deliveries. Where duration of continuous work exceeds 21 days, subdivide activities by location or other sub-element of the work. At the request of the Owner, the Construction Manager shall substantiate the need for specific activities having longer durations than stated herein. If the Construction Manager fails to substantiate this need, then the ~~r~~ Construction Manager shall modify activity durations and the corresponding work scope of the activities to the satisfaction of the Owner.

G. **Activity Dates:** Early and late start and finish dates of activities shall be calculated for each activity based upon the schedule data date, actual dates, schedule logic, schedule constraints, calendars and original duration or remaining duration, in accordance with the software to calculate incorrect early and late, start and finish dates, the Construction Manager shall be responsible to identify all such errors and to determine correct dates consistent with the parameters specified in this Section.

H. **Activity Predecessors and Successors:** Every activity shall have logically assigned predecessors and successors in conformance with the requirements of this Section. Unless otherwise specified, Notice to Proceed shall be the only activity in the Project Schedules without a predecessor. Unless otherwise specified, Acceptance and each Contract Milestone(s) shall be the only activity in the Project Schedules without a successor.

I. **Activity Constraints:** Activity Constraints can affect activity float calculations and shall not be used unless accepted by the Owner. The imposition of a date constraint on any activity shall only be permitted when the Construction Manager demonstrates the need for such a constraint to the satisfaction of the Owner.

J. **Imposed Project Finish Date:** The imposed project finish date shall be the Contract Completion date, or if the ~~r~~ Construction Manager plans an early completion date, the date it plans to complete the Work.

K. **Negative Float:** Negative float is calculated when the user imposes a finish date or other constraint on the schedule and when an activity can only finish after its late finish date. The Construction Manager shall remove the imposed finish date and/or constraint causing the negative float when directed to do so by the Owner.

L. **Activity Codes:** The schedules shall contain activity code classifications and code values. The coding structure shall, at a minimum, include code fields for the following: Phase, Area, Location, Type of Work, Submittal/Procurement, Construction, Responsibility, Original/Extra Work, and Division. All activities in the schedule must have non-blank values for the required codes.

M. **Calendars:** The planning unit for the Work shall be days. The global calendar shall contain all union holidays. The Construction Manager shall coordinate holidays to be observed with the Owner and incorporate them into the schedule as non-working days. Calendar No. 1 shall be a **five (5)** day work week, Monday through Friday. Calendar No. 2 shall be a **six (6)** day work week, Monday-Saturday. Calendar No. 3 shall be a **seven (7)** day work week, Monday-Sunday. Calendar No. 4 shall be a **seven (7)** Day work week with no holidays. Other calendar shall be incorporated for multiple shift work, cold weather restrictions and Contract restrictions. Every activity shall be assigned a working day calendar based on when the activity is planned to occur and when it is contractually permitted to occur. The Construction Manager shall define and submit additional working day calendars for acceptance by the Owner that are necessary for completion of work in accordance with the requirements of the Contract Documents. Only Owner defined or Owner accepted working day calendars shall be utilized in the Project Schedules.

N. Logic: The Construction Manager shall be responsible for developing the logic of the Preliminary, Baseline and Recovery Schedules and for updating that logic each month to accurately reflect the progress of the Work to-date and the Construction Manager's current plan for the timely completion of the Work.

1. The following criteria shall form the basis for assembly of the schedule logic:
   - **a.** Which activity must be completed before a subsequent activity can be started?
   - **b.** Which activities can be done concurrently?
   - **c.** Which activities must be started immediately following a completed activity?
   - **d.** What major economic facility or manpower restrictions are required for sequencing these activities?
2. All paths through the Project schedules shall proceed in the direction representing the progression of time. Activity lag duration shall not have a negative value unless the Construction Manager substantiates to the satisfaction of the Owner that this is the best representation of reality. The use of activity lags shall be kept to a minimum. The Construction Manager shall eliminate lags by creating new activities, when the creation of new activities will perform the same function of the lag and when requested to do so by the Owner.
3. Redundant ties to preceding activities in a sequential series of activities will not be permitted. For example, if activity C is the successor in a finish-start relationship to activity B, and activity B is the successor in a finish-start relationship to activity A, then activity A shall not have a redundant finish-start relationship to activity C. A tie representing a different constraint will not be considered redundant. For example, a logic tie showing that the completion of the work scope of a predecessor is required before the successor can start is different from a logic tie representing a resource limitation and will not be considered redundant.
4. The Construction Manager is required to use manpower and equipment restraints, separately noted, to optimize and level manpower and equipment requirements. Such resource leveling shall reflect a reasonable plan for accomplishing the Work. The individual activities involved may be sequenced within the limits of the available Total Float. However, when this leveling technique is used in establishing the initial schedule, it shall be reflected in the logic with restraints identified as "restraint for manpower or equipment leveling purposes only." Critical or near Critical Paths resulting from the use of manpower restraints shall be kept to a minimum.
5. All activities with resource restraints shall be supplemented with resource loading information as noted in Paragraph G.
6. The Construction Manager shall correct all incorrect logic relationships in the Schedule Updates to eliminate any out-of-sequenced logic. The Construction Manager shall make all changes in the logic or other adjustments found to be incorrect by the Owner.

O. Progress Data: Actual start and finish dates shall not be automatically updated by default mechanisms that may be included in the CPM scheduling software systems. The primary source of actual starts and finishes and period percentage completes shall be by field verification. The Construction Manager is to insure that progress is based of a current estimate of remaining duration to complete the Work and not the activity percent complete which calculates the remaining duration based on the original estimated duration.

P. Submittals:

1. Each submission that is required by the Contract Documents shall have a corresponding activity, for the preparation and review and approval at the submission. When the Construction Manager plans on making a submission in parts, each part of the submission shall have corresponding preparation and review and approval activities.
2. The timing, sequencing and duration of all submitted review and approval activities shall be in accordance with the Contract Documents.
3. All submissions designated "Revise and Resubmit" shall require that the Construction Manager insert new submittal preparation and review and approved activities with appropriate logic into the schedule.
4. When submittal receives a partial approval and the partial approval is sufficient to enable the commencement of a successor activity, then the original submittal activity shall be broken down into multiple activities as necessary to accurately reflect the logic of the Construction Manager's current plan.
5. When multiple items are included in a single submittal, the "Review and Approve" activity for the submittal shall be a predecessor to every activity representing the fabrication and delivery of any of the materials.

Q. Delivery Activities: The schedules shall include activities for all fabrication and delivery work except for short lead time items. "Short lead time" shall be defined as a period of fourteen (14) days or less from placement of

order to delivery of material to the project site. Activities representing the delivery of materials or equipment for more than one (1) installation activity will permitted in accordance with the following conditions.

1. The material delivery activity shall be a predecessor to the first activity representing the installation of the material in each area.
2. When partial deliveries are received and those deliveries are adequate to enable the commencement of some, but not all, successor activities, then the original delivery activity shall be broken down into multiple activities as necessary to accurately reflect the logic of the Construction Manager's current plan.

R. Inspections/Testing: The Construction Manager shall include an activity for each inspection and test required by the various officials and agencies, including the Building Inspector, and Fire Marshall. The Construction Manager shall schedule these activities in accordance with the availability of the corresponding agency/official.

S. Progress Override/Retained Logic: The Construction Manager shall use retained logic to calculate all schedules required by this section. The use of progress override is not allowed without prior approval of the Owner.

T. Weather Days Allowance: The Construction Manager shall include as a separate identifiable activity on the Critical Path, and activity labeled "Weather Days Allowance." Insert this activity at the end of the schedule.

1. The duration of the Weather Days Allowance shall be calculated as follows (decimals rounded to nearest whole number):

$$\frac{\textbf{Contract Time}\ \text{(Calendar Days)}}{\textbf{365}} \quad \text{multiplied by} \quad \textbf{7} \quad \text{equals} \quad \textbf{Weather Days Allowance}\ \text{(Calendar Days)}$$

2. The Contractor shall insert an activity in the Critical Path to reflect weather day occurrences when weather days are experienced and accepted by the Owner. Identify this activity as a weather delay.
3. The Construction Manager shall reduce duration of Weather Days Allowance activity as weather delays are experienced and inserted into the schedule. Remaining weather days in Weather Day Allowance at completion of project is considered float. Weather delay, when justified, are considered allowable, non compensable.

U. Regulatory/Third Party Approvals: The Construction Manager shall include activities in its schedule for all approvals required by regulatory agencies or other third parties.

V. Resource Loading: The Construction Manager shall resource load the schedules when required by this Specification and/or if requested to do so by the Owner. When required, the schedules shall be resource loaded for both the Construction Manager and all of its subcontractors as detailed below or as otherwise directed by the Owner. The Construction Manager may propose additional or alternative resource loading for the Owner review and acceptance. Defining a resource shall consist of identifying the resource name, resource description, unit of measure, and calendar assignment.

1. **Labor Resources:** Labor shall refer to all craft labor including foreman. Labor shall be measured in person-days. The labor resource definitions shall be consistent with the subcontractor work scope.
2. **Construction Equipment Resources:** The planned use of equipment requiring a licensed operator shall be reflected in equipment resource assignments to activities.
3. **Limits on Resources:** The Construction Manager shall indicate in its Narrative the expected amount of resource and shall define the normal or expected usage along with a maximum limit available to the Construction Manager. Resource limits may vary for different stages of the work. Resource limits shall be revised to reflect the Construction Manager's current plan for the timely completion of the work.

W. Activity Logs:

1. Activities that are modified or added by change order shall be identified in the activity log. The change order number, as issued by the Owner, and the date the activity was modified or added shall be clearly recorded.
2. Activities affected by logic changes, resource changes, duration changes and calendar changes shall be identified in the activity log. The date the activity was modified, the nature of the change and the reason for the change shall be clearly recorded.

1.6 PRELIMINARY SCHEDULE AND PRELIMINARY SCHEDULE UPDATES

A. For projects with a construction cost estimate over five (5) million dollars, the Construction Manager shall submit a Preliminary Schedule and Preliminary Schedule Updates. The Notice to Proceed will not be issued and the

Construction Manager will not be allowed to start work at the Project site until the Preliminary Schedule has been submitted and accepted.

B. The Preliminary Schedule shall contain a detailed plan of operations for the first 90 days of Work after receipt of the Notice to Proceed.

C. The Architect and DPW PM and Construction Manager shall meet after receipt of Preliminary Schedule to review and make necessary adjustments Construction Manager shall submit a revise Preliminary Schedule incorporating the adjustments with **five (5)** days after meeting.

D. All Work contemplated beyond the first **ninety (90)** days shall be shown in sufficient detail such that the Critical Path and all Contract Milestones may be identified.

E. The Preliminary Schedule shall be updated monthly during first **ninety (90)** days after issuance of the Notice to Proceed. The first update of the Preliminary Schedule shall show the progress on the actual Notice to Proceed date and shall be submitted to the Owner's Representative within **five (5)** days after the issuance of the Notice to Proceed. Subsequent updates shall show the progress through the last day of the month and shall be submitted to the Architect and DPW PM by the fifth business day of each month.

F. Preliminary Schedule Update revisions that are required as a result of review comments by the Architect and DPW PM shall be submitted within **five (5)** days of the Construction Manager's receipt of the Architect and DPW PM comments. The data date of the revised Preliminary Schedule Update shall remain on the first day of the month.

G. The Construction Manager shall not be permitted to make any schedule revisions (besides progress) to the Preliminary Schedule Update unless approved by the Architect and DPW PM. When schedule revisions are required, the Construction Manager shall submit a Schedule Revision per Article 1.11.

1.7 BASELINE SCHEDULE

A. For projects with a construction cost estimate over five (5) million dollars, the Construction Manager shall submit the proposed Baseline Schedule to the Owner's Representative Architect and DPW PM for all the work of the project within 45 days after issuance of the Notice to Proceed. The Accepted Preliminary Schedule shall be incorporated unchanged, as first 90 days activity in the Construction Manager's Baseline Schedule.

B. The proposed Baseline Schedule shall show sequence and interdependence of all activities required for complete performance of all Work, beginning with date of Notice to Proceed and concluding with date of final completion of the Contract. The Baseline Schedule shall depict the work as bid and as planned as of the Notice to Proceed. The data date shall be the actual date of the Notice to Proceed.

C. The Owner's Representative and the Construction Manager shall meet after the Owner's Representative's receipt of the Baseline Schedule to review and make necessary adjustments. Should adjustments be required, the Construction Manager shall submit a revised Baseline Schedule within **five (5)** days after the meeting and receipt of the Architect and DPW PM comments. Subsequent follow-up meetings and resubmissions may continue until the Architect and DPW PM accepts the Baseline Schedule.

D. The Construction Manager shall require each major Trade Contractor and major supplier to submit in writing a statement certifying that the major Trade Contractor or major supplier has concurred with the Construction Manager's Baseline Schedule, the major Trade Contractor's or major supplier's related schedule has been incorporated accurately, including the duration of activities and crew allocations. The definition of a "major Trade Contractor" is **one (1)** that provides services valued in excess of **five (5)** percent of the Contract value. The definition of "major supplier" is **one (1)** that provides material(s) or services valued in excess of **one (1)** percent of the Contract value. Failure of the Construction Manager to provide the required information will delay the approval of the Baseline Schedule.

1.8 SCHEDULE UPDATES

A. The Construction Manager shall update and progress the CPM Schedule through the last day of each month (the Data Date is the first day of the month). Updating and progressing the CPM Schedule shall be completed and submitted by the fifth business day each month. Except as otherwise authorized by the Owner's Representative, monthly submissions received after the due date are considered late.

B. The first update will consist of the approved Baseline Schedule updated as of the first day of the first month which starts after 90 days from the Notice to Proceed. Subsequent monthly Schedule Updates will be the previous month's approved Schedule Update or approved Revision Schedule updated to reflect progress over the last month. Schedule revisions, apart from updating the status of the remaining durations and percent completes of the various work activities will not be permitted in the Schedule Update.

C. The Construction Manager shall create a copy of the previous month Schedule Update for the purpose of updating and progressing it. The schedule shall be updated to show the work actually accomplished during the preceding month, the actual time consumed for each activity, and the estimated time remaining for any activity that has been started but not completed. The updating of the percent complete and the remaining duration of any activity shall be independent functions; program features that calculate one of these parameters from the other shall be disabled.

D. The Construction Manager shall make the necessary adjustments to the Schedule Update in accordance with the Owner's Representative's Schedule Update review comments and shall re-submit the Schedule Update within **five (5)** days after receipt of those comments.

E. The Construction Manager shall prepare the monthly Schedule Updates every month starting on the month described above through the actual substantial completion date.

1.9 TWO-WEEK LOOK AHEAD SCHEDULES

A. The Construction Manager shall be required to produce and submit to the Owner's Representative a Two-Week Look Ahead Schedule, to be updated and submitted the first day of each week. Except as otherwise authorized by the Owner, submissions received after the due date are considered late.

B. The Two-Week Look Ahead Schedule may be a CPM schedule or a bar chart; it shall be consistent with the previously approved Schedule Update or approved Schedule Revision.

1.10 SCHEDULE REVISIONS

A. If, at any time, the Construction Manager alters its logic, original durations, or descriptions, adds activities or activity codes, or in any way modifies the accepted Preliminary Schedule, accepted Preliminary Schedule Update, Baseline Schedule or Schedule Update, the Construction Manager must notify the Owner's Representative of the change(s), in writing and submit a Revision Schedule to the Owner's Representative for review.

B. The preparation and submission of Revision Schedules will also be required to reflect any Contract Modifications that were approved and Construction Change Directives that were issued during the preceding period and any extra or changed work that the Construction Manager has started during the preceding period.

C. With each Revision Schedule, the Construction Manager shall submit a written narrative explaining the nature of the change(s), the schedule, the reason for the change(s) and the impact on the schedule as a result of the change(s).

D. All changes (i.e. duration changes, logic changes, new logic, new or modified activities changes in work sequence, etc.) shall be recorded and a note added to the activity log. The record shall include at a minimum, the date and the reason for the change, and description of the change.

E. The required Revisions Schedules and Narratives are in addition to the regular Schedule Update. They shall be separate submittals and shall be noted as Schedule Revisions.

F. Proposed Revision Schedules shall be submitted by the fifth day of the month and shall reflect status as of the first day of the month.

G. The Owner's Representative and Construction Manager shall meet after the Owner's Representative's receipt of the Revision Schedule and Narrative to review and make necessary adjustments. Should adjustments be required, the Construction Manager shall submit a revised Revision Schedule to the Owner's Representative within **five (5)** days after the meeting and receipt of the Owner's Representative Comments. Subsequent follow-up meetings and resubmissions may continue until after the Owner's Representative accepts the Revision Schedule.

H. Only upon acceptance of a revision to the Schedule by the Owner's Representative shall the revision be reflected in the next Schedule Update and Two-Week Look-Ahead Schedule.

I. The Owner's Representative reserves the right to accept or reject any schedule revisions proposed by the Construction Manager.

1.11 RECOVERY SCHEDULES

A. If, in opinion of the Owner, a Schedule Update indicates that the Construction Manager has fallen behind schedule, or that a revision in sequence or operations may be necessary for any other reason, the Construction Manager shall within **seven (7)** days of receiving a written request to perform "Recovery" from the Owner's Representative, immediately institute all necessary steps to improve his progress and shall submit such revised

network diagrams, tabulations, operational plans and any supplementary information, as may be deemed necessary by the Owner, to demonstrate the manner in which an acceptance rate of progress will be regained.

B. Should the Construction Manager's "Recovery" efforts not demonstrate an ability to regain an acceptable rate of progress, Owner's Representative may require the development of a "Recovery Schedule" and the Construction Manager shall submit the Recovery Schedule within **twenty-one (21)** days of receiving a written request for the Recovery Schedule from the Owner's Representative. The Recovery Schedule is to be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations shall be shown to a level of detail that facilitates report generations based on labor crafts and equipment classes for the Construction Manager and Trade Contractors. The Construction Manager shall use average composite crews to display the labor loading of onsite construction activities. The Construction Manager shall optimize and level labor to reflect a reasonable plan for accomplishing the Work of the Contract and to assure that resources are not over allocated in multiple concurrent activities. The time-scaled resource histograms shall show labor crafts and equipment classes to be utilized on the Contract.

C. In addition to required submittals, the "Recovery Schedule" submission will also include a Narrative as detailed herein, a time-scaled resource histogram and a Monthly Resources Loading Summary Report (tabular) indicating the peak number of resources required for each activity.

D. The Owner's Representative shall be the sole judge as to whether the Recovery Schedule is sufficiently detailed. Upon acceptance of this Recovery Schedule, it shall form the basis of the new Monthly Schedule Updates going forward.

E. No additional compensation will be allowed for Recovery Schedules required to overcome delays caused in whole or in part by the Construction Manager.

1.12 NARRATIVES

A. The Construction Manager shall prepare and submit a Narrative to accompany the Baseline Schedule, Preliminary Schedule and each Preliminary Schedule Update and Monthly Schedule Update. The Narratives shall include:

1. Identification of the update period, the data date and the schedule file name.
2. A description of the current Critical and Near Critical Paths activities that are supposed to start or to be worked on over the coming month.
3. Changes to the Critical Path, intermediate and completion Milestones
4. Description of problem areas.
5. Current or anticipated delays:
   - **a.** Cause of delay.
   - **b.** Impact of delay on other activities, Milestones, and completion dates.
   - **c.** Corrective action and schedule adjustments to correct the delay.
6. A discussion of work completed during the period.
7. A comparison of the planned versus schedule progress early on and near Critical Path activities that were to have been worked on over the last month.
8. A description of any interdependencies between the Construction Manager's Schedule and any work by other Contractors, third parties, and/or the Owner and its representatives.
9. A description of the current status of float created by any previous or ongoing compensable or excusable delays, whether or not the Construction Manager has utilized any of this float over the last period by purposefully slowing down (pacing) and any request to utilize this float over the coming period.
10. An explanation of how adverse weather has been addressed in Schedule and an accounting of the Weather Day Allowance delineating the activities incorporated into the Schedule to account of work days lost due to weather and the resultant decrease in the duration of the Weather Day Allowance.
11. A description of planned labor resources to be utilized to complete critical and near Critical Path work as requested by the Owner's Representative.
12. A description of actual and potential equipment resource limitations.

1.13 NETWORK FILES, GRAPHICAL OUTPUT AND REPORTS

A. With each Preliminary Schedule, Preliminary Schedule Update, Baseline Schedule, Schedule Update, Revision Schedule and Recovery Schedule required by these specifications, the Construction Manager shall submit to the Owner's Representative the following schedule reports/graphics/files:

1. **Three (3)** compact disc sets that each include:
   - **a.** A compressed back up of the entire schedule.
   - **b.** Gantt charts in Adobe Acrobat PDF file format, formatted to fit ANSI Size D paper (610mm x 914mm) (24" x 36"), and showing the Activity ID, Activity Description, Original Duration, Remaining Duration, Total Float, Early Start and Finish Dates, and Calendar ID. Types of Gantt Charts to be included are:
     - **i.** The project critical (longest) path.
     - **ii.** The Project near Critical Path (excluding Critical Path activities).
     - **iii.** All uncompleted work activities as of the data date.
2. Reports in Adobe Acrobat PDF file format, formatted to fit 216mm x 279mm (8½" x 11") size paper, to include:
   - **a.** A listing of all activities, by activity code, with early & late starts and Total Float.
   - **b.** A Claim Digger Report that details all changes between the current schedule submittal and the previous month's update submittal.
   - **c.** Detailed Predecessor/Successor Report which included a listing of all activities that immediately precede and immediately succeed that activity in the schedule logic.
3. **Three (3)** paper copies of each Gantt Charts in color and report on the paper size specified above.

B. Schedule submittals will only be considered complete when all materials have been submitted.

1.14 FLOAT/CRITICAL PATH

A. With the exception of the Float described in Paragraphs B and C, Float is not for the exclusive use or benefit of either the Owner's Representative or the Construction Manager but is an expiring resource available to all parties acting in good faith as needed to meet any Contract Milestone(s).

B. As float is an expiring resource, if the Work is delayed on the Critical Path due to an excusable delay (either compensable or non-compensable) or by any delay for which responsibility has not yet been agreed upon, the Construction Manager may not use any float created by such delay on any other path without the express written approval of the Owner's Representative or unless at the time of the float consumption a time extension had been issued for the delay that created the float being consumed. Use of such float on any parallel path without the approval of the Owner's Representative shall be construed as a concurrent inexcusable delay to any delay caused by the Owner's Representative.

C. It is acknowledged and agreed by the Construction Manager that Owner's Representative caused delays on the project may be offset by Owner's Representative caused time savings (including, but not limited to: Critical Path submittals returned in less time than allowed for in the Contract, approval of substitution requests which result in a savings of time along the Critical Path for the Construction Manager, etc.). In such an event, the Construction Manager shall not be entitled to receive an extension of time or delay damages until the Owner's Representative caused time savings are exceeded and the Contract completion date also exceeded.

1.15 EARLY COMPLETION

A. Should Construction Manager submit a Preliminary Schedule, Baseline Schedule, Schedule Update or Schedule Revision showing Project Completion more than **twenty-eight (28)** days prior to Contract Completion Date, the Owner's Representative may issue a Change Order, at no cost to Owner, revising the time of performance of Work and Contract completion date to match Construction Manager's schedule. Contract Milestone dates, if any, shall be adjusted accordingly. The assessment of liquidated damages shall be measured based on the new Milestone and Contract completion dates.

B. Should any monthly Schedule Update show the project completion earlier than current Contract completion date, the Construction Manager shall show early completion time as schedule activity, identified as "Project Float." This float shall be available for use by either party as per the provisions of this subsection 1.14 - Float/Critical Path. The Owner shall not liable for any damages as a result of utilizing this float.

1.16 CONTRACT TIME EXTENSIONS

A. Mitigation of Delays:

1. The General shall be responsible to develop mitigation measures for all delays regardless of responsibility for the delays and to identify all time and cost impacts to the work associated with those mitigation measures. Unless circumstances otherwise require, the General Float/Critical Path shall not pursue mitigation action for which it expects the Owner to be liable prior to notifying the Owner and receiving Owner's Representative authorization to proceed with the mitigation action. Any action taken by the Construction Manager prior to receiving approval from the Owner's Representative shall be at the Construction Manager's risk.

2. When the need for mitigation arises to ensure timely completion, the Construction Manager shall review all uncompleted activities on the Critical and Near Critical Paths to the Contract Completion Date for errors in scope, duration, and logic and for the feasibility of performing in parallel work currently scheduled sequentially.

3. Whenever it is possible for the Construction Manager to mitigate delay without added cost, the Construction Manager shall do so. The Construction Manager shall mitigate all delays as efficiently and economically as possible, with the objective of minimizing both the time and cost impact of the delay regardless of responsibility for the delay. The Owner will not be liable for damages which the Construction Manager could have avoided by reasonable means such as prudent scheduling of the work and judicious handling of forces, equipment or plant. The Owner will not be liable for damages incurred by the Construction Manager during any period of time when the Construction Manager has failed to provide notification of delay in accordance with the Contract requirements when having the notification at the specified time could have influenced the Owner's decision or actions.

B. Time Impact Analysis:

1. If the Construction Manager believes that a proposed change will impact the Project Completion Date or interim Milestones, the Construction Manager shall submit an analysis with its Change Order Proposal demonstrating the delay to the Critical Path. This analysis shall be in the form of a Time Impact Analysis (TIA).

2. The Time Impact Analysis shall consist of: 1) a Fragnet of the portion of the schedule that will be affected by the incorporation of the change, which shall include the new activities, revised logic and durations associated with the proposal change; 2) a narrative explanation of how the proposed change would impact the schedule; 3) an impact schedule which shall be developed by incorporating the Fragnet and required changes, including any delay mitigation measures, into the most recent accepted schedule update and; 4) electronic copies of the Fragnet and impact schedule.

3. The Construction Manager shall submit its TIA in sufficient time to allow it to be incorporated into a Revision Schedule prior to the change order work proceeding, allowing the Owner thirty (30) days after receipt of the TIA and all the supporting information required with the Change Order Proposal to approve or reject the analysis.

4. Upon agreement on the schedule impact due to the proposed change and the issuance of a time extension, the Construction Manager shall incorporate the agreed upon Fragnet/schedule revisions in the next monthly update.

5. The Owner reserves the right to have the Construction Manager proceed with the change order related work without agreeing on the time associated with it and to measure the actual schedule impact via Contemporaneous Period Analysis.

6. In cases where the Construction Manager has not submitted a TIA with its Change Order Proposal for a particular proposed change, the Construction Manager agrees that the particular proposed change has no impact on the Contract Completion Date or interim Milestones and no time extension is required.

C. Contemporaneous Period Analysis:

1. When an accepted Schedule Update indicates the project has been delayed beyond the current Contract Completion Date and the Construction Manager believes it is entitled to an extension of time, the Construction Manager shall prepare and submit to the Owner a Contemporaneous Period Analysis (CPA) demonstrating the delay(s) to the Critical Path at the time of the delay, mitigation measures taken or proposed by the Construction Manager and request an extension of time.

2. The Construction Manager's CPA and time extension request shall be submitted prior to the submission of the next Schedule Update.

3. The request shall indicate the amount of time requested, the period when the delay was experienced and an explanation as to the cause of the delay.
4. The CPA shall quantify the delay by comparing the completion dates and Milestone dates on an update by update basis, starting with the update just prior to the delaying event and ending with the update just after the conclusion of the delaying event. Only the accepted schedules/Schedule Updates shall be used in the CPA. The CPA shall determine the cause of the delay by correlating slippage with various unforeseen events.
5. The CPA will consist of: 1) an update by update accounting of all delay(s) during the period in question; 2) an update by update narrative explanation of how the delay(s) affected the completion date or would have affected the completion date but for other concurrent delay(s); 3) chronologies of the issues affecting the schedule period in question; and 4) a day by day accounting and description of the unanticipated work/work stoppage on the Critical Path and/or path in question; 5) a Gantt chart comparing the as-planned schedule just prior to the start of the delay to the actual as-built for the path(s) in question.

D. The Owner may require the Construction Manager to correct errors in its TIA or CPA at anytime, whether or not the schedules have been accepted and/or time extension issued and agreed upon. Should the errors affect the outcome of the TIA or CPA, the Owner reserves the right to adjust the time extension accordingly. Generally, a schedule will be found to be in error if it does not properly reflect the sequencing, timing and durations of all the work and required events as well as mitigation efforts contemplated or which should have been contemplated at the time of the data date of the schedule.

E. Time Extensions will be granted only to the extent that equitable adjustments for the activity or activities affected exceed or exceeded the total or remaining float along the Critical path or activities at the time of the actual delay. Actual delays in activities which do not affect the Critical Path work or which do not move the Construction Manager's planned completion date beyond the Contract completion date or current completion date as affected by previous delays, will not be the basis for an adjustment to the Contract time. Time Extensions shall not be granted until a delay occurs that is:

1. Beyond control of and without fault of or negligence of the Construction Manager and the major Trade Contractors or Suppliers at any time.
2. Extends the actual performance of the work beyond the Contract completion date or other specified Interim Milestones.

E. Should a non-compensable excusable delay be concurrent with one or more compensable delays, the Construction Manager and Owner agree that the net result is a non-compensable, excusable delay to the extent the delay is caused by the non-compensable event.

F. The Construction Manager shall have no claim for damages of any kind, or extensions or increase to the Contract time(s) or Contract Milestone(s), or adjustments of Contract Price on account of any delay, interruption or suspension of the Work or any portion thereof (herein after collectively referred to as "Delay"), due to whatever cause unless the prerequisites of this Subsection are met. The requirements of this Subsection are in addition to and not in lieu of the requirements of any other applicable subsection.

1.17 REVIEW AND ACCEPTANCE OF PROJECT SCHEDULE SUBMITTALS

A. The Owner's Representative shall review schedule submittals for conformance with the requirements of the Contract Documents. Schedule review comments by the Owner's Representative may address whether items of Work are omitted, activity durations are reasonable or that the level of labor, materials, and equipment, the means, methods, timing, and sequencing of the Work are practicable. The planning, scheduling or execution of the Work and the accuracy of any Project Schedule shall remain the sole responsibility of the Construction Manager.

B. During the review of any of the submissions required by this section, if any of the following conditions are discovered the submittal shall be returned by the Owner's Representative without further review for correction and re-submittal:

1. The submittal is incomplete.
2. The submittal does not comply with the specified format.
3. A component of the submittal has not been prepared in accordance with all of the requirements of this section.
4. The quality of the submittal indicates that the Construction Manager has failed to perform an internal quality control review prior to submission.

5. There is an inconsistency between electronic files and printed material.

C. It is the Construction Manager's responsibility to ensure that all Project Schedules are in compliance with all of the requirements of the Contract Documents. The Owner's Representative's failure to return a submittal shall not be construed to mean that the submittal is in compliance with the requirements of the Contract Documents. The Owner's Representative, at its discretion, may choose to complete a submittal review even though the submittal fails to meet one of more of the conditions for rejection stated herein.

D. The acceptance of any Project Schedule by the Owner's Representative does not constitute acceptance or approval of any change to the requirements of the Contract Documents including but not limited to any mandated construction sequences. The Owner's Representative is not responsible for any erroneous assumptions or information in any Project Schedules regardless of origin.

E. The Construction Manager shall be responsible for all delays due to its failure to submit complete submittals in accordance with the requirements of the Contract Documents.

F. The Schedule submitted will not be considered acceptable until all of the Owner's Representative's comments are incorporated into the schedule to the Owner's Representative's satisfaction.

G. Errors in any Project Schedule accepted by the Owner's Representative, including but not limited to activity durations, relationships between activities, resource allocation or other float suppression techniques that do not accurately reflect the work may be identified at any time and once identified shall be corrected by the Construction Manager.

H. Owner's Representative's acceptance of a Schedule Update shall not constitute the approval of a time extension should the Project Completion Date or Contract Milestone(s) be shown as delayed.

I. Notwithstanding any review, review comments, acceptance, scheduling assistance or direction to change an/or revise any schedule by the Owner's Representative, the schedules shall at all times be the Construction Manager's schedule for performing the Work and not be considered as any Owner's Representative direction constituting a change unless the Construction Manager gives appropriate notice and the other Contract provisions for determining merit and entitlement are met.

1.18 PAYMENT

A. When the Construction Manager submits its schedule of values in accordance with the General Conditions, it shall include a amount for the scheduling work associated with this section, this cost to be paid in accordance with Division 01, Section 01 29 76 Progress Payment Procedures - CMR.

B. Failure of the Construction Manager to submit a Baseline Schedule or Revised Baseline Schedule for any portion of the work in accordance with t his specification may result in the withholding all Contract payment until the schedule is submitted to, and accepted for compliance with the specification and reasonableness, by the Owner's Representative.

C. In the event the project extends beyond the original completion date by more than 30 days, and a time extension is granted to the Construction Manager, the Owner's Representative may require additional CPM updates which will be paid at the per month cost for the Scheduling Update services.

1.19 DISTRIBUTION

A. Distribute copies of the computer generated schedules to Owner's Representative, Architect, Owner, Subcontractors, suppliers, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problem anticipated by projections indicated in schedules.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 32 16.13 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for construction photographs.

B. **Related Sections:** The following Section contains requirements that relate to construction photographs:

1. Division 01 Section 01 33 00 "Submittal Procedures - CMR" specifies general requirements for submitting digital construction photographs.

1.3 SUBMITTALS

A. **Photographs:** Provide a digital camera to take **twenty-four (24)** or more photos each time. Deliver **two (2)** sets of photo files on CD-ROM and **one (1)** set of prints (8x10) to the Owner's Representative for the Department.

B. **Extra Sets:** When requested by the Owner, the photographer shall prepare extra sets of prints or CD-ROMs. The photographer shall distribute these directly to the designated parties who will pay the costs for the extra sets directly to the photographer.

1.4 QUALITY ASSURANCE

A. Engage a qualified commercial photographer to take photographs during construction.

B. **Photographer's Qualifications:** Photographer shall be an individual of established reputation who has been regularly engaged as a professional photographer for not less than **three (3)** years.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC COPIES

A. On the date the work is begun and every **thirty (30)** Calendar Days thereafter (until the work is at least 95 percent complete), the Construction Manager shall have digital photographs of the construction taken by a professional photographer.

B. **Identification:** Label each CD-ROM with project name and date the photographs were taken. With each submittal provide an applied label, rubber-stamped or index sheet with the following information:

1. Name of the Project.
2. Name and address of the photographer.
3. Name of the Architect.
4. Name of the Construction Manager.
5. Date the photographs were taken.
6. Vantage Point: Description of vantage point, in terms of location, direction (by compass point), and elevation or story of construction.

PART 3 – EXECUTION

3.1 PRECONSTRUCTION PHOTOGRAPHS

A. Before starting construction, take digital photos of the site and surrounding properties from different points of view, as selected by the Architect and DPW PM and Owner's Representative.

1. Take digital photos in sufficient number to show existing site conditions before starting Work.

2. Take digital photos of adjacent existing buildings either on or adjoining the property in sufficient detail to record accurately the physical conditions at the start of construction.

3.2 PHOTOGRAPHIC REQUIREMENTS

A. Take **twenty-four (24)** or more digital photographs monthly, coinciding with the cutoff date associated with each Application for Payment. The Architect and DPW PM and Owner's Representative shall select the vantage points for each shot to best show the status of construction and progress since the last photos were taken.

B. As the digital photographs are a record of the work progress, they shall be taken each month, whether or not they show work done during the preceding month. Deliver the CD-ROMs and prints within **ten (10)** Calendar days of their taking.

C. Provide and coordinate the use of photographic software to assure that the photos are viewable by all interested parties.

END OF SECTION 01 32 33 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including but not limited to the following:

1. Submittal schedule.
2. Shop Drawings.
3. Product Data.
4. Samples.
5. Quality assurance submittals.
6. Proposed "Substitutions/Equals".
7. Warrantee samples.
8. Coordination Drawings.
9. O & M Manuals

B. Administrative Submittals: Refer to other Division 01 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Permits.
2. Applications for Payment.
3. Performance and payment bonds.
4. Construction Manager's Construction Schedule or CPM Schedule.
5. Daily construction reports.
6. Construction Photographs.
7. Insurance certificates.
8. List of subcontractors.
9. Subcontractors/Suppliers FEIN #'s and Connecticut tax registration #.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 25 00 "Substitution Procedures - CMR" specifies requirements for submittal of requests for equals and substitutions.
2. Division 01 Section 01 29 76 "Progress Payment Procedure- CMR s" specifies requirements for submittal of the Schedule of Values.
3. Division 01 Section 01 31 00 "Project Management and Coordination- CMR" specifies requirements governing preparation and submittal of required Coordination Drawings.
4. Division 01 Section 01 31 19 "Project Meetings- CMR" specifies requirements for submittal and distribution of meeting and conference minutes.
5. Division 01 Section 01 32 16.13 "CPM Schedules- CMR" for requirements for CPM scheduling and reporting progress of work.
6. Division 01 Section 01 32 33 "Photographic Documentation- CMR" specifies requirements for submittal of periodic construction photographs.
7. Division 01 Section 01 35 26 "Government Safety Requirements- CMR" specifies the requirements for safety plans, reports, and investigation submittals.

8. Division 01 Section 01 45 00 "Quality Control- CMR" specifies requirements for submittal of inspection and test reports and mockups.
9. Division 01 Section 01 45 23.13 "Testing for Indoor Air Quality (IAQ), Baseline IAQ, and Materials- CMR " specifies requirements for submittal of documentation required to support LEED or Green Globes certification.
10. Division 01 Section 01 77 00 "Closeout Procedures- CMR "specifies requirements for submittal of Project Record Documents and warranties at project closeout.
11. Division 01 Section 01 78 30 "Warranties and Bonds- CMR".
12. Division 01 Section 01 81 13 "Sustainable Design Requirements- CMR" specifies requirements for submittal of documentation required to support LEED or Green Globes certification.
13. Division 01 Section 01 91 00 "Commissioning- CMR" specifies requirements for submittal of quality assurance documentation related to commissioning.

1.3 DEFINITIONS

A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended and as identified in the Specification Divisions 02 through 49.

1. Preparation of Coordination Drawings is specified in Division 01 Section 01 31 00 "Project Management and Coordination-CMR" and may include components previously shown in detail on Shop Drawings or Product Data.

B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.

C. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.

1.4 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
   a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
   b. The Architect reserves the right to reject incomplete submitted packages.
3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review. Include the assumption of at least one re-submittal.
   a. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

B. **Submittal Preparation:** Place a permanent label, title block or 8-1/2 inches x 11 inches cover page approved by the Architect, on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. The minimum number of copies required for each submittal shall be seven (7) or as determined otherwise at the pre-construction conference or by the Construction Administrator.
2. Provide a space approximately 4 inches by 5 inches on the label, beside the title block or on the cover page on Shop Drawings to record the Construction Manager's review and approval markings and the action taken.
3. Include the following information on the label for processing and recording action taken.
   a. Project Name and State of Connecticut Project Number.
   b. Date.

c. Name and address of the Architect, Construction Administrator, and Owner Representative.

d. Name and address of the Construction Manager.

e. Name and address of the subcontractor.

f. Name and address of the supplier.

g. Name of the manufacturer.

h. Number and title of appropriate Specification Section.

i. Drawing number and detail references, as appropriate.

j. Indicate either initial or resubmittal.

k. Indicate deviations from Contract Documents.

l. Indicate if "equal" or "substitution".

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Construction Manager to the Architect using a transmittal form. Copy the Construction Administrator on the transmittal. The Architect will return all submittals to the Construction Manager after action is taken with a complete copy of the submittal package and one complete copy of the submittal package. The Architect will not accept submittals received from sources other than the Construction Manager.

1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Construction Manager's certification that information complies with Contract Document requirements.

1.6 SUBMITTAL SCHEDULE

A. After development and review by the Owner and Architect acceptance of the Construction Manager's Construction or CPM schedule prepare a complete schedule of submittals. Submit the schedule to the Owner's Representative within thirty (30) Calendar Days of Contract Award.

1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Construction Manager's Construction or CPM Schedule.

2. Prepare the schedule in chronological order. Provide the following information:

a. Schedule date for the initial submittal.

b. Related section number.

c. Submittal category (Shop Drawings, Product Data, or Samples).

d. Name of Subcontractor.

e. Description of the part of Work covered.

f. Scheduled date for resubmittal.

g. Scheduled date for the Architect's final release of approval.

B. 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 modifications to submittals noted by the 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 Construction Manager's Construction Schedule or CPM Schedule.

2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first sixty (60) Calendar 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 Construction Manager's Construction Schedule or CPM Schedule.

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

C. **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. **Owner's Representative** reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

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

1. **Initial Review:** Allow (15) fifteen days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect and Owner's Representative will advise Construction Manager when a submittal being processed must be delayed for coordination with related submittals not yet received. Additional time will be required if processing must be delayed to permit review of related subsequent submittals.
2. **Intermediate Review:** If intermediate submittal is necessary, process it in same manner as initial submittal.
3. **Resubmittal Review:** Allow (15) fifteen days for review of each resubmittal.
4. **Mass Submittals:** Six (6) or more submittals in one (1) day or 20 or more submittals in one (1) week. If "Mass Submittals" are received, Architect's review time stated above may be extended as necessary to perform proper review. Architect will review "Mass Submittals based upon priority determined by Architect after consultation with Owner and Construction Manager.

E. **Distribution:** Following response to the initial submittal, print and distribute copies to the Construction Administrator, Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

F. **Schedule Updating:** Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.7 DAILY CONSTRUCTION REPORTS

A. Prepare a daily construction report recording the following information concerning events at the site, and submit duplicate copies to the Construction Administrator at weekly intervals:

1. List of subcontractors at the site.
2. Approximate count of personnel at the site.
3. High and low temperatures, general weather conditions.
4. Accidents and unusual events.
5. Meetings and significant decisions.
6. Stoppages, delays, shortages, and losses.
7. Meter readings and similar recordings.
8. List of equipment on site and identify if idle or in use.
9. Orders and requests of governing authorities.
10. Change Orders received, start and end dates.
11. Services connected, disconnected.
12. Equipment or system tests and startups.

13. Partial Completion's, occupancies.
14. Substantial Completion's authorized.
15. Equals or Substitutions approved or rejected.

1.8 SHOP DRAWINGS

A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included by sheet and detail number.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. **Sheet Size:** Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 36 by 48 inches.
7. Submit one (1) reproducible media and seven (7) prints as directed by the Construction Administrator. The Construction Manager's submittal shall identify the specification section and/or drawing number applicable to the submittal.
8. Details shall be large scale and/or full size.

C. The Construction Manager shall review the Shop Drawings, stamp with this approval, and submit them with reasonable promptness and in orderly sequence so as to cause no delay in his Work or in the Work of any subcontractor. Shop Drawings shall be properly identified as specified for item, material, workmanship, and project number. At the submission, the Construction Manager shall inform the Architect, in writing of any deviation in the shop drawings from the requirements of the Contract Documents.

D. The Architect will review and comment on shop drawings with reasonable promptness so as to cause no delay, but only for conformance with the design concept of the project and with the information given in the Contract Documents. Refer to Article 5 of the General Conditions. Shop Drawings received by the Architect that indicate insufficient study of drawings and specifications, illegible portions or gross errors, will be rejected outright. Such rejections shall not constitute an acceptable reason for granting the Construction Manager additional time to perform the work.

E. The Construction Manager shall make any corrections required by the Architect and shall resubmit the required number of corrected copies of Shop Drawings until fully reviewed.

F. Upon final review submit four (4) additional prints, same as submitted, for use by the Construction Administrator.

G. The Architect's review and comments on Shop Drawings shall not relieve the Construction Manager of responsibility for any deviation from the requirements of the Contract Documents.

H. Only final reviewed Shop Drawings are to be used on the Project site.

I. The Work installed shall be reviewed in accordance with the Shop Drawings and the drawings and specifications. Final Review of the Shop Drawings by the Architect shall constitute acceptance by the State and the Architect of a variation or departure that is **clearly identified**. If the Construction Manager believes notations made by the A/E increases the value or scope of the CD's, the Construction Manager must provide written notice to the Owner's Representative within seven (7) Calendar Days of this issue. Final reviewed Shop Drawings shall not replace or be used as a vehicle to issue or incorporate change orders or substitutions. Substitutions shall be submitted in accordance with Division 01 Section 01 25 00 "Substitution Procedures - CMR".

1.9 SHOP DRAWING FOR FIRE PROTECTION SYSTEMS

A. Shop drawings for fire protection systems shall comply with all of the requirements in the section above "Shop Drawings" In addition Sprinkler system shop drawings and hydraulic calculations must be stamped by a professional engineer licensed in the state of Connecticut and must include the DPW project number.

Two (2) sets of information shall be submitted to the State's Insurance Carrier (SIC), and one (1) set shall be submitted to a) the State Fire Marshals (SFM) office for projects exceeding statutory threshold limit or b) to DPW Code Unit for those projects which do not exceed statutory threshold limit.

STATE INSURANCE CARRIER (SIC):
FM Global
Factory Mutual Insurance Company
P.O. Box 9102 500 River Ridge Drive
Norwood, MA 02062
Tel: (781) 440-8000 or FAX (781) 440-8742
Contact: Costa Terzides (781) 440-8204 or Jeannette Dantona (781) 440-8245

Exceeds Threshold or CSUS 2020 Project	Does not exceed threshold
STATE FIRE MARSHALS (SFM): Deputy State Fire Marshal 1111 Country Club Road, PO Box 2794 Middletown, CT 06457 Tel: (860) 685-8350	DPW Codes Unit State Office Building - DPW 165 Capitol Avenue Room 280 Hartford, CT 06106 Ira Henowitz (860) 713 5708 or Joseph Cassidy (860) 713-5705

B. Before the shop drawings are submitted to SIC or Code (either SFM or DPW), the A/E and/or the A/E fire protection consultant must review the sprinkler design for compliance with the code and DPW requirements. SIC review comments will be addressed to the DPW Project Manager. The A/E is responsible for changes that result from the SIC and/or Code (SFM or DPW) required during construction.

The State Insurance Carrier (SIC) requires two- (2) weeks prior notice of a sprinkler system acceptance test.

1.10 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, schedules, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
   a. Manufacturer's printed recommendations.
   b. Compliance with trade association standards.
   c. Compliance with recognized testing agency standards.
   d. Application of testing agency labels and seals.
   e. Notation of dimensions verified by field measurement.
   f. Notation of coordination requirements.
2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
3. **Preliminary Submittal:** Submit a preliminary single copy of Product Data where selection of options is required.
4. **Submittals:** Submit seven (7) copies of each required submittal; submit five (5) copies where required for maintenance manuals. The Architect will retain one (1) and will return the other marked with action taken and corrections or modifications required.
   a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
5. **Distribution:** Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
   a. Do not proceed with installation until a copy of Product Data is in the Installer's possession.

b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.11 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

1. Store, mount or display Samples on site in the manner to facilitate review of qualities indicated. Prepare Samples to match the Architect's sample. Include the following:

a. Specification Section number and reference.

b. Generic description of the Sample.

c. Sample source.

d. Product name or name of the manufacturer.

e. Compliance with recognized standards.

f. Availability and delivery time.

2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show approximate limits of the variations.

b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

c. Refer to other Sections for Samples to be returned to the Construction Manager for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.

d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Construction Manager and shall be removed from the site prior to Substantial Completion.

3. **Preliminary Submittals:** Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics from a range of standard choices, unless otherwise noted in specification section.

a. The Architect will review and return preliminary submittals with the Architects notation, indicating selection and other action.

4. **Submittals:** Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit three (3) sets. The Architect will return one (1) set marked with the action taken.

5. Maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.

a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

b. Sample sets may be used to obtain final acceptance of the construction associated with each set.

B. **Distribution of Samples:** Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.

1. Field samples are full-size examples erected on-site to illustrate finishes, coatings, or finish materials and to establish the Project standard.

a. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.12 QUALITY ASSURANCE SUBMITTALS

A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

B. **Certifications:** Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.

1. **Signature:** Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.

C. **Inspection and Test Reports:** Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 01 Section 01 45 00 "Quality Control - CMR."

1.13 ARCHITECT'S ACTION

A. Except for submittals for the record or information, where action and return is required, the Architect will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Construction Manager's responsibility.

B. **Action Stamp:** The Architect will stamp each submittal with a uniform, action stamp. The Architect will mark the stamp appropriately to indicate the action taken, as follows:

1. **Final Unrestricted Release:** When the Architect marks a submittal "Approved for fabrication," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.

2. **Final-But-Restricted Release:** When the Architect marks a submittal "Incorporate Notations," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Submit corrected copies for record. Final payment depends on that compliance.

3. **Returned for Resubmittal:** When the Architect marks a submittal "Rejected, or Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.

a. Do not use, or allow others to use, submittals marked "Rejected, or Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.

4. **Other Action:** Where a submittal is for information or record purposes or special processing or other activity, the Architect will return the submittal marked "Action Not Required."

C. **Unsolicited Submittals:** The Architect will discard unsolicited submittals without action.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 33 00 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for performing alteration and renovation Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 31 00 "Project Management and Coordination - CMR" for procedures for coordinating cutting and patching with other construction activities.
2. Division 01 Section 01 73 29 "Cutting and Patching - CMR" for procedures for cutting and patching.
3. Division 02 Section 01 74 19 "Construction Waste Management & Disposal - CMR" for the requirements for waste management goals, waste management plan and waste management plan implementation.
4. Division 02 Section 02 41 16 "Structure Demolition" for demolition of selected portions of the building for alterations.
5. Division 02 Section 02 41 19 "Selective Structure Demolition" for demolition of selected portions of the building for alterations.
6. Refer to other Sections for specific requirements and limitations applicable to performing alteration Work with individual parts of the Work.
7. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 21, 22, 23 and 26 Sections for other requirements and limitations applicable to renovation Work by mechanical and electrical installations.

PART 2 - PRODUCTS

2.1 PRODUCTS FOR PATCHING AND EXTENDING WORK

A. New materials: As specified in product sections; match existing Products and Work for patching and extending Work.

B. Type and Quality of Existing Products: Determine by inspecting and testing Products where necessary, referring to existing Work as a standard.

PART 3 - EXECUTION

3.1 INSPECTION

A. General:

1. Verify that demolition is complete and areas are ready for installation of new Work.
2. Beginning of restoration Work means acceptance of existing conditions.

B. Project Procedures for Work Involving <u>Lead Containing Material (LBP)</u>:

1. Exposure levels for lead in the construction industry are regulated by 29 CFR 1926.62. Construction activities disturbing surfaces containing lead-based paint (LBP) which are likely to be employed, such as sanding, grinding, welding, cutting and burning, have been known to expose workers to levels of lead in excess of the Permissible Exposure Limit (PEL). Conduct demolition and removal Work specified in the technical sections of this specification in conformance with these regulations. In addition, construction debris/waste may be classified as hazardous waste. Disposal of hazardous waste material shall be in accordance with 40 CFR Parts 260 through 271 and Connecticut Hazardous Waste

Management Regulations Section 22a-209-1; 22a-209-8(c); 22a-449(c)-11; and 22a-449(c)-100 through 110.

2. The Construction Manager's Work shall be based on a child under the age of six (6) years in residence; the Work shall also be in accordance with Connecticut Regulations Section 19a-111-1 through 11.

3. This facility was constructed prior to 1978 and is likely to have painted surfaces containing lead-based paint.

4. Testing for lead-based paint has been conducted at the facility scheduled for renovation, demolition, reconstruction, alteration, remodeling, or repair. Results of the LBP testing are for information purposes only. The results are in Appendix 1. Under no circumstance shall this information be the sole means used by the Construction Manager for determining the extent of LBP. The Construction Manager shall be responsible for verification of all field conditions affecting performance of the Work.

5. For work that will disturb more than 6 square feet of interior lead based paint or more than 25 square feet of exterior lead based paint in a "child-occupied" structure, the following shall apply: The Construction Manager shall be certified under the Lead, Renovation, Repair, & Painting (RRP) rule issued by the United States Environmental Protection Agency on April 22, 2008. The Construction Manager shall follow specific work practice requirements of the RRP rule to prevent lead contamination during renovation, repair, and painting projects that disturb LBP in homes, child care facilities, and schools built before 1978. The Construction Manager shall have at least one "Certified Renovator" assigned to jobs where LBP is disturbed. **Note: A child-occupied structure is one where a child under the age of six (6) resides, including private residences, day care centers, and schools.**

C. Project Procedures for Work Involving Asbestos Containing Material (ACM):

1. If the Construction Manager should encounter any material suspect or known to contain ACM, he should immediately notify the Owner's Representative of same. It is the Owner's responsibility to have the material tested and abated (if necessary). The Owner will respond within twenty (24) hours after receiving the Construction Manager's written request to the Owner's Representative for testing the suspect material. The Owner will abate ACM (if necessary) within a reasonable time period, i.e. within seven (7) days.

2. Testing for asbestos has been conducted at the facility scheduled for renovation, demolition, reconstruction, alteration, remodeling, or repair. Results of the asbestos testing are for information purposes only. The results are in Appendix 1. Under no circumstance shall this information be the sole means used by the Construction Manager for determining the extent of asbestos. The Construction Manager shall be responsible for verification of all field conditions affecting performance of the Work.

D. Project Procedures for Work Involving Products Containing Persistent Bioaccumulative Toxic Chemicals" (PBT's) such as Polychlorinated Biphenols (PCB's), Di-2-ethylhexyl Phthalate (DEHP), and Mercury:

1. The Construction Manager is responsible for abating all PCB's, DEHP, and mercury prior to the start of any Work involving construction, renovation or demolition (if necessary).

2. Exposure Levels for Products Containing Persistent Bioaccumulative Toxic Chemicals (PBT's) such as PCB's. DEHP, and mercury in the construction industry is regulated by 29CFR1910.1200 and 29CFR1926.28 et. al. Construction, renovation or demolition activities disturbing Products Containing Persistent Bioaccumulative Toxic Chemicals" (PBT's) such as PCB's and DEHP which are likely to be employed. These materials include but are not limited to fluorescent light fixtures and exit signs, ballasts, high density discharge (HID) lamps, certain types of construction products containing vinyl, and mercury containing electrical switches and thermostats. These activities may expose workers in excess of the respective Permissible Exposure Limit (PEL). Conduct demolition and removal Work specified in the technical sections of these specifications in conformance with these regulations. In addition construction debris/waste may be classified as hazardous waste. Disposal of all hazardous materials shall be in accordance with but not limited to 40CRF Parts 761 Subpart K, 761, and 761.65 and the Connecticut General Hazardous Waste Statute Sec. 22a-454.

3. A Survey for Products Containing Persistent Bioaccumulative Toxic Chemicals (PBT's) such as PCB's, DEHP and Mercury has been conducted at the facility. Examples include but are not limited to fluorescent light fixtures & exit signs, ballasts, high density discharge (HID) lamps, certain types of construction products containing vinyl, and mercury containing electrical switches and thermostats. It is the Construction Manager's responsibility to verify all materials and field conditions prior to construction, renovation, and demolition that may affect the performance of their Work.

E. See also Division 00 General Conditions of the Contract for Construction – CMR, Article 23 "Cutting, Fitting, Patching and Digging."

3.2 PREPARATION

A. Cut, move, or remove items as are necessary for access to alteration and renovation Work. Replace and restore at completion.

B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.

C. Remove debris and abandoned items from area and from concealed spaces.

D. Prepare surface and remove surface finishes to provide for proper installation of new Work and finishes.

E. Close openings in exterior surfaces to protect existing Work and salvageable items from weather and extremes of temperature and humidity. Insulate ductwork and piping to prevent condensation in exposed areas.

3.3 INSTALLATION

A. Coordinate alteration and renovation Work to expedite completion, and if required sequence Work to accommodate Owner occupancy.

B. Remove, cut and patch Work in a manner to minimize damage and to provide restoring products and finishes to original and or specified condition in accordance with Section 01 73 29 "Cutting and Patching - CMR."

C. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with neat transition to adjacent finishes in accordance with Section 01 73 29 "Cutting and Patching - CMR."

D. In addition to specified replacement of equipment and fixtures, restore existing plumbing, heating, ventilation, air conditioning, and electrical systems to full operational condition.

E. Recover and refinish Work that exposes mechanical and electrical Work exposed accidentally during the Work.

F. Install products as specified in individual specification sections.

3.4 TRANSITIONS

A. Where new Work abuts or aligns with existing, perform a smooth and even transition. Patch work to match existing adjacent Work in texture and appearance.

B. When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect/Engineer.

3.5 ADJUSTMENTS

A. Where removal of partitions or walls result in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

B. Where a change of plane of 1/4-inch in (12) inches or more occurs, request recommendation from Architect/Engineer for providing a smooth transition.

C. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.

D. Fit Work at penetrations of surfaces as specified in Section 01 73 29 "Cutting and Patching - CMR."

3.6 REPAIR OF DAMAGED SURFACES

A. Patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing imperfections.

B. Repair substrate prior to patching finishes.

3.7 FINISHES

A. Finish surfaces as specified in individual product specification sections.

B. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.8 CLEANING

A. In addition cleaning specified in Section 01 50 00 "Temporary Facilities and Controls - CMR"; clean Agency occupied areas of Work.

END OF SECTION 01 35 16 - CMR

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents 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. This guide specification covers construction safety requirements and requirements for the protection of people, property, and resources. It is intended for use in construction, renovation, and demolition projects for the DPW State of CT.

B. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 33 00 Submittal Procedures – CMR" specifies the requirements for submittal requirements;
2. Division 01 Section 01 31 19 "Project Meetings - CMR" specifies requirements for submittal and distribution of meeting and conference minutes.

1.2 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 the basic designation only.

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE) www.asse.org/publications/	
ASSE/SAFE A10.32	(2004) Fall Protection
ASSE/SAFE A10.34	(2001; R 2005) Protection of the Public on or Adjacent to Construction Sites
ASSE/SAFE Z359.1	(2007) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) www.asme.org/Codes/	
ASME B30.22	(2005) Articulating Boom Cranes
ASME B30.3	(2004) Construction Tower Cranes
ASME B30.5	(2004) Mobile and Locomotive Cranes
ASME B30.8	(2004) Floating Cranes and Floating Derricks
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) www.nfpa.org/	
NFPA 10	(2007) Portable Fire Extinguishers
NFPA 51B	(2009) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 241	(2004) Safeguarding Construction, Alteration, and Demolition Operations
NFPA 70	(2008) National Electrical Code
NFPA 70E	Standard for Electrical Safety in the Workplace
CODE OF FEDERAL REGULATIONS (CFR) www.archives.gov/federal-register/cfr/	
10 CFR	Standards for Protection Against Radiation
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1910.28	Safety Requirements For Scaffolding.
29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1910.147	Control Of Hazardous Energy (Lockout/Tagout)
29 CFR 1910.178	Powered industrial trucks.
29 CFR 1915	Confined and Enclosed Spaces and Other
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.500	Fall Protection
29 CFR 1926.550	Cranes and Derricks
US Army Core of Engineers (USACE) www.iwr.usace.army.mil	
EM 385-1-1	Safety, and Health Requirements Manual (2008),

1.3 SUBMITTALS

A. An "O" followed by "A" indicates that the Owner acceptance; submittals not having an "O" designation are for Contractor Quality Control approval.

B. Submittal Procedures:

1. Preconstruction Submittals:
   a. Accident Prevention Plan (APP): "O, A";
   b. Activity Hazard Analysis (AHA); "O, A";
2. Test Reports: Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."
   a. Accident Reports;
   b. Monthly Exposure Reports;
   c. Regulatory Citations and Violations;
   d. Gas Protection.
3. Certificates:
   a. Hot work permit;
   b. License Certificates.

1.4 DEFINITIONS

A. Competent Person. A competent person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

B. Competent Person for Fall Protection. A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as their application and use with related equipment, and has the authority to take prompt corrective measures to eliminate the hazards of falling.

C. Confined Space: A space which by design has limited openings for entry and exit, unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy. Confined spaces include, but are not limited to storage tanks, process vessels, pits, silos, vats, degreasers, reaction vessels, boilers, ventilation and exhaust ducts, sewers, tunnels, underground utility vaults, and pipelines.

D. High Visibility Accident: Any mishap which may generate publicity and/or high visibility.

E. Medical Treatment; Medical treatment includes treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.

F. Operating Envelope: The area surrounding any crane. Inside this "envelope" is the crane, the operator, riggers and crane walkers, rigging gear between the hook and the load, the load and the crane's supporting structure (ground, rail, etc.).

G. Qualified Person for Fall Protection: A person with a recognized degree or professional certificate and with extensive knowledge, training and experience in the field of fall protection; who is capable of performing design, analysis, and evaluation of fall protection systems and equipment.

H. Recordable Injuries or Illnesses: Any work-related injury or illness that results in:

1. Death, regardless of the time between the injury and death, or the length of the illness;
2. Days away from work (any time lost after day of injury/illness onset);
3. Restricted work;
4. Transfer to another job;
5. Medical treatment beyond first aid;
6. Loss of consciousness; or
7. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

I. Weight Handling Equipment (WHE) Accident: A WHE accident occurs when any one or more of the six elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; and/or collision, including unplanned contact between the load, crane,

and/or other objects. A dropped load, derailment, two-blocking, overload and collision are considered an accident even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, roll over, etc.).

1.5 REGULATORY REQUIREMENTS

A. In addition to the detailed requirements included in the provisions of this Section see, **Division 01, Section 01 42 20 "Reference Standards and Definitions"** for other state laws, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, regulations, and referenced documents vary, the most stringent requirements govern.

1.6 SITE QUALIFICATIONS, DUTIES, AND MEETINGS

A. Personnel Qualifications:

B. Site Safety and Health Officer (SSHO):

1. Provide a Site Safety and Health Officer (SSHO) at the work site at all times to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The Contractor Quality Control (QC) person can be the SSHO on this project. Meet the following requirements within the SSHO:

Level 4: A minimum of ten (10) years safety work of a progressive nature with at least **5** years of experience on similar projects. 30-hour OSHA construction safety class or equivalent within the last 5 years. An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following five (5) areas of competency: Excavation; Scaffolding; Fall protection; Confined Space; Health hazard recognition, evaluation and control of chemical, physical and biological agents.

E. Crane Operators:

Meet the crane Operators and Crane operation requirements of the Connecticut Bureau of License and Permits – Cranes, Department of Public Safety, Office of State Fire Marshal pursuant to C.G.C § 29-221 through 29-230. Provide proof of current license and qualification. For more information visit the DPS Website **www.ct.gov/dps** or call **(860) 685-8470**.

F. Personnel Duties:

1. Site Safety and Health Officer (SSHO):

a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Attach safety inspection logs to the Contractors' daily report.

b. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors. For more information visit the OSHA website at www.osha.gov.

c. Maintain applicable safety reference material on the job site.

d. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.

e. Implement and enforce accepted APPS and AHAs.

f. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. Post a list of unresolved safety and health deficiencies on the safety bulletin board.

g. Ensure sub-contractor compliance with safety and health requirements.

Failure to perform the above duties will result in dismissal of the superintendent and/or SSHO, and a project work stoppage. The project work stoppage will remain in effect pending approval of a suitable replacement.

G. Meetings:

1. Preconstruction Conference:

a. Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the preconstruction conference. This includes the project

superintendent, site safety and health officer, quality control supervisor, or any other assigned safety and health professionals who participated in the development of the Accident Prevention Plan (APP); (including the Activity Hazard Analyses (AHAs), and special plans, program and procedures associated with it).

b. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Owner's representative as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.

c. Deficiencies in the submitted APP will be brought to the attention of the Contractor at the preconstruction conference, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

2. **Safety Meetings:**
Safety meetings shall be conducted to review past activities, plan for new or changed operations, review pertinent aspects of appropriate AHA (by trade), establish safe working procedures for anticipated hazards, and provide pertinent safety and health training and motivation.

a. Meetings shall be conducted at least once a month for all supervisors on the project location and at least once a week for all workers by supervisors or foremen.

b. Meetings shall be documented, including the date, persons in attendance, subjects discussed, and names of individual(s) who conducted the meeting. Documentation shall be maintained and copies furnished to the CA on request.

c. The CA shall be informed of all scheduled meetings in advance and be invited to attend.

1.7 ACCIDENT PREVENTION PLAN (APP):

A. Use a qualified person to prepare the written site-specific APP.

1. Prepare the APP in accordance with the format and requirements of US Army Core of Engineers (USACE), Safety, and Health Requirements Manual, EM 385-1-1, or as approved by the CA and as supplemented herein. Cover all paragraphs and subparagraph elements in USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Accident Prevention Plan" or as approved by the CA. The USACE Safety, and Health Requirements Manual, EM 385-1-1 is available at the USACE Website www.iwr.usace.army.mil.

2. Specific requirements for some of the APP elements are described in "B" below. The APP shall be job-specific and address any unusual or unique aspects of the project or activity for which it is written.

B. The APP shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and made site-specific. The Owner considers the Prime General Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer and any designated Certified Safety Professional (CSP) and/or Certified Industrial Hygienist (CIH).

C. Submit the APP to the DPW Project Manager and Construction Administrator fourteen (14) calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP. Once accepted by the DPW Project Manager and Construction Administrator, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the DPW Project Manager and Construction Administrator, until the matter has been rectified. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the DPW Project Manager and Construction Administrator, project superintendent, Site Safety and Health Officer (SSHO) and quality control manager. Should any hazard become evident, stop work in the area, secure the area, and develop a plan to remove the hazard. Notify the DPW Project Manager and Construction Administrator within twenty (24) hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by American Society of Safety Engineers, ASSE/SAFE A10.34 - Protection of the Public on or Adjacent to Construction Sites, see www.asse.org) and the environment.

Copies of the accepted plan will be maintained at the CA's office at the job site. Continuously reviewed and amended the APP, as necessary, throughout the life of the contract. Incorporate unusual or high-hazard activities not identified in the original APP as they are discovered.

D. APP Contents:
The contents of the Accident Prevention Plan (APP) shall be in accordance with Appendix A of the US Army Corps of Engineers, EM 385-1-1 Safety and Health Requirements Manual, Appendix A, Minimum Basic Outline for Accident Prevention Plans or as approved by the CA. For more information visit the USACE Website at www.usace.army.mil/Library.

1.8 ACTIVITY HAZARD ANALYSIS (AHA): Activity Hazard Analyses (AHAs) define the activities being performed and identify the sequences of work, the specific hazards anticipated, site conditions, equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk. The Activity Hazard Analysis (AHA) format shall be in accordance with US Army Corps of Engineers, EM 385-1-1 Safety and Health Requirements Manual or as approved by the CA.

A. Submittals:

1. Submit initial AHA to CA for review at least fifteen (15)calendar days prior to the start of each phase. Format subsequent AHAs as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.
2. The AHA list will be reviewed monthly at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change. Develop the activity hazard analyses using the project schedule as the basis for the activities performed. Any activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier or subcontractor and provided to the prime contractor for submittal to the CA.

1.9 DISPLAY OF SAFETY INFORMATION
Within one (1) calendar day after commencement of work, erect a safety bulletin board at the job site. Include and maintain information on safety bulletin board as required by US Army Corps of Engineers, EM 385-1-1 Safety and Health Requirements Manual, Section 01.A.06 or as approved by the CA. Additional items required to be posted include:

A. Confined space entry permit.

B. Hot work permit.

1.10 SITE SAFETY REFERENCE MATERIALS
Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturer's manuals.

1.11 EMERGENCY MEDICAL TREATMENT
Contractors will arrange for their own emergency medical treatment. The Owner has no responsibility to provide emergency medical treatment.

1.12 REPORTS

A. Accident Reports

1. Conduct an accident investigation for recordable injuries and illnesses, and property damage accidents resulting in at least $2,000 in damages, to establish the root cause(s) of the accident, complete "Accident Report Form" approved by the CA. Provide the report to the CA within five (5) calendar days of the accident.

B. Accident Notification
Notify the CA as soon as practical, but not later than four hours (4), after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than $2,000, or any weight handling equipment accident.

1. Within notification include the following:
   - **a.** contractor name;
   - **b.** contract title;
   - **c.** type of contract;
   - **d.** name of activity,
   - **e.** installation or location where accident occurred;

f. date and time of accident;
g. names of personnel injured;
h. extent of property damage, if any; extent of injury, if known, and brief description of accident. Preserve the conditions and evidence on the accident site until the U.S. Department of Labor, Occupational Safety and Health Administration (USDOL-OSHA) investigation team arrives on-site and USDOL-OSHA investigation is conducted.

C. **Monthly Exposure Reports**
Monthly exposure reporting to the CA is required to be attached to the monthly Application for Payment request. This report is a compilation of employee-hours worked each month for all site workers, both prime and subcontractor. Provide on a form approved by the CA.

D. **Crane Reports**
Submit crane inspection reports on a form approved by the CA and as specified herein with Daily Reports of Inspections.

E. **HOT WORK**
Hot Work shall only be performed in accordance with the requirements of NFPA 51B "Fire Prevention During Welding, Cutting and Other Hot Work Standard.

1. **Definitions:**
   a. **Hot Work:** Work involving burning, welding, or a similar operation that is capable of initiating fires or explosions. Examples listed by NFPA include arc welding, oxygen- fuel gas welding, open-flame soldering, brazing, thermal spraying, oxygen cutting, and arc cutting.

   b. **Permit Authorizing Individual (PAI).** Means the individual designated by the General Contractor to authorize hot work. The PAI is permitted to be, among others, the General Contractor's project executive, supervisor, foreperson, or designated safety administrator. The PAI CANNOT be the hot work operator, except as permitted in NFPA 51B. The PAI is aware of the fire hazards involved and is familiar with the provisions of this standard.

2. **Permit:** Submit and obtain a written permit from the PAI prior to performing "Hot Work" (welding, cutting, etc.) or operating other flame-producing/spark producing devices, from the PAI. CONTRACTORS ARE REQUIRED TO MEET ALL CRITERIA BEFORE A PERMIT IS ISSUED. The General Contractor will provide at least two (2) twenty (20) pound 4A:20 BC rated extinguishers for normal "Hot Work". All extinguishers shall be current inspection tagged, approved safety pin and tamper resistant seal.

3. **Fire Watch:** It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. The Fire Watch shall be trained in accordance with NFPA 51B Standard for Fire Prevention During Welding, Cutting, and Other Hot Work and remain on-site for a minimum of thirty (30) minutes after completion of the task or as specified on the hot work permit. When starting work in the facility, require personnel to familiarize themselves with the location of the nearest fire alarm boxes and place in memory the local fire department emergency phone number(s). ANY FIRE, NO MATTER HOW SMALL, SHAL BE REPORTED TO THE LOCAL FIRE DEPARTMENT, GENERAL CONTRACTOR'S AUTHORIZED REPRESENTATIVE, AND OWNER'S CA IMMEDIATELY.

1.13 FACILITY OCCUPANCY CLOSURE
Streets, walks, and other facilities occupied and used by the state User Agency shall not be closed or obstructed without written permission from the CA.

1.18 SEVERE STORM PLAN
In the event of a severe storm warning, the Contractor must:

A. Secure outside equipment and materials and place materials that could be damaged in protected areas.

B. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.

C. Ensure that temporary erosion controls are adequate.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

3.1 CONSTRUCTION AND/OR OTHER WORK

Comply with the Connecticut State Building and Fire Safety Codes, OSHA regulations, and other references regulations. The most stringent standard prevails.

3.1.2 HAZARDOUS MATERIAL EXCLUSIONS

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with USACE EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocynates, lead-based paint are prohibited. The CA, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials.

3.1.3 UNFORESEEN HAZARDOUS MATERIAL

A. Related Section: Division 01, Section 01 35 16, Alteration Project Procedures.

3.2 PRE-OUTAGE COORDINATION MEETING

Contractors are required to apply for utility outages at least fifteen (15) days in advance. As a minimum, the request should include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Special requirements for electrical outage requests are contained elsewhere in this specification section. Once approved, and prior to beginning work on the utility system requiring shut down, attend a pre-outage coordination meeting with the CA, User Agency Representative, and Public Utilities representative to review the scope of work and the lock-out/tag-out procedures for worker protection. No work will be performed on energized electrical circuits unless proof is provided that no other means exist.

3.3 SAFETY LOCKOUT/TAGOUT PROCEDURES

A. The General Contractor shall ensure that each employee is familiar with and complies with these procedures and OSHA 29 CFR 1910.147 Control Of Hazardous Energy (Lockout/Tagout).

1. The General Contractor's "Authorized Employee" shall apply lockout/tagout tags and take other actions that, because of experience and knowledge, are known to be necessary to make the particular equipment safe to work on.
2. No person, regardless of position or authority, shall operate any switch, valve, or equipment that has an official lockout/tagout tag attached to it, nor shall such tag be removed except as provided in this section.
3. No person shall work on any equipment that requires a lockout/tagout tag unless he, his immediate supervisor, project leader, or a subordinate has in his possession the stubs of the required lockout/tagout tags. Only qualified personnel shall perform work on electrical circuits.
4. A supervisor who is required to enter an area protected by a lockout/tagout tag will be considered a member of the protected group provided he notifies the holder of the tag stub each time he enters and departs from the protected area.
5. Identification markings on building light and power distribution circuits shall not be relied on for established safe work conditions.
6. Before clearance will be given on any equipment other than electrical (generally referred to as mechanical apparatus), the apparatus, valves, or systems shall be secured in a passive condition with the appropriate vents, pins, and locks. Pressurized or vacuum systems shall be vented to relieve differential pressure completely. Vent valves shall be tagged open during the course of the work. Where dangerous gas or fluid systems are involved, or in areas where the environment may be oxygen deficient, system or areas shall be purged, ventilated, or otherwise made safe prior to entry.

B. Tag Placement

Lockout/tagout tags shall be completed in accordance with the regulations printed on the back thereof and attached to any device which, if operated, could cause an unsafe condition to exist. If more than one group is to work on any circuit or equipment, the employee in charge of each group shall have a separate set of lockout/tagout tags completed and properly attached. When it is required that certain equipment be tagged, the State of Connecticut Authority Having Jurisdiction will review the characteristics of the various systems involved that affect the safety of the operations and the work to be done; take the necessary actions, including voltage and pressure checks, grounding, and venting, to make the system and equipment safe to work on; and apply such lockout/tagout tags to those switches, valves, vents, or other mechanical devices needed to preserve the safety provided. This operation is referred to as "Providing Safety Clearance."

C. Tag Removal

When any individual or group has completed its part of the work and is clear of the circuits or equipment, the supervisor, project leader, or individual for whom the equipment was tagged shall turn in his signed lockout/tagout tag stub to the Contractor. That group's or individual's lockout/tagout tags on equipment may then be removed on authorization by the Contractor.

3.4 FALL HAZARD PROTECTION AND PREVENTION PROGRAM

Establish a fall protection and prevention program, for the protection of all employees exposed to fall hazards. Within the program include company policy, identify responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and evacuation procedures.

A. Training

Institute a fall protection training program. As part of the Fall Hazard Protection and Prevention Program, provide training for each employee who might be exposed to fall hazards. Provide training by a competent person for fall protection in accordance with USACE EM 385-1-1, Section 21.A.16.

B. Fall Protection Equipment and Systems

Enforce use of the fall protection equipment and systems designated for each specific work activity in the Fall Protection and Prevention Plan and/or AHA at all times when an employee is exposed to a fall hazard. Protect employees from fall hazards as specified in USACE EM 385-1-1, section 21. In addition to the required fall protection systems, safety skiff, personal floatation devices, life rings etc., are required when working above or next to water in accordance with USACE EM 385-1-1, paragraphs 05.H. and 05.I. Personal fall arrest systems are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall arrest systems are required when operating other equipment such as scissor lifts if the work platform is capable of being positioned outside the wheelbase. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, or travel. Fall protection must comply with OSHA 29 CFR 1926.500, Fall Protection, Subpart M, and ASSE/SAFE A10.32, Fall Protection.

1. Personal Fall Arrest Equipment

Personal fall arrest equipment, systems, subsystems, and components shall meet ASSE/SAFE Z359.1, Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components. Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest body support device. Body belts may only be used as a positioning device system (for uses such as steel reinforcing assembly and in addition to an approved fall arrest system). Harnesses shall have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Only locking snap hooks and carabiners shall be used. Webbing, straps, and ropes shall be made of synthetic fiber. The maximum free fall distance when using fall arrest equipment shall not exceed 1.8 m (6 feet). The total fall distance and any swinging of the worker (pendulum-like motion) that can occur during a fall shall always be taken

2. Fall Protection for Roofing Work

Implement fall protection controls based on the type of roof being constructed and work being performed. Evaluate the roof area to be accessed for its structural integrity including weight-bearing capabilities for the projected loading.

a. Low Sloped Roofs:

(i) For work within 6 feet (1.8 m) of an edge, on low-slope roofs, Protect personnel from falling by use of personal fall arrest systems, guardrails, or safety nets.

(ii) For work greater than 6 feet (1.8 m) from an edge, erect and install warning lines in accordance with OSHA 29 CFR 1926.500, Fall Protection.

3. Existing Anchorage

Certified (or re-certified) by a qualified person for fall protection existing anchorages, to be used for attachment of personal fall arrest equipment in accordance with ASSE/SAFE Z359.1, Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components. Exiting horizontal lifeline anchorages must be certified (or re-certified) by a registered professional engineer with experience in designing horizontal lifeline systems.

4. Horizontal Lifelines

Design, install, certify and use under the supervision of a qualified person horizontal lifelines for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 (OSHA 29 CFR 1926.500 Fall Protection).

5. **Guardrails and Safety Nets**
Design, install and use guardrails and safety nets in accordance with 29 CFR 1926, Safety and Health Regulations for Construction Subpart M.

6. **Rescue and Evacuation Procedures**
When personal fall arrest systems are used, the contractor must ensure that the mishap victim can self-rescue or can be rescued promptly should a fall occur. Prepare a Rescue and Evacuation Plan and include a detailed discussion of the following: methods of rescue; methods of self-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility. Include the Rescue and Evacuation Plan within the Activity Hazard Analysis (AHA) for the phase of work, in the Fall Protection and Prevention (FP&P) Plan, and the Accident Prevention Plan (APP).

3.5 SCAFFOLDING

A. The Contractor shall provide all employees with a safe means of access to the work area on the scaffold in accordance with OSHA 29 CFR 1910.28 Safety Requirements For Scaffolding and as contained in this section.

1. Climbing of any scaffold braces or supports not specifically designed for access is prohibited.

2. Access scaffold platforms greater than 20 feet (6 m) maximum in height by use of a scaffold stair system.

3. Do not use vertical ladders commonly provided by scaffold system manufacturers for accessing scaffold platforms greater than 20 feet (6 m) maximum in height.

4. The use of an adequate gate is required.

5. Ensure that employees are qualified to perform scaffold erection and dismantling.

6. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection and prevention plan.

7. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward.

8. Give special care to ensure scaffold systems are not overloaded. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material are prohibited.

9. The first tie-in shall be at the height equal to 4 times the width of the smallest dimension of the scaffold base. Place work platforms on mud sills. Scaffold or work platform erectors shall have fall protection during the erection and dismantling of scaffolding or work platforms that are more than six feet. Delineate fall protection requirements when working above six feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Activity Hazard Analysis (AHA) for the phase of work.

B. Stilts
The use of stilts for gaining additional height in construction, renovation, repair or maintenance work is **PROHIBITED**.

3.6 EQUIPMENT

A. Material Handling Equipment
Material Handling Equipment shall be in accordance with OSHA 29 CFR 1910.178 Powered Industrial Trucks and as contained in this section.

1. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions.

2. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions.

3. Operators of forklifts or power industrial trucks shall be licensed in accordance with OSHA.

B. Weight Handling Equipment

1. Equip cranes and derricks as specified in ASME B30.5 or ASME B30.22 or ASME B30.8 as applicable.

2. Comply with the crane manufacturer's specifications and limitations for erection and operation of cranes and hoists used in support of the work. Perform erection under the supervision of a designated person (as defined in ASME B30.5). Perform all testing in accordance with the manufacturer's recommended procedures.

3. Comply with ASME B30.5 for mobile and locomotive cranes, ASME B30.22 for articulating boom cranes, and ASME B30.3 for construction tower cranes.

4. Under no circumstance shall a Contractor make a lift at or above

5. When operating in the vicinity of overhead transmission lines, operators and riggers shall be alert to this special hazard and follow the requirements of ASME B30.5 or ASME B30.22 as applicable.

6. Do not crane suspended personnel work platforms (baskets) unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Do not lift personnel with a line hoist or friction crane.

7. Inspect, maintain, and recharge portable fire extinguishers as specified in NFPA 10, Standard for Portable Fire Extinguishers.

8. All employees must keep clear of loads about to be lifted and of suspended loads.

9. Use cribbing when performing lifts on outriggers.

10. The crane hook/block must be positioned directly over the load. Side loading of the crane is prohibited.

11. A physical barricade must be positioned to prevent personnel from entering the counterweight swing (tail swing) area of the crane.

12. Certification records which include the date of inspection, signature of the person performing the inspection, and the serial number or other identifier of the crane that was inspected shall always be available for review by CA.

13. Written reports listing the load test procedures used along with any repairs or alterations performed on the crane shall be available for review by CA.

14. Certify that all crane operators have been trained in proper use of all safety devices (e.g. anti-two block devices).

C. USE OF EXPLOSIVES

Explosives shall not be used or brought to the project site without prior written approval from the CA. Such approval shall not relieve the Contractor of responsibility for injury to persons or for damage to property due to blasting operations. Storage of explosives, when permitted on State property, shall be only where directed and in approved storage facilities. These facilities shall be kept locked at all times except for inspection, delivery, and withdrawal of explosives. Explosive work shall be performed in accordance with the requirements of C.G.S. § 29-343 through 29-355 and as required by the Office of State Fire Marshal, CT Department of Public Safety.

3.7 EXCAVATIONS

A. Perform soil classification by a competent person in accordance with 29 CFR 1926 Safety and Health Regulations for Construction.

1. **Utility Locations**
All underground utilities in the work area must be positively identified by and coordinated in accordance with Division 00, General Conditions-CMR, Article 18 Surveys, Permits, And Regulations. All underground utilities in the work area must be positively identified by a private utility locating service and coordinated with the public utility company. Any markings made during the utility investigation must be maintained by the general Contractor throughout the contract.

2. **Utility Location Verification**
The Contractor must physically verify underground utility locations by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system. Digging within two (2) feet of a known utility must not be performed by means of mechanical equipment; hand digging shall be used. If construction is parallel to an existing utility expose the utility by hand digging every one hundred (100) feet if parallel within 5 feet of the excavation.

3. **Shoring Systems**
Trench and shoring systems must be identified in the accepted safety plan and AHA. Manufacture tabulated data and specifications or registered engineer tabulated data for shoring or benching systems shall be readily available on-site for review. Job-made shoring or shielding must have the registered professional engineer stamp, specifications, and tabulated data. Extreme care must be used when excavating near direct burial electric underground cables.

4. **Trenching Machinery**
Operate trenching machines with digging chain drives only when the spotters/laborers are in plain view of the operator. Provide operator and spotters/laborers training on the hazards of the digging chain drives with emphasis on the distance that needs to be maintained when the digging chain is operating. Keep documentation of the training on file at the project site.

3.8 UTILITIES WITHIN CONCRETE SLABS

A. Utilities located within concrete slabs or pier structures, bridges, and the like, are extremely difficult to identify due to the reinforcing steel used in the construction of these structures. Whenever contract work involves concrete chipping, saw cutting, or core drilling, the existing utility location must be coordinated with utility company in addition to a private locating service. Outages to isolate utility systems must be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the contractor from meeting this requirement.

3.9 ELECTRICAL

A. **Conduct of Electrical Work**
Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Positive cable identification must be made prior to submitting any outage request for electrical systems. Arrangements are to be coordinated with the CA and utility company for identification. The CA will not accept an outage request until the Contractor satisfactorily documents that the circuits have been clearly identified. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers will be permitted to enter. When work requires Contractor to work near energized circuits as defined by the NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses. In addition, provide electrical arc flash protection for personnel as required by NFPA 70E. Insulating blankets, hearing protection, and switching suits may also be required, depending on the specific job and as delineated in the Contractor's AHA.

B. **Portable Extension Cords**
Size portable extension cords in accordance with manufacturer ratings for the tool to be powered and protected from damage. Immediately remove from service all damaged extension cords. Portable extension cords shall meet the requirements of NFPA 70.

3.10 WORK IN CONFINED SPACES

A. Comply with the requirements in OSHA 29 CFR 1910.146 and OSHA 29 CFR 1926.21(b) (6). Any potential for a hazard in the confined space requires a permit system to be used.

1. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.
2. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained to ensure exposure to any hazardous atmosphere is kept below its' action level.
3. Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection.

END OF SECTION 01 35 26

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections - CMR, apply to this Section.

1.2 DEFINITIONS

A. General: Basic contract definitions are included in the General Conditions of the Contract for Construction - CMR.

B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited to this term.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.

D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract - CMR.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Subcontractor or another entity engaged by the CCMR, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term **"experienced,"** when used with the term "installer," means having a minimum of **five (5)** previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of authorities having jurisdiction.
2. **Trades:** Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
3. **Assigning Specialists:** Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the CMR has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.
   a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.

J. "Project Site" is the space available to the CMR for performing construction activities, either exclusively or in conjunction, with others performing other Work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. **"Testing Agencies":** A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. **Specification Format:** These Specifications are organized into Divisions and Sections based on CSI's "MasterFormat" 49-Division format and numbering system.

B. **Specification Content:** This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. **Abbreviated Language:** Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated, as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2. **Streamlined Language:** The Specifications generally use the imperative mood and streamlined language. Requirements expressed in the imperative mood are to be performed by the CMR. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the CMR or by others when so noted.

   a. The words "shall be" are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. **Applicability of Standards:** Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. **Publication Dates:** Comply with the standards in effect as of the date of the Contract Documents unless a specific date is indicated in the Contract Documents or the governing regulations cited herein.

C. **Conflicting Requirements:** Where compliance with two (2) or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent and highest quality requirement. Request a decision from the Architect before proceeding on requirements that are different but apparently equal, and where it is uncertain which requirement is the most stringent.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum acceptable. 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 the requirements. Request a clarification from the Architect regarding uncertainties before proceeding.

D. **Copies of Standards:** Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the CMR shall obtain copies directly from the publication source.

E. **Abbreviations and Names:** Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Thompson Gale's "Encyclopedia of Associations," available in most libraries.

1.5 GOVERNING REGULATIONS AND AUTHORITIES

A. **Copies of Regulations:** Obtain copies of the following regulations and retain at the Project Site to be available for reference by parties who have a reasonable need during submittals, planning, and progress of the Work, until Substantial Completion.

1. State Building Code/2005.
2. International Building Code/2003.
3. International Existing Building Code/2003.

4. International Mechanical Code/2003.
5. International Plumbing Code/2003.
6. International Energy Conservation Code/2003.
7. National Electric Code NFPA 70-2005.
8. Connecticut Fire Safety Code/2005.
9. ICC/ANSI A117.1-Accessible and Usable Buildings and Facilities/2003.
10. OSHA 29 CFR Part 1910 Occupational Safety and Health Regulations/1999.
11. OSHA 29 CFR Part 1926 Occupational Safety and Health Regulations for Construction/1999.

B. For a list of the "latest applicable State Codes and Regulations" and how they can be obtained see www.ct.gov/dps (Connecticut Department of Public Safety website) and www.ctdol.state.ct.us Connecticut Department of Public Safety website).

1.6 SUBMITTALS

A. **Permits, Licenses, and Certificates:** For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 42 20

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality-control services.

B. Quality-Control services include fire alarm acceptance testing, inspections, tests, and related actions, including reports performed by Construction Manager, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by the Owner.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Construction Manager of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified inspections, tests, and related actions do not limit Construction Manager's quality-control procedures that facilitate compliance with Contract Document requirements.
3. Requirements for Construction Manager to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

E. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 33 00 "Submittal Procedures - CMR" specifies requirements for development of a schedule of required tests and inspections.
2. Division 01 Section 01 73 29 "Cutting and Patching- CMR" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.
3. Division 01 Section 01 77 00 "Closeout Procedures- CMR", specific requirements for contract closeout procedures.
4. Division 28 Section 28 31 00 "Fire Detection and Alarm- CMR" specifies field quality control for the Alarm System.

1.3 RESPONSIBILITIES

A. **Construction Manager Responsibilities:** Unless otherwise indicated as the responsibility of another identified entity, the Owner, through the Owner's Representative, shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. All tests required by the individual specification sections are required to be scheduled and notification given to the Owner's Representative 24/48 hours in advance of the test/inspection as applicable. Costs for these services are not included in the Contract Sum.

1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Construction Manager's responsibility, the Construction Manager shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Guaranteed Maximum Price.
2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.
   - **a.** Such services include Special Inspections as required by the latest edition of the "Connecticut State Building Code".
   - **b.** Where the Owner has engaged a testing agency for testing and inspecting part of the Work, and the Construction Manager is also required to engage an entity for the same or related element, the

Construction Manager shall not employ the entity engaged by the Owner. The Owner will engage the services of a qualified Special Inspector for this project. The Special Inspector, as a representative of the Owner, shall document and confirm compliance with the provisions of the Connecticut State Building Code for Special Inspections.

c. Materials and assemblies for this project will be tested and construction operations inspected as the work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered nor shall it obligate the State for final acceptance.

d. The Owner's use of testing and inspection services shall in no way relieve the Construction Manager of the responsibility to furnish materials and finished construction in full compliance with the Contract Documents and the Connecticut State Building Code.

B. **Retesting:** The Construction Manager is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Construction Manager 's responsibility.

1. The cost of retesting construction, revised or replaced by the Construction Manager, is the Construction Manager's responsibility where required tests performed on original construction indicated non-compliance with Contract Document requirements.

2. The Owner will issue a credit change order to cover all costs incurred related to all re-tests/re-inspections due to non-compliance to the Contract Documents, including but not limited to the Owner's costs and the Consultant's costs.

C. **Associated Services:** Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the Agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:

1. Provide access to the Work.

2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.

3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.

4. Provide facilities for storage and curing of test samples.

5. Provide an approved design mix proposed for use for material mixes that require control by the testing agency.

6. Provide security and protection of samples and test equipment at the Project Site.

D. **Duties of the Testing Agency:** The independent testing agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Owner's Representative, Architect and the Construction Manager in performance of the testing agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.

1. The testing agency shall notify the Owner's Representative and the Construction Manager promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The testing agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.

3. The testing agency shall not perform any duties of the Construction Manager.

E. Owner will pay for the services of an independent testing agency laboratory to perform inspections, tests and other services required by the Specifications except as noted below, listed for which the Owner will issue a deduct change order to cover the cost associated with these tests:

1. When the Construction Manager notifies the Owner's Representative and/or Testing Agency less than 24 hours before the expected time of testing.

2. When the Construction Manager requires testing for his own convenience.

3. When the Construction Manager schedules a test and is not ready for the required test.

F. Submit reports of tests that are part of the submittal requirements which indicate compliance or non-compliance with the specified standard.

G. See also Division 00 General Conditions of the Contract for Construction – CMR, Article 16 "Inspections & Tests".

H. **Fire Alarm/Acceptance Testing Procedures:**

1. For buildings exceeding the threshold limit, the fire alarm testing shall be as the authority having jurisdiction shall dictate. This will be as determined by the State Fire Marshals Office.
2. For buildings that do not exceed the threshold limit, the fire alarm testing shall be as the authority having jurisdiction shall dictate. This will be determined by the Department of Public Works requirements as set below:

   a. Protective Signaling Systems: All protective signaling systems shall meet with acceptance testing requirements of the applicable standards listed in Section 7-6.1.4, NFPA 101/2003 and NFPA 13/2002.

   b. Prior Test Notification: At least **five (5)** working days prior to testing, the Fire Alarm Construction Manager shall notify (in writing) the following people of the proposed date the acceptance tests are to be performed (Also, see Part 2 of Certificate of Compliance).

      Department of Public Works Team Representative

      i. Construction Manager;

      ii. Engineer of Record;

      iii. Equipment Supplier Representative;

      iv. Sprinkler Contractor.

   c. **Certificates of Compliance:**

      i. A Fire Alarm System Inspection and Testing Certification and Description form shall be prepared for each system (See NFPA 72/2002 Chapter 7 and Figure 7-5.2.2).

      ii. Parts 1 and 3 through 9, shall be completed after the system is installed and the installation of the wiring has been checked. Every alarm device must also be pre-tested to ensure proper operation and correct annunciation at each remote annunciator and control panel. Part 1 of the form (Certification of System Installation) shall be signed by the fire alarm contractor. The signed and completed preliminary copies of the Certification form shall be forwarded to all parties along with the Prior Test Notification.

      iii. Part 2, of each applicable form, shall be completed after the operational tests have been completed.

      iv. After the completion of the operational acceptance tests and sign-off of test witness (with stipulations noted), final copies of the Certificates shall be forwarded to the Department of Public Works Representatives.

   j. **Tests:**

      i. All tests shall be conducted in accordance with the Manufacturer's Testing Recommendations.

      ii. All testing equipment, apparatus (i.e. sound level decibel meter, 2-way radio communication, test devices, ladders, tools, lighting, etc.) and personnel shall be supplied by the Fire Alarm Contractor and Sprinkler Contractor.

   k. **System Documentation:** Every system shall include the following documentation, which shall be delivered to the Department of Public Works Representatives upon final acceptance of the system. An owner's manual or manufacturer's installation instructions covering all system equipment, including the following:

      i. A detailed narrative description of the system inputs, evacuation signaling, ancillary functions, annunciation, intended sequence of operations, expansion capability, application considerations, and limitations.

      ii. Operator's instructions for basic systems operations including alarm acknowledgment, system reset, interpreting system output (LED's CRT display, and printout), operation of manual evacuation signaling and ancillary function controls, changing printer paper, etc.

      iii. A detailed description of routine maintenance and testing as required and recommended and as would be provided under a maintenance contract, including testing and maintenance instructions for each type of device installed. This information should include:

         (a) A listing of individual system components that require periodic testing and maintenance.

         (b) Step by step instructions detailing the requisite testing and maintenance procedures and the intervals at which those procedures should be performed.

(c) A schedule that correlates the testing and maintenance procedures required by paragraph (2) above and with the listing required by paragraph (1) above.

iv. Detailed troubleshooting instructions for each type of trouble condition recognized by the system, including opens, grounds, parity errors, "loop failures," etc. These instructions should include a list of all trouble signals, and step by step instructions describing how to isolate those problems and correct them (or call for service as appropriate).

v. A service directory, including a list of names and telephone numbers for those who should be called to service the system.

f. **As-Built Drawings:**

1. The Construction Manager will produce **two (2)** sets of as-built drawings and specifications for the fire alarm system, indicating the location (and programmed address, if applicable) of all devices and appliances, the wiring sequences, wiring methods, connection of the components, and sequence of operation of the protective signaling system as installed, shall be given to DPW representatives. This shall be in Accordance with NFPA 72. Refer also to Section 01 77 00 "Closeout Procedures - CMR".

1.4 SUBMITTALS

A. Unless the Construction Manager is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Owner's Representative. If the Construction Manager is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Construction Manager.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

2. **Report Data:** Written reports of each inspection, test, or similar service include, but are not limited to, the following:

a. Date of issue.

b. Project title and number.

c. Name, address, and telephone number of testing agency.

d. Dates and locations of samples and tests or inspections.

e. Names of individuals making the inspection or test.

f. Designation of the Work and test method.

g. Identification of product and Specification Section.

h. Complete inspection or test data.

i. Test results and an interpretation of test results.

j. Ambient conditions at the time of sample taking and testing.

k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.

l. Name and signature of laboratory inspector.

m. Recommendations on re-testing.

1.5 QUALITY ASSURANCE

A. **Qualifications for Service Agencies:** Engage inspection and testing service agencies, including independent testing laboratories, that are pre-qualified as complying with the National Voluntary Laboratory Accreditation Program and that specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

B. **Mockups:** Provide full-size, physical assemblies that are constructed on-site. Mockups will be used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not samples. Approved mockups establish the standard by which the Work will be judged.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 MOCKUPS

A. Build site-assembled mockups using installers who will perform same tasks for project.

B. 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 and Owner's Representative seven (7) 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 and Owner's Representative approval of mockups before starting work, fabrication, or construction.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

6. Demolish and remove mockups when directed, unless otherwise indicated.

3.2 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 01 Section 01 73 29 "Cutting and Patching - CMR."

B. Protect constructions exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Construction Manager's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 01 45 00 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Requirements of baseline Indoor Air Quality (IAQ) testing for maximum indoor pollutant concentrations for acceptance of the facility.
2. Requirements for independent materials testing of specific materials anticipated to have major impact on IAQ.
3. Procedures for testing specific construction materials for IAQ performance to assure compliance with green building rating system credits. Materials have been identified for independent testing based on the following three (3) criteria:
   - **a.** Large volume of material used in occupied spaces.
   - **b.** The space is occupied during normal working hours.
   - **c.** Materials are used in an area where there is recirculating air.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Divisions 01 through 49 sections for green building rating system requirements specific to the Work of each of those sections. These requirements may or may not include reference to LEED or Green Globes.
2. Division 23 Section 23 05 93 "Testing, Adjusting and Balancing for HVAC" for additional requirements for baseline testing for IAQ.
3. Division 23 Section 23 05 93 "Testing, Adjusting and Balancing for HVAC" for cleaning of HVAC system including duct work, air intakes and returns, and changing of filters.

1.3 REFERENCES

A. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE):

1. ASHRAE 52.2-1999, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

B. ASTM International, Inc. (ASTM):

1. ASTM D5116-2006, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

C. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

1. IAQ Guidelines for Occupied Buildings Under Construction, 1995.

D. United States Environmental Protection Agency (EPA):

1. Compendium of Methods for the Determination of Air Pollutants in Indoor Air.

1.4 SUBMITTALS

A. Baseline IAQ Testing: Submit a report for each test site specified for IAQ baseline testing as prescribed in Section 23 05 93 "Testing, Adjusting and Balancing for HVAC". Report on air concentrations of targeted pollutants as identified in Table 3.1 below.

B. Product Emissions Test Reports: Submit a report for each material emissions test performed. Report test results in terms of emission factors that will be used by the Owner to model indoor air concentrations. These reports and the modeling data prepared by the Owner shall be included in the closeout documentation specified in Section 01 77 00 "Closeout Procedures - CMR".

C. Green Building Submittals:

1. Construction Indoor Air Quality (IAQ) Management Plan (During Construction):
   a. Construction IAQ management plan.
   b. Product data for temporary filtration media. Indicate manufacturer, model number, MERV rating, and location of installed media.
   c. Product data for filtration media to be used during occupancy. Indicate manufacturer, model number, MERV rating, and location of media.
2. **Construction Indoor Air Quality (IAQ) Management Plan (Before Occupancy):**
   a. A narrative describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
   b. Product data for filtration media used during flush-out and during occupancy.
   c. A narrative describing the building's IAQ testing process and results including the dates when testing was started and completed.
   d. Report from testing and inspecting agency indicating results of IAQ testing and documentation showing conformance with IAQ testing procedures and requirements.

1.5 QUALITY ASSURANCE

A. Perform material tests and report results in accordance with ASTM D5116.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 BASELINE IAQ TESTING The Construction Manager shall hire an independent subcontractor, subject to approval by the Architect, with a minimum of five (5) years experience in performing the types of testing specified herein, to test levels of indoor air contaminants for compliance with specified requirements.

A. **HVAC System Verification:** To assure compliance with recognized standards for indoor air quality including ASHRAE 62-2004, the Construction Manager's independent testing and balancing agency shall verify the performance of each HVAC system including space temperature and space humidity uniformity, outside air quantity, filter installation, drain pan operation, and any obvious contamination sources.

B. **Indoor Air Quality Testing:** Upon verification of HVAC system operation, the Construction Manager shall hire an independent subcontractor, subject to approval by the Architect, with a minimum of five (5) years experience in performing the types of testing specified herein, to test levels of indoor air contaminants for compliance with specified requirements.
   1. Submit a test plan for the approval of the Architect. The plan shall specify procedures, times, instrumentation, and sampling methods that will be employed.
   2. Perform testing in 16 different locations. Contaminant levels are to be measured on each floor of each building in an area agreed upon by the Construction Manager and the Architect. Areas with very high outside air ventilation rates such as laboratories are excluded from these testing requirements. The Architect is the sole judge of areas exempt from testing.
   3. Collect air samples on three (3) consecutive days during normal business hours (between the hours of 8:00 AM and 5:00 PM) with building operating at normal HVAC rates. Average the results of each three-day test cycle to determine compliance or non-compliance of indoor air quality for each air handling zone tested.
   4. Sample and record outside air levels of formaldehyde and TVOC contaminants at outside air intake of each respective air handling unit simultaneously with indoor tests to establish basis of comparison for these contaminant levels. Indoor testing will be done in the breathing zone; between four (4) and seven (7) feet from the floor.
   5. Acceptance of respective portions of the building by the Architect is subject to compliance with specified limits of indoor air quality contaminant levels.

C. **Compliance indoor air quality shall conform to the following standards and limits:**
   1. **Carbon Monoxide:** Not to exceed nine (9) ppm.
   2. **Carbon Dioxide:** Not to exceed 800 ppm.

3. **Airborne Mold and Mildew:** Simultaneous indoor and outdoor readings.
4. Maximum Air Concentration Standards: Indoor room air concentration levels, emission rates, and qualities of the listed contaminants shall not exceed the following limits specified in Table 3.1 below.

D. **Test Reports:** Prepare test reports showing the results and location of each test, a summary of the HVAC operating conditions, a listing of any discrepancies and recommendations for corrective actions, if required.

1. Include certification of test equipment calibration with each test report.

E. If any test fails the standard, the Construction Manager is responsible to ventilate the building with 100 percent outside air until the building passes both air quality tests and duct inspections. Retesting shall be performed at no additional expense to the Owner.

Table 3.1 MAXIMUM INDOOR AIR CONCENTRATION STANDARDS

INDOOR CONTAMINANTS	MAXIMUM AIR CONCENTRATION LEVELS*
Formaldehyde	50 parts per billion
Particulates (PM10)	50 micrograms per cubic meter
Total Volatile Organic Compounds (TVOC)	500 micrograms per cubic meter
4-Phenylcyclohexene (4-PCH)**	6.5 micrograms per cubic meter
Carbon Monoxide (CO)	9 parts per million and no greater than 2 parts per million above outdoor levels

* All levels must be achieved prior to acceptance of the building. The levels do not account for contributions from office furniture, occupants, and occupant activities.

** This test is only required if carpet and fabrics with styrene-butadiene rubber (SBR) latex backing material are installed in the building.

F. Construction Indoor Air Quality (IAQ) Management Plan (During Construction) Credit: Comply with SMACNA IAQ Guidelines for Occupied Buildings under Construction.

G. Construction Indoor Air Quality (IAQ) Management Plan (Before Construction):

1. After construction ends and with all interior finishes installed, perform a building flush-out in accordance with the contract drawings.
2. Engage an independent testing and inspecting agency to conduct a baseline IAQ testing program according to EPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air.

END OF SECTION 01 45 23.13 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for identification badges, parking stickers, construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.

B. Temporary utilities include, but are not limited to, the following:

1. Temporary water service and distribution.
2. Temporary electric power and lighting services.
3. Temporary heating, cooling and ventilation
4. Temporary telephone service and data.
5. Temporary sanitary facilities, including drinking water.
6. Storm and sanitary sewer.
7. Storm water pollution control.

C. Support facilities include, but are not limited to, the following:

1. Field offices –Construction Manager, Subcontractor, Owner, and Owner's Representative.
2. Storage and fabrication sheds.
3. Temporary roads and paving.
4. Dewatering facilities and drains.
5. Temporary enclosures.
6. Temporary lifts, hoists and elevator use.
7. Temporary project identification signs.
8. Temporary exterior lighting.
9. Collection and disposal of waste and cleaning.
10. Temporary Environmental Controls.
11. Stairs.

D. Security and protection facilities include, but are not limited to, the following:

1. Temporary fire protection.
2. Permanent fire protection.
3. Security for site and Agency.
4. Barricades, warning signs, and lights.
5. Enclosure fence.
6. Security enclosure and lockup.
7. Protection.
8. Environmental protection.
9. Traffic ways.
10. Identification badges for Construction Manager's personnel & parking stickers.

1.3 RELATED SECTIONS

A. Division 01 Section 01 57 30 "Indoor Environmental Control - CMR" for additional provisions governing temporary heating, ventilating and air conditioning.

1.4 SUBMITTALS

A. **Temporary Utilities:** Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

B. **Implementation and Termination Schedule:** Within twenty-one (21) days of the date established for commencement of the Work, submit a schedule indicating implementation and termination of each temporary utility.

1.5 QUALITY ASSURANCE

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

1. Building and fire code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.
6. Americans with Disabilities Act.

B. **Standards:** OSHA. Comply with NFPA 241 "Standard for Safeguarding Construction, Alteration, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA 200 "Recommended Practice for Installing and Maintaining Temporary Electric Power at Construction Sites."

1. **Electrical Service:** Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."

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

1.6 PROJECT CONDITIONS

A. **Temporary Utilities:** Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, the Owner's Representative and DPW PM will direct the change over from use of temporary service to use of permanent service.

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. **General:** Provide new materials. If acceptable to the Architect, the Construction Manager may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. **Lumber and Plywood:** Comply with requirements in Division 06 Section 06 10 00 "Rough Carpentry."

1. For signs and directory boards, provide 3/4-inch exterior grade, Grade A-B Fir plywood. Mount sign on preservative treated Fir posts.
   a. Project sign shall be 4' x 8' painted and supported on 4-inch x 4-inch posts, of a design to be provided by the Owner via the Owner's Representative and DPW PM.
2. Vision Barriers: Provide minimum 1/2-inch thick exterior plywood.

3. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch thick exterior plywood.

C. **Paint:** Comply with requirements of Division 09 Section 09 91 00 "Painting."

1. For sign and directory boards applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer unless otherwise indicated.

D. **Tarpaulins:** Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

E. **Water:** Provide potable water approved by local health authorities.

F. Provide potable water approved by local health authorities.

G. **Enclosure Fencing:** Provide 0.120-inch thick, galvanized 2-inch chain link fabric fencing six (6) feet high galvanized steel pipe posts, 1-1/2 inches knuckle both bottom and top I.D. for line posts and 2-1/2 inches I.D. for corner posts.

2.2 EQUIPMENT

A. **General:** Provide new equipment. If acceptable to the Architect, the Construction Manager may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

1. The Construction Manager shall furnish tools, apparatus and appliances, hoists and/or cranes and power for same, scaffolding, runways, ladders, temporary supports and bracing and similar work or material necessary to insure convenience and safety in the execution of the Contract except where this is otherwise specified in any Specification Section. All such items shall meet the approval of the Owner but responsibility for design, strength and safety shall remain with the Construction Manager. All such items shall comply with Federal OSHA regulations and applicable codes, statutes, rules and regulations, including compliance with the requirements of the current edition of the "Manual of Accident Prevention in Construction" published by the Associated General Contractors (AGC) and the standards of the State Labor Department.

2. Staging, exterior and interior, required for the execution of this Contract, shall be furnished, erected, relocated if necessary and removed by the Construction Manager. Staging shall be maintained in a safe condition without charge to and for the use of all trades as needed.

B. **Water Hoses:** Provide 3/4-inch, heavy-duty, abrasion-resistant, flexible rubber hoses with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge and backflow preventers.

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

D. **Electrical Power Cords:** Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

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

F. **Heating Units:** Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

G. **Temporary Field Offices:** Provide prefabricated or mobile units with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

H. **Temporary Toilet Units:** Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

I. **Fire Extinguishers:** Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

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

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

C. **Storm Water Pollution Control:**

1. Assume responsibility for storm water pollution control by submitting to the Connecticut Department of Environmental Protection (DEP) a "General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities" registration; conform to the permit requirements.
2. Conform to the Stormwater Pollution Control Plan included in the Contract Documents or use another plan, prepared at the Construction Manager's expense, which has been approved by the Owner and the Connecticut Department of Environmental Protection.
3. The "General Permit for the Discharge of Stormwater and Dewatering Wastewater from Construction Activities" "draft" registration is attached to the technical Section 311000 Site Clearing.
4. Sign and cause to be signed by each appropriate subcontractor, the Certification Statement required by the General Permit.
5. Provide, maintain, and monitor a rain gauge on the site; monitoring shall include maintaining a log of the readings. The rain gauge shall remain the property of the Construction Manager.

3.2 TEMPORARY UTILITY INSTALLATION

A. **General:** Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
4. Use Charges: If cost or use charges for temporary facilities are specified by this section to be borne by the Owner the cost or use charges for temporary facilities will be borne not longer than 30 days after final acceptance of the project.

B. **Temporary Water Service and Distribution:**

1. Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
   a. Sterilization: Sterilize temporary water piping prior to use.
2. Water for construction purposes may be taken from the existing service. The Construction Manager shall provide connections, approved backflow prevention device, meter and pipe to the water main or nearest hydrant, subject to the approval of the Owner. Upon completion of work, the Construction Manager shall remove the temporary connections and backfill if necessary. If new water service is installed before construction is complete, the new system may be used provided it is returned to the Owner in as-new condition. The Construction Manager shall pay for the water used, as metered.

3. Connect to existing facilities, through an approved backflow prevention device; extend branch piping with outlets so that water is available by use of hoses. Owner will pay for water used. The Construction Manager shall not waste water or use faulty equipment. The Construction Manager shall provide, at his own expense, all connections, extensions and other apparatus required for use of such services. Upon completion of the Contract, the Construction Manager shall disconnect temporary extensions and return utility to its original condition.

C. Temporary Electric Power and Lighting Services:

1. Power and lighting may be taken from the power company's nearest pole with temporary poles, if needed, to extend the line to project. If permanent power lines have been installed before beginning project, then temporary lines can be brought in from the last pole.
2. Provide service required for construction with branch wiring and distribution boxes located to provide power and lighting by construction-type extension cords. Meter shall be provided and installed by the Construction Manager.
3. The Construction Manager shall pay all costs of temporary power and light.
4. **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.
5. **Temporary Lighting:** When overhead floor or roof deck has been installed, provide temporary lighting with local switching. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

D. Temporary Heating, Cooling and Ventilating:

1. Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
   a. **Heating Facilities:** Except where the Owner authorizes use of the permanent system, provide vented, self-contained, LP-gas or fuel oil heaters with individual space thermostatic control.
   b. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.
2. Provide temporary heat during construction for interior areas included in the Contract to counteract low temperatures or excessive dampness. Maintain during said period or periods until final completion of the Contract, unless otherwise approved by the Owner in writing. Windows, doors, ventilators and similar openings shall be temporarily closed. Provide heat and ventilation to maintain specified conditions for construction operations and to protect materials and finishes from damage by temperature or humidity. The permanent heating system is not to be used for temporary heating unless approved, in writing, by the Owner. If approved, use of the permanent heating system by the Construction Manager does not constitute beneficial use by the Owner. The warrantee for said system will not commence until Substantial Completion is granted. Costs shall be paid by the Construction Manager. See individual Sections for temperature/humidity limits. Temporary heating methods shall comply with OSHA regulations and other applicable codes, statutes, rules and regulations and shall be approved by the Architect/Engineer and Owner.
3. Permanent air handling equipment, when used for temporary heating, shall be equipped with disposable "construction" filters. The construction filters shall have an average efficiency at least equal to the filters specified under Division 23, but not less than 30 percent when tested in accordance with ASHRAE 52.2 "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size." The filters shall have an average arrestance of not less than 90 percent efficiency on one (1) micron size particles. Before turning over the system for final acceptance, the Construction Manager shall remove and dispose of the construction filters; clean the ductwork; spray clean the heating and cooling coils, and drain pans to "like new" condition; and install the filters specified in Division 23 Section 23 40 00 "HVAC Air Cleaning Devices."
4. The Construction Manager may use the existing heating system with temporary extensions, radiators or unit heaters, but such use is subject to the Owner's approval. Coordinate use of existing facilities with Owner. Provide additional, temporary extensions and units to satisfy the criteria given in the preceding paragraph. Owner will pay cost of energy used. Take measures to conserve energy. At the termination of construction, return the facilities to their original condition. Before operation of permanent facilities, verify that installation is approved for operation and that filters are in place.

5. The Contractor shall arrange with his Heating Subcontractor to install and maintain temporary piping, radiators or unit heaters, reducing valves, steam traps and other necessary fittings and accessories. Traps shall be provided to prevent steam from entering main returns. The temporary layout shall meet the approval of the Architect/Engineer. Condensate meter (or meters) shall be installed to record usage of steam.
   Steam from the Agency's lines will be furnished to the Contractor without cost, but may be discontinued if use is unreasonable or wasteful. At the termination of construction, return the facilities to their original condition.

6. Refer to Section 01 57 30 "Indoor Environmental Control – CMR" for additional requirements regarding means and methods of providing temporary heating, cooling and ventilating. Meet manufacturer's standards for minimum and maximum temperatures and humidity governing installation of materials and systems.

E. **Temporary Telephone Service and Data:** Provide temporary telephone service throughout the construction period for all personnel engaged in construction activities. Install telephone on a separate line for each temporary office and first aid station. Construction Manager shall provide telephone service in his office and separate telephone service in the DPW Office and Owner's Representative's Office, if provided. It is preferred that the Construction Manager use a cellular phone. Basic service and local calls will be paid for by the Construction Manager. Toll calls will be paid for by the respective users.

1. **Separate Telephone Lines:** Provide additional telephone lines for the following:
   a. Where an office has more than two (2) occupants, install a telephone for each additional occupant or pair of occupants.
   b. Provide dedicated telephone lines for a separate fax machine in both the Construction Manager's office and the DPW/OR office.
2. At each telephone, post a list of important telephone numbers.

F. **Temporary Sanitary Facilities, Including Drinking Water:** Temporary sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

1. Provide toilet tissue, wash basins with water, soap and paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material. The Construction Manager shall maintain the facilities in a sanitary condition.
2. **Toilets:** The Construction Manager shall install self-contained chemical toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted. Provide separate facilities for male and female personnel.
3. **Water Coolers:** Where power is accessible, provide electric hot/cold water coolers to maintain dispensed cold water temperature at 45 to 55 degrees F. Provide bottled water service and cup supplies and maintain in a clean sanitary condition.

G. **Storm and Sanitary Sewer:** If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully.

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 sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal conditions promptly.

H. **Storm Water Pollution Control:** Provide earthen embankments and similar barriers in and around excavations and sub-grade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.3 SUPPORT FACILITIES INSTALLATION

A. **General:** Locate field offices, storage sheds, and other temporary construction and support facilities in designated area as shown on the Contract Documents. The location of the trailers on the Drawings is diagrammatic in nature. Final placement of the trailers is to be approved by the Owner's Representative and DPW PM.

1. Maintain support facilities until Final Completion. Remove prior to Final Completion with permission from the Owner.

B. **Field Offices:** Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project Site. Keep all offices clean and orderly, sweep weekly and remove rubbish on a daily basis. Furnish and equip offices as follows:

1. The Construction Manager shall provide an office for their own use and a method to contact them by e-mail and telephone at any point and time.

2. The Construction Manager shall provide a field office, for the sole use of the Owner's Representative and the Owner; (1) one double-wide trailer 24' x 60'. The trailer shall be in "new condition" as determined by the Owner's Representative. The trailer shall have a minimum of four (4) offices (minimum 150 square feet each), a main meeting area and a sound insulated toilet room, sink and hot and cold running water. The trailers shall have ample natural light, heating of sufficient capacity to maintain 70 degrees F in winter and air conditioning of sufficient capacity to maintain 75 degrees F in summer. The operational noise level of the supplied HVAC systems shall be low enough so as not to impede the conducting of meetings. The Construction Manager shall provide a 5-lb ABC fire extinguisher and an OSHA approved first aid kit. The Construction Manager shall provide the following furniture, which will remain his property. The furniture may be used but shall be in good condition as judged by the Owner's Representative and DPW PM.

   a. The Construction Manager shall provide a lockable chemical toilet with toilet tissue for the Owner's use. The Construction Manager shall maintain the facility in a sanitary condition.

   b. (5) Four lockable, double-pedestal, office desks, each with an executive chair.

   c. (2) Two plan tables.

   d. (2) Two plan racks.

   e. (20) Twenty conference chairs and a conference table (approx. 5'x12').

   f. (2) Two side tables (approx. 3'x5').

   g. (4) Four 4'x6' wall mounted, cork display boards.

   h. (3) Three 3'x4' wall mounted, white, wipe-off board, with markers.

   i. (12) Twelve file cabinets (lockable four drawer letter size).

   j. (2) Two bookshelves w/10 L.F. of 12" wide shelving each.

   k. (2) Two large capacity waste receptacles.

   l. (1) One plain paper, Fax Machine with dedicated telephone line approved by Owner.

   m. (7) Seven telephones with telephone lines and voice mail.

   n. (5) Five telephone lines (dedicated to computer use) with high-speed Internet connection (minimum of DSL or cable modem service).

   o. (5) Five Computers, with a 19" 1280 x 768 @72Hz Analog/ digital displays. Intel Core 2 Duo Processor 2.0 GHz 800Mhz FSB, 2MB L2 Cache, 2 GB RAM, 104+ USB Keyboard and 2 button Mouse, 80 GB hard-drive (7200 rpm) SATA II 300, the computers shall have a DVD CD RW Combo drive, graphic and sound cards, integrated Intel 10/100/1GB NIC, (2) serial (1) parallel and (2) USB ports, external powered speakers, each CD—ROM restore software, including but not limited to, Windows XP SP2, AutoCAD reading program as AutoDesk DWG TrueView, Microsoft Office2003 sp2), Primavera P-3 (latest version), McAfee Enterprise Virus Scan, (1) Wireless G compatible switch / router equivalent to the Linksys WRT54g Broadband router, Internet connection capabilities and the following:. (With working Cable or DSL ISP provided by Construction Manager. All software provided shall be compatible versions with license and certificate of authenticity.

   p. (1) One Laser Printer, with (5) hub connection, with supplies approved by Owner.

   q. (1) One Copy Machine with automatic stapling, coping capability for letter sized paper (8 ½ x 11), legal size (11 x 14) and ledger size (11 x 17), ability to enlarge and reduce, with collation up to 10 sets, duplex copying (both sides), and supplies for machine approved by Owner.

   r. (1) One Color printer with ink and photo paper supplies (equivalent to Epson Stylus Photo 1280 Printer, Photographic Dye Ink system, maximum resolution up to 5760X720 optimized DPI, 6 ink colors, advanced Micro Piezo printing technology, monochrome head with 48 nozzles, color head with 48 nozzles x 5, 100 sheet paper capacity in tray, USB and parallel interface, Windows 98,

2000, ME and XP operating system compatibility, 42 db(A) sound level, Energy Star compliant, and supplies for machine approved by Owner).

s. (1) One Digital Camera with software (4 mega pixel resolution with minimum 3 X zoom Digital Camera).

t. (2) Two battery operated wall clocks.

u. Window blinds.

v. (8) Eight mailboxes.

w. (1) One refrigerator.

x. (1) One microwave.

y. (1) One HP Scanjet N7710 or equal. Sheet fed, 600 dpi with 256 levels of grayscale, and standard 50 sheet automatic document feeder capacity.

3. When the Construction Manager supplies the trailer(s) they shall equip each trailer with a water cooler for hot and cold water.

C. **Storage and Fabrication Sheds:** Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on-site.

1. Storage sheds for tools, materials and equipment shall be weathertight with heat, lighting and ventilation for products requiring controlled conditions.

2. Remove temporary materials, equipment services and construction before Substantial Completion.

3. Clean and repair damage caused by installation or use of temporary facilities. Restore existing facilities used during construction to specified or original condition.

D. **Temporary Roads and Paving:** Construct and maintain temporary roads and paving to support the indicated loading adequately 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 Owner's Representative, DPW PM and Architect.

1. Provide paving for pedestrian access and parking for field offices.

2. **Paving:** Comply with Division 32 Section 32 12 16 "Asphalt Paving" for construction and maintenance of temporary paving.

3. Coordinate temporary paving development with sub-grade grading, compaction, installation and stabilization of sub-base and installation of base and finish courses of permanent paving.

4. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas without damage or deterioration when occupied by the Owner.

5. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration, and supervision.

E. **Dewatering Facilities and Drains:** For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 31 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.

F. **Temporary Enclosures**: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25-sq ft or less with plywood or similar materials.

3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.

4. Where temporary enclosure exceeds 100-sq ft in area, use UL-labeled, fire-retardant-treated material for framing and main sheathing.

G. **Temporary Lifts, Hoists and Elevator Use:**

1. Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
2. Refer to Division 14 Sections for elevators.

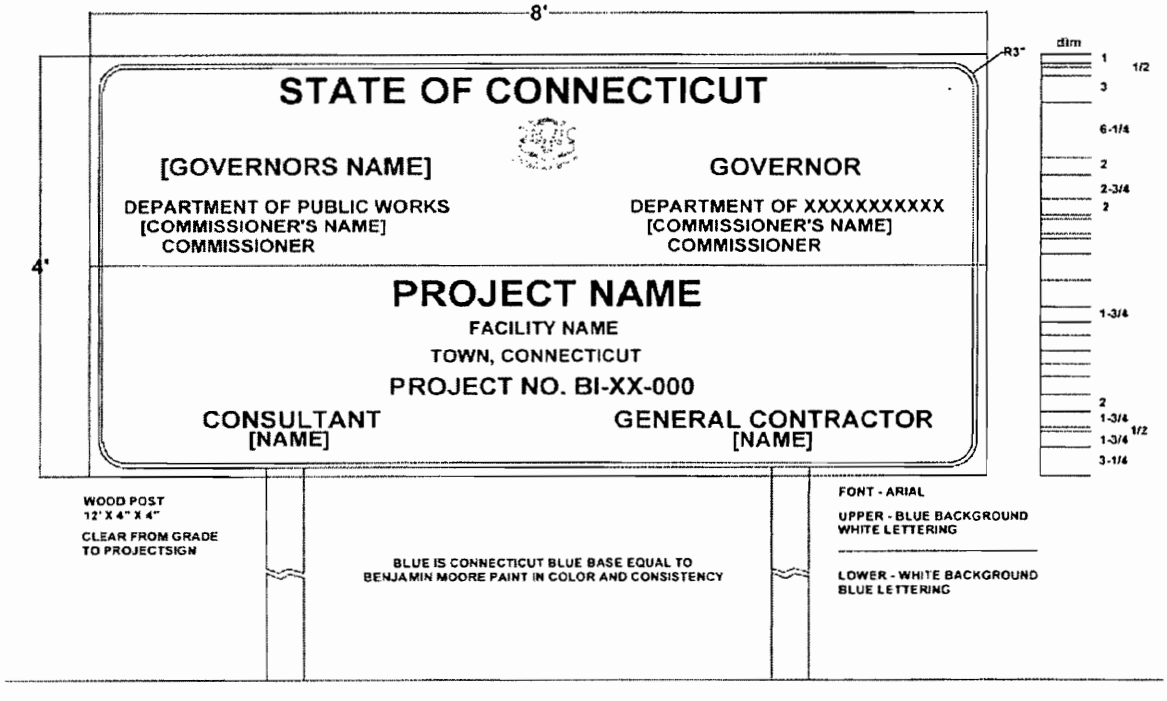
H. Temporary Project Identification Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.

I. Project Sign: Engage an experienced sign painter to apply graphics. Comply with details to be furnished by the Owner's Representative.

a. Temporary Tripod Frame: For groundbreaking ceremonies only, provide a temporary tripod for the sign illustrated and described below. Make the tripod of 12 ft long 2" x 4"s (Stud Grade), beveled and bolted at the top. Provide approximately 5-ft between legs at grade. Provide a 6-ft long, 2" x 4" seat for the sign; locate 5-ft above grade and nail in place. Nail sign at four (4) places where edges intersect tripod legs. Drive a 24" long, pointed 2" x 4" stake into the earth next to each leg and nail to legs.

b. **Project Sign:** The Construction Manager shall contact the Owner's Representative for the proper wording for the project sign. Fabricate sign of **3/4"** Exterior Grade A-B Fir plywood. Mount sign on preservative treated Fir posts. The Owner shall provide design, color selection and illustration of the Project Sign. Paint both sides and all edges of sign and the posts with **two (2)** coats of exterior, white, alkyd primer. Paint the border and letters with "bulletin" (sign) paint. Letter sizes, colors and related information are given on the illustration below. A self-adhesive decal of the State seal will be furnished at the Contract signing. Erect the sign within **two (2)** weeks after execution of the Contract and remove the sign within one (1) week after completion of the project.

c. **Project Sign detail:**



J. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.

K. Collection and Disposal of Waste and Cleaning:

1. Collect waste within the contract limit line from construction areas daily. Provide separate containers for proper waste recycling. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than **seven (7)** days during normal weather or **three (3)** days when the temperature is expected to rise above **80°** degrees F.

Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

2. Maintain areas under Construction Manager's control free of waste materials, debris and rubbish. Maintain in a clean and orderly condition.
3. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces and other closed or remote spaces before closing the space.
4. Periodically clean interior areas before start of surface finishing and continue cleaning on an as-needed basis.
5. Control cleaning operations so that dust and other particulates will not adhere to wet or newly coated surfaces.

L. **Temporary Environmental Controls:** Construction Manager is to provide the following controls.

1. Rodent and Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at materials.
2. Dust Control (construction and demolition).
3. Noise Control.
4. Erosion and Sediment Control.
5. Pollution Control.
6. Traffic Control.

M. **Stairs:** Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Owner.

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

1. Provide and locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. The Construction Manager, during construction, shall be responsible for loss or damage by fire to the work of the Contract until completion. Any fire used within the structure for working purposes shall be extinguished when not in use. Bitumen or tar shall be melted on the ground only. No flammable material shall be stored in the structure in excess of amounts allowed by the authorities. No gasoline shall be stored in or close to the building at any time. The Construction Manager shall assign a responsible employee to be in charge of fire protection measures.
6. If an EPDM or other single-ply roof is included in the work that requires cleaning of mating surfaces of laps with gasoline, limit amount of gasoline on roof to **two (2)** gallons which shall be in UL listed containers. Also provide one 30 B:C fire extinguisher within 75 feet of any point on the roof.

C. **Permanent Fire Protection:** At the earliest feasible date in each area of the Project, complete installation of the permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

D. **Security for Site and Agency:**

1. Provide security program and facilities to protect work, existing facilities and the Owner and Agency's operations from unauthorized entry, vandalism and theft. Coordinate with the Owner's and Agency's security program.
2. The Construction Manager shall be solely responsible for damage, loss or liability due to theft or vandalism.

E. **Barricades, Warning Signs, and Lights:** Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.

1. Provide covered walkways as required by governing authorities for public rights-of-way and for public access to existing buildings.
2. Provide temporary, insulated, weathertight closures at openings to the exterior to provide acceptable working conditions and protection for materials, to allow for temporary heating and to prevent entry of unauthorized persons. Provide doors with self-closing hardware and locks.
3. Barriers and enclosures shall be in conformance with code requirements. Do not block egress from occupied buildings unless necessary to further the work of the Contract. In this case, secure the Owners approval of an alternate egress plan.
4. See also General Conditions Article 19, "Protection of the Work, Persons and Property".

F. **Enclosure Fences:** Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated on the Construction Documents, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.

1. Provide chain link construction fencing with posts set in a compacted mixture of gravel and earth. Use existing fence to the extent possible.

G. **Security Enclosure and Lockup:** Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Provide keys to the Owner's Representative.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

H. **Protection:**

1. Protect buildings, equipment, furnishings, grounds and plantings from damage. Any damage shall be repaired or otherwise made good at no expense to the Owner.
2. Provide protective coverings and barricades to prevent damage. The Construction Manager shall be held responsible for, and must make good at his own expense, any water or other type of damage due to improper coverings. Protect the public and building personnel from injury.
3. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.
4. Provide protective coverings for walls, projections, jambs, sills and soffits of openings. Protect finished floors and stairs from traffic, movement of heavy objects and storage. Prohibit traffic and storage on waterproofed and roofed surfaces and on lawn and landscaped areas.
5. Provide temporary partitions and ceilings to separate work areas from Agency-occupied areas to prevent penetration of dust and moisture into Agency-occupied areas and equipment. Erect framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces.
6. See also General Conditions Article 19, "Protection of the Work, Persons and Property".

I. **Environmental Protection:** Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result.

J. **Traffic Ways:**

1. The Construction Manager may use on-site paved roads and parking areas but shall not encumber same or their access. Public highways shall not be blocked by standing trucks, parked cars, material storage, construction operations or in any other manner.

2. Public roads and existing paved roads, drives and parking areas on Owner's property shall be kept free from scrap or debris due to construction operations and any damage to their surface caused by the Construction Manager shall be repaired by him at his own expense.
3. If the work of the Contract affects public use of any street, road, highway or thoroughfare, the Construction Manager shall confer with the police authority having jurisdiction to determine if and how many police are needed for public safety in addition to any barriers and signals that may be needed. The Construction Manager will be responsible for payment of any needed police services.
4. Access to the drive located between the portables and the existing building will not be allowed during time periods when the school children are arriving and being dismissed:

Monday – Friday	7:30	a.m.	to	9:00	a.m.
Monday – Friday	2:30	p.m.	to	3:30	a.m.

This time period is subject to change at the discretion of the Owner's Representative.

K. Identification Badges for Construction Manager's Personnel, Visitors & Parking Stickers:

1. The Construction Manager will provide each person working or visiting at the site with an identification badge, bearing the name of the Construction Manager and a number. As badges are assigned, a record shall be kept by the Construction Manager and given to the Owner's Representative and Agency Representative. Update and correct the records of all badges issued on a semi-monthly basis.
2. Badges are to be worn on outer garment where visible at all times while at the construction site, return them to the Construction Manager's field office at the end of each day and pick them up there each morning.
3. All vehicles parking in the Construction Manager's parking lot and those used around the site require an ID sticker. They will be issued by the Agency. Each Construction Manager shall apply for parking stickers through the Owner's Representative no more than semi-monthly and shall keep record of all stickers issued.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a **twenty-four (24)** hour basis where required to achieve indicated results and to avoid possibility of damage.
2. **Protection:** Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Architect/OR requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Construction Manager's property. The Owner reserves the right to take possession of project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.
3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
   a. Replace air filters and clean inside of ductwork and housings.
   b. Replace significantly worn parts and parts subject to unusual operating conditions.

c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 01 50 00 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Microbial and fungal contamination control.

2. Indoor air quality and pollution control.

3. Heating, ventilating, and air conditioning.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 45 23.13 "Testing for IAQ, Baseline IAQ & Materials - CMR" for building flush out requirements.
2. Division 01 Section 01 57 40 "Construction IAQ Management Plan - CMR" for a description of the IAQ management plan.

1.3 REFERENCES

1. ASTM International (ASTM):

a. ASTM D5116-2006, Standard Guide for Small-Scale Environmental Chamber Determination of Organic Emissions From Indoor Materials/Products.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 MICROBIAL AND FUNGAL CONTAMINATION CONTROL

A. Perform, schedule, and sequence Work as required to limit conditions supporting formations of microbes, molds, and fungi.

1. Control water penetration, dampness, and humidity to prevent products not treated for exterior use from becoming soaked or damp.

2. Enclose building prior to installing interior materials and finishes.

3. Do not install interior products subject to moisture absorption until building is enclosed and wet work generating moisture and humidity is complete.

B. When visible formations are observed and when formations cannot be completely removed by non-abrasive surface cleaning:

1. Remove and replace materials identified as food sources for microbes, molds, and fungi.
2. Correct conditions supporting microbial, mold, and fungal growth.

C. Remove interior products and finishes, identified as food sources that have absorbed sufficient moisture to become damp whether or not microbial, mold, or fungal growth is observed. Include:

1. Gypsum board cores.

2. Organic materials composed of cellulose fiber or paper.

3. Materials containing sucrose or other binders identified as supporting microbial growth.

D. Remove fibrous insulation materials subject to retaining moisture such as duct liner, insulation, and other materials that are made wet or damp and cannot immediately be made dry.

E. Repair or replace ductwork, pans, and other conditions subject to moisture condensation, water penetration, or other water source not drained and made dry.

1. Remove conditions that have become an environment for microbes, molds, or fungi.
2. Do not permit conditions leading to standing water.

F. Install wet work and allow time needed to dry and cure prior to installing materials such as carpet, acoustical material, textiles, and other material of type that may attract and retain moisture.

3.2 INDOOR AIR QUALITY AND POLLUTION CONTROL

A. Do not use products in combination with or in contact with other products that can be identified as combining to form toxic fumes or sustained odors.

B. Do not use solvents within interior areas that may penetrate and be retained in absorptive materials such as concrete, gypsum board, wood, cellulose products, fibrous material, and textiles.

C. Protect construction materials from contamination and pollution from contact with construction dust, debris, fumes, solvents, and other environmentally polluting materials.

D. Allow furnishings and materials such as carpet, floor tile, acoustical tile, textiles, office furniture, and casework, to air out in clean environment prior to installation.

3.3 HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

A. Do not run permanent HVAC system during course of construction. Seal ductwork intake and exhaust vents.

B. Heat, dehumidify, and ventilate building during course of Work as necessary to maintain environmental conditions suitable for drying and curing materials and for prevention of conditions suitable for mold and mildew growth.

1. Ventilate building to remove moisture, dust, fumes, and odors.
2. Temper and dehumidify air as needed to remove excess moisture.
3. Do not use propane heaters and other moisture generating heating systems.

C. **Flush out building prior to commissioning.** Refer to Section 01 45 23.13 "Testing for IAQ, Baseline IAQ & Materials - CMR" for procedure.

D. Inspect ductwork for refuse, contaminants, moisture and other foreign contamination prior to commissioning. Notify Commissioning Authority (CA) of satisfactory inspection prior to beginning of Commissioning.

E. Clean underfloor plenum at access flooring acting as supply air duct, prior to occupancy.

3.4 REMEDIAL ACTION

A. Promptly take action as necessary to inspect and remediate conditions suspected of supporting microbial, fungal or mold conditions and where contaminated by indoor air pollution.

B. Notify and consult with Architect prior to beginning remedial action where contamination by hazardous chemicals, microbes, and fungi is suspected.

END OF SECTION **01 57 30 - CMR**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
1. Description of a Construction Indoor Air Quality (IAQ) Management Plan.
2. IAQ construction requirements.

B. **Related Sections:** The following Sections contain requirements that relate to this Section:
1. Divisions 01 through 49 sections for green building rating system requirements specific to the Work of each of those sections. These requirements may or may not include reference to LEED or Green Globes.
2. Division 01 Section 01 45 23.13 "Testing for IAQ, Baseline IAQ, & Materials - CMR."
3. Division 01 Section 01 57 30 "Indoor Environmental Control - CMR."
4. Division 01 Section 23 05 93 "Testing, Adjusting and Balancing for HVAC - CMR" for additional requirements for baseline testing for IAQ. – CMR.
5. Division 01 Section 23 05 93 "Testing, Adjusting and Balancing for HVAC - CMR" for cleaning of HVAC system including ductwork, air intakes and returns, and changing of filters.

1.3 REFERENCES

A. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):
1. ASHRAE Standard 52.1-1992, Gravimetric and Dust Spot Procedures for Testing Air Cleaning Devices in General Ventilation for Removing Particulate Matter.

B. ASTM International, Inc. (ASTM):
1. ASTM D5116-2006, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

C. Sheet Metal and Air Conditioning National Contractors' National Association (SMACNA):
1. IAQ Guidelines for Occupied Buildings under Construction, 1995.

1.4 INDOOR AIR QUALITY

A. **Goals:** The Owner has set the following indoor air quality goals for jobsite operations on the project, within the limits of the construction schedule, Guaranteed Maximum Price, and available materials, equipment, products and services. Goals include:
1. Protect workers on the site from undue health risks during construction.
2. Prevent residual problems with indoor air quality in the completed building.

1.5 SUBMITTALS

A. **Indoor Air Quality Plan:** Within fourteen (14) days after receipt of Award of Contract and prior to any waste removal from the project, develop and submit for review a healthy indoor air quality plan. The plan shall include:
1. List of IAQ protective measures to be instituted on the site.
2. Schedule for inspection and maintenance of IAQ measures.

1.6 QUALITY ASSURANCE

A. Perform material tests and report results in accordance with ASTM D5116.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Should the Construction Manager desire to use procedures, materials, equipment, or products that are not specified but meet the intent of the specifications to protect indoor air quality on the site, the Construction Manager shall propose these substitutions in accordance with Section 01 60 00 "Product Requirements - CMR."

2.2 MATERIALS

A. Low emitting products have been specified in appropriate sections.

PART 3 - EXECUTION

3.1 CONSTRUCTION IAQ MANAGEMENT PLAN

A. Meet or exceed the minimum requirements of the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction."

1. Protect the ventilation system components from contamination, or provide cleaning of the ventilation components exposed to contamination during construction prior to occupancy.

2. After construction ends and with all interior finishes installed, perform a building flush-out as indicated in the Construction Documents.

B. During installation of carpet, paints, furnishings, and other VOC-emitting products, provide supplemental (spot) ventilation for at least 72 hours after work is completed. Preferred HVAC system operation uses supply air fans and ducts only; exhaust provided through windows. Use exhaust fans to pull exhaust air from deep interior locations. Stair towers and other paths to exterior can be useful during this process.

C. Conduct regular inspection and maintenance of indoor air quality measures including ventilation system protection, and ventilation rate.

D. Require VOC-safe masks for workers installing VOC-emitting products (interior and exterior) defined as products that emit 150 gpl or more UNLESS local jurisdiction's requirements are stricter, in which case the strictest requirements shall be followed for use of VOC-safe masks.

E. Use low-toxic cleaning supplies for surfaces, equipment, and worker's personal use. Options include several soybean-based solvents and cleaning options (SoySolv) and citrus-based cleaners.

F. Use wet sanding for gypsum board assemblies. Exception: Dry sanding allowed subject to Owner's approval of the following measures:

1. Full isolation of space undergoing finishing.
2. Plastic protection sheeting is installed to provide air sealing during sanding.
3. Closure of all air system devices and ductwork.
4. Sequencing of construction precludes the possibility of contamination of other spaces with gypsum dust.
5. Worker protection is provided.

G. Use safety meetings, signage, and Construction Manager agreements to communicate the goals of the construction indoor air quality plan.

END OF SECTION 01 57 40 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing the- Construction Manager's selection of products for use in the Project.

B. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 25 00 "Substitution Requirements - CMR" specifies administrative procedures for handling requests for substitutions made after award of the Contract.
2. Division 01 Section 01 33 00 "Submittal Requirements - CMR" specifies requirements for submittal of the Construction Manager's Construction Schedule or CPM Schedule and the Submittal Schedule.
3. Division 01 Section 01 42 20 "Reference Standards and Definitions - CMR" specifies the applicability of industry standards to products specified.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, which is current as of the date of the Contract Documents.
2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 QUALITY ASSURANCE

A. **Source Limitations:** To the fullest extent possible, provide products of the same kind from a single source.

B. **Compatibility of Options:** When the Construction Manager is given the option of selecting between two (2) or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. **Nameplates:** Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. **Labels:** Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
2. **Equipment Nameplates:** Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
   a. Name of product and manufacturer.
   b. Model and serial number.
   c. Capacity.
   d. Speed.

e. Ratings.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Store products in accordance with manufacturers' instructions and maintain within temperature and humidity range required by manufacturer.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation.
8. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
9. Store loose granular material on solid surfaces in a well-drained area; prevent mixing with foreign matter.
10. Arrange storage to provide access for inspection. Periodically inspect to insure products are undamaged and are maintained under required conditions. Keep log showing date, time and problems, if any.
11. Stone, masonry units and similar materials shall be stored on platforms or dry skids and shall be adequately covered and protected against damage.
12. Materials and equipment shall be delivered, stored and handled to prevent intrusion of foreign matter and damage by weather or breakage. Packaged materials shall be delivered and stored in original, unbroken packages.
13. Promptly inspect shipments to assure that products comply with requirements, that quantities are correct and products are undamaged.
14. Packages, materials and equipment showing evidence of damage will be rejected and replaced at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. **General Product Requirements:** Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. **Product Selection Procedures:** The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:

1. **Semi-proprietary Specification Requirements:** Where Specifications name two (2) or more products or manufacturers, provide one (1) of the products indicated. Comply with the requirements of Division 01 Section 01 25 00 "Substitution Procedures - CMR."

2. **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.
3. **Compliance with Standards, Codes, and Regulations:** Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
4. **Visual Selection:** Where specified product requirements include the phrase ***"...as selected from manufacturer's standard colors, patterns, textures..."*** or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.

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 60 00 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. General: This Section specifies administrative and procedural requirements for field engineering services including, but not limited to, the following:

1. Land survey work.
2. Civil Engineering services.
3. Damage surveys.
4. Geo-technical monitoring.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 31 00 "Project Management and Coordination - CMR" for procedures for coordinating field engineering with other construction activities.

2. Division 01 Section 01 33 00 "Submittal Procedures- CMR" for submitting Project record surveys.

3. Division 01 Section 01 77 00 "Closeout Procedures- CMR" for submitting final property survey with Project Record Documents and recording of Owner-accepted deviations from indicated lines and levels.

1.3 SUBMITTALS

A. Certificates: Submit a certificate from the Land Surveyor stating that the control information furnished by the Owner is accurate or identify inaccuracies, if they exist. The Construction Manager shall not take advantage of errors, which may be included in the control information. Stakes and markings shall be preserved.

B. Final Property Survey: Prepare and submit 10 copies of the final property survey.

C. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of "Submittals" and "Project Closeout" Sections.

1.4 QUALITY ASSURANCE

A. Provide field engineering services to establish and record grades, lines and elevations.

B. The Construction Manager shall retain a Land Surveyor registered by the State of Connecticut to confirm State furnished base lines and benchmarks, lay out the building, underground utility lines and other site work from the information furnished by the Owner and to establish and record the necessary elevations, at no additional cost to the State.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Identification: The Owner will identify two (2) base lines on the Contract Drawings.

B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks. Notify the Owner's Representative and Architect of any discrepancies immediately in writing before proceeding to lay out the Work. Locate and protect existing benchmarks and base line. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or base line without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.

2. Promptly replace lost or destroyed Project baseline benchmarks. Base replacements on the original survey control points.

C. Establish and maintain a sufficient quantity of (minimum of 2) permanent benchmarks on the site, referenced to data established by Owner supplied information.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

D. **Existing Utilities and Equipment:** 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 and other construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping. Notify the Owner's Representative of any discrepancies prior to proceeding.

3.2 PERFORMANCE

A. Work from lines and levels established by the property survey. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities of benchmarks and control points for their use.

2. As construction proceeds, check every major element for line, level, and plumb.

B. **Surveyor's Log:** Maintain a surveyor's log of control and other survey work. Make this log available for reference.

1. Record deviations from required lines and levels, and advise the Owner's Representative and Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

2. On completion of foundation walls, major site improvements, underground utilities, and other Work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, elevations of construction, as-built locations and site work.

C. **Site Improvements:** Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.

D. **Building Lines and Levels:** Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels, and control lines and levels required for mechanical and electrical work.

E. **Existing Utilities:** Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

F. **Final Property Survey:** Prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey.

END OF SECTION 01 71 23 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for cutting and patching.

B. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 31 00 "Project Management and Coordination - CMR" for procedures for coordinating cutting and patching with other construction activities.
2. Division 01 Section01 35 16 "Alteration Project Procedures - CMR" for procedures for coordinating cutting and patching with other construction activities.
3. Division 02 Section 02 41 19 "Selective Structure Demolition" for demolition of selected portions of the building for alterations.
4. Division 02 Section 02 41 16 "Structure Demolition" for demolition of entire portions of the building.
5. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
   a. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 22, 23, and 26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 SUBMITTALS

A. **Cutting and Patching Proposal:** Submit a proposal to the Owner's Representative describing procedures well in advance of the time cutting and patching will be performed to determine if the Owner and/or Architect/Engineer requires approval of these procedures before proceeding. Request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. Describe affects to integrity of weather exposed or moisture resistant element.
4. Describe affects to efficiency, maintenance, or safety of any operational element.
5. Describe affects to Work of Owner or separate Construction Manager.
6. List products to be used and firms or entities that will perform Work.
7. Indicate dates when cutting and patching will be performed.
8. **Utilities:** List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
9. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations sealed by an Engineer registered in the State of Connecticut showing integration of reinforcement with the original structure.
10. Approval by the Owner's Representative to proceed with cutting and patching does not waive the Architect/Engineer of Record's rights to later require complete removal and replacement of unsatisfactory Work.

1.4 QUALITY ASSURANCE

A. **Requirements for Structural Work:** Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio.

1. Obtain approval from the Architect/Engineer of the cutting and patching proposal before cutting and patching the following structural elements:
   a. Foundation construction.
   b. Bearing and retaining walls.
   c. Structural concrete.
   d. Structural steel.
   e. Lintels.
   f. Structural decking.
   g. Miscellaneous structural metals.
   h. Exterior curtain-wall construction.
   i. Equipment supports.
   j. Piping, ductwork, vessels, and equipment.
   k. Structural systems of special construction in Division 13 Sections.

B. **Operational Limitations:** Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.

1. Obtain Architect/Engineer's approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
   a. Primary operational systems and equipment.
   b. Air or smoke barriers.
   c. Water, moisture, or vapor barriers.
   d. Membranes and flashings.
   e. Fire protection systems.
   f. Noise and vibration control elements and systems.
   g. Control systems.
   h. Communication systems.
   i. Conveying systems.
   j. Electrical wiring systems.
   k. Operating systems of special construction in Division 13 Sections.

C. **Visual Requirements:** Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

1.5 WARRANTY

A. **Existing Warranties:** Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.

B. The Construction Manager shall install sleeves, inserts and hangers furnished by the trades needing same.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, notify the Owner's Representative and Architect, before proceeding with corrective action.

B. Openings and chases may not be shown on the Drawings. It is the responsibility of the Construction Manager to examine the Architectural, Electrical, Heating, Cooling, Ventilating and Plumbing Drawings and to provide chases, channels or openings where needed.

1. After installing Work into openings, channels and/or chases, the Construction Manager shall close same. If finishes are to be restored, the new Work shall match the original and shall be done by the trade customarily responsible for the particular kind of Work.

C. The Construction Manager shall verify dimensions for built-in Work and/or Work adjoining that of other trades before ordering any material or doing any Work. Discrepancies shall be submitted to the Owner's Representative before proceeding with the Work.

D. See also Division 00 General Conditions of Contract for Construction - CMR, Article 23 "Cutting, Fitting, Patching & Digging".

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Work that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
2. Do perform cutting and patching to integrate elements of Work. Provide penetrations of existing surfaces. Provide samples for testing. Seal penetrations through floors, walls, ceilings and roofs, as applicable; restore or preserve fire-rated and smoke-barrier construction. Construction and finishes shall match original Work.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
4. Comply with requirements of applicable Division 32 Sections where cutting and patching requires excavating and backfilling.
5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.
4. Patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.4 CLEANING

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01 73 29 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for waste management goals, waste management plan and waste management plan implementation.

B. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 11 00 "Summary of Work".
2. Division 01 Section 01 29 76 "Progress Payment Procedures – CMR".
3. Division 01 Section 01 25 00 "Substitution Procedures– CMR".
4. Division 01 Section 01 31 19 "Project Meetings – CMR".
5. Division 01 Section 01 33 00 "Submittal Procedures – CMR".
6. Division 01 Section 01 45 00 "Quality Control – CMR".
7. Division 01 Section 01 50 00 "Temporary Facilities and Controls – CMR".
8. Division 01 Section 01 60 00 "Product Requirements – CMR".
9. Division 01 Section 01 77 00 "Closeout Procedures – CMR".
10. Division 01 Section 01 81 13 "Sustainable Design Requirements – CMR"

1.3 DEFINITIONS

A. **Construction Waste:** Solid wastes such as building materials, packaging and rubble resulting from construction, paving and infrastructure.

B. **Demolition Waste:** Solid wastes such as concrete, wood, brick, plaster, roofing materials, wallboard, metals, carpeting, insulation, and clean fill resulting from demolition or selective demolition of structures.

C. **Recyclable Materials:** Products and materials that can be recovered and remanufactured into a new product. Recyclable materials include, but are not limited to, the following:

1. Metals (ferrous and non-ferrous), including banding, metal studs, ductwork, and piping.
2. Asphaltic concrete paving.
3. Portland cement concrete.
4. Gypsum products.
5. Paper and cardboard.
6. Wood products, including structural, finish, crates, and pallets.
7. Brick and masonry.
8. Carpet and padding.
9. Plastics.
10. Copper wiring.

D. **Recycling Facility:** A business that specializes in collecting, handling, processing, distributing, or remanufacturing waste materials generated by new construction projects, into products or materials that can be used for this project or by others.

E. **Salvage and Reuse:** Existing usable product or material that can be saved and reused in some manner on the project site. Materials for reuse must be approved by the Architect. Materials that can be salvaged and reused must comply with applicable technical specifications and include, but are not limited to, the following:

1. Dimensional lumber and other wood products.
2. Structural steel.

3. Soil.
4. Masonry products.
5. Plants.

F. **Salvage for Resale:** Existing usable product that can be saved and removed intact (as is) from the project site to another site for resale to others without remanufacturing.

1.4 WASTE MANAGEMENT GOALS

A. The Owner has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.

B. The Construction Manager shall use all means available to divert the greatest extent practical and economically feasible, construction waste from landfills and incinerators.

C. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.

D. Recycle and/or salvage a minimum of 50 percent of non-hazardous construction and demolition waste by weight of the total solid waste generated by the Project.

E. With regard to these goals the Construction Manager shall develop, for the Architect's review, a Waste Management Plan for this Project.

F. Take a pro-active, responsible role in management of construction waste and require all subcontractors, vendors, and suppliers to participate in the effort. Establish a construction waste management program that includes the following categories:

1. Minimizing packaging waste.
2. Salvage and reuse.
3. Recycling.
4. Disposal.

1.5 SUBMITTALS

A. **Draft Waste Management Plan:** Within thirty (30) days after receipt of Notice of Award of Bid, or prior to any waste removal, whichever occurs sooner, the Construction Manager shall submit three (3) copies of a Draft Waste Management Plan to the Owner's Representative.

B. **Final Waste Management Plan:** Once the Owner has determined which of the recycling options addressed in the Draft Waste Management Plan are acceptable, the Construction Manager shall submit within ten (10) days three (3)copies of a Final Waste Management Plan.

C. **Progress Reports:** Submit three (3) copies of monthly progress reports, at the same time as the Application for Payment, documenting the following:

1. Material category.
2. Point of waste generation.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, in tons.
5. Quantity of waste recycled, in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

D. **Calculations:** Submit three (3) copies of calculations indicating the end-of-project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Project prior to Substantial Completion.

E. **Record Submittals:**

1. **Donations:** Indicate which salvageable materials were donated, who they were donated to, and whether the recipient is tax exempt. Submit documentation indicating receipt of donations.
2. **Sales:** Indicate which salvageable materials were sold, who they were sold to, and whether the recipient is tax exempt. Submit documentation indicating receipt of materials.

3. **Recycling:** Indicate which materials were recycled and the name of the facility licensed to accept them. Submit documentation such as manifests, weight tickets, receipts, and invoices.
4. **Waste Disposal:** Indicate which materials were accepted as waste by landfills and incinerator facilities licensed to accept them. Submit documentation indicating receipt of materials.

1.6 QUALITY ASSURANCE

A. **Regulatory Requirements:** Comply with regulations of State of Connecticut Department of Environment Protection, Waste Management Bureau Recycling Program.

B. **Waste Management Conference:** Review and discuss the waste management plan, requirements for documenting quantities of each type of waste and its disposition, procedures for materials separation, procedures for periodic collection and transportation to recycling and disposal facilities. Review waste management requirements for each trade. Verify availability of containers and bins needed to avoid delays.

1.7 WASTE MANAGEMENT PLAN

A. **Draft Waste Management Plan:** Include the following in the Draft Plan:

1. Analysis of the proposed jobsite waste to be generated, including types and quantities.
2. **Landfill Options:** The name of the landfill(s) where trash will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all Project waste in the landfill(s).
3. **Alternatives to Landfilling:** A list of each material proposed to be salvaged, reused, or recycled during the course of the Project, the proposed local market for each material, and the estimated net cost savings or additional costs resulting from separating and recycling (versus landfilling) each material. "Net" means that the following have been subtracted from the cost of separating and recycling:
   a. Revenue from the sale of recycled or salvaged materials and
   b. Landfill tipping fees saved due to diversion of materials from the landfill. The list of these materials is to include, at a minimum, the following materials:
      i. Cardboard.
      ii. Clean dimensional 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.

B. **Resources for Development of Waste Management Plan:** The following sources may be useful in developing the Draft Waste Management Plan:

1. **Recycling Haulers and Markets:** Local haulers and markets for recyclable materials. For more information, contact the State of Connecticut Department of Environmental Protection, Waste Management Bureau Recycling Program, (860) 424-3365, **www.dep.state.ct.us/wst/recycle/ctrecycle.htm**.

C. **Final Waste Management Plan:** The Final Waste Management Plan shall contain the following:

1. Analysis of the proposed jobsite waste to be generated, including types and quantities.
2. **Landfill Options:** The name of the landfill(s) where trash will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all Project waste in the landfill(s).
3. **Alternatives to Landfilling:** A list of the waste materials from the Project that will be separated for reuse, salvage, or recycling.
4. **Meetings:** A description of the regular meetings to be held to address waste management. Refer to Section 01 31 19 "Project Meetings".
5. **Materials Handling Procedures:** A description of the means by which any waste materials identified in item (3) above will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.

6. **Transportation:** A description of the means of transportation of 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) and destination of materials.

1.8 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. **Manager:** The Construction Manager shall designate an on-site party (or parties) responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.

B. **Distribution:** The Construction Manager shall distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner, and the Architect.

C. **Instruction:** The Construction Manager shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.

D. **Separation Facilities:** The Construction Manager shall lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.

E. **Hazardous Wastes:** Hazardous wastes shall be separated, stored, and disposed of according to local regulations.

F. **Application for Progress Payments:** The Construction Manager shall submit with each Application for Progress Payment a Summary of Waste Generated by the Project. Failure to submit this information shall render the Application for Payment incomplete and shall delay Progress Payment. The Summary shall be submitted on a form acceptable to the Owner and shall contain the following information:

1. The amount (in tons or cubic yards) of material landfilled from the Project, the identity of the landfill, the total amount of tipping fees paid at the landfill, and the total disposal cost. Include manifests, weight tickets, receipt, and invoices.
2. For each material recycled, reused, or salvaged from the Project: the amount (in tons or cubic yards), the date removed from the jobsite, the receiving party, the transportation cost, the amount of any money paid or received for the recycled or salvaged material, and the net total cost or savings of salvage or recycling of each material shall be indicated. Attach manifests, weight tickets, receipts, and invoices.

PART 2 – PRODUCTS

(Not Applicable)

PART 3 – EXECUTION

3.1 PLAN IMPLEMENTATION

A. Implement the waste management plan as approved by Owner's Representative.

B. Provide training of workers, Construction Manager's staff, subcontractors, and suppliers on proper waste management procedures.

1. Distribute waste management plan to all parties involved in the Project within three (3) days of submittal return.
2. Distribute plan to parties when they first begin working on the Project site. Review plan procedures and locations established for salvage, recycling, and disposal.

3.2 SEPARATION OF RECYCLABLE WASTE MATERIALS

A. Provide the necessary containers and bins, to facilitate the waste management program, that are clearly and appropriately marked. Prevent contamination of recyclable materials from incompatible products and materials. Separate construction waste at the project site by one of the following methods:

1. **Source Separated Method:** Waste products and materials, that are recyclable, are separated from trash and sorted into appropriately marked separate containers and then transported to the respective recycling facility for further processing. Trash is transported to a landfill or incinerator.

2. **Co-Mingled Method:** All construction waste is placed into a single container and then transported to a recycling facility where the recyclable materials are sorted and processed and the remaining trash is transported to a landfill or incinerator.
3. Other methods proposed by the Construction Manager and approved by the Owner's Representative.

END OF SECTION 01 74 19 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for handling requests for building system start up and system demonstration and includes the following:

1. Starting Systems.
2. Demonstration and instructions.
3. Testing, adjusting, and balancing.

B. **Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 45 00 "Quality Control - CMR" specifies quality assurance and inspecting services.

2. Division 01 Section 01 77 00 "Contract Closeout - CMR" specifies requirements for contract close out requirements for system operation and maintenance data and extra materials.

3. Division 01, Section 01 91 00 "Commissioning - CMR" specifies process requirements for system commissioning.

4. Division 23, Section 23 08 00 "Commissioning of HVAC - CMR" specifies requirements HVAC&R system commissioning.

1.3 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Provide written notification to the Owner's Representative thirty (30) days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, and control sequence for other conditions that may cause damage.

D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components are complete and tested.

F. Execute the start-up under supervision of manufacturer's representative, in accordance with manufacturer's instructions.

G. When referenced in individual specification sections, require manufacturer to provide an authorized representative to be present at the site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Division 01 Section 01 45 00 "Quality Control" that the equipment or system has been properly installed and is functioning properly.

1.4 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner and Agency Personnel fourteen (14) days prior to substantial completion.

B. Demonstrate Project equipment and instruct in a classroom environment at location designated by the Owner's Representative and DPW PM and instructed by a qualified manufacturer's representative who is knowledgeable about the Project.

C. For equipment or systems requiring seasonal operation perform demonstration for season within six (6) months.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner and Agency Personnel in detail to explain all aspects of operation and maintenance.

E. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, and maintenance, and shutdown of each item at agreed upon scheduled time and at equipment or designated location.

F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during demonstration.

G. Starting and adjusting equipment does not constitute acceptance by the owner since commissioning is a requirement of this contract. Additionally, the warrantee does not begin until substantial completion has been granted for that specific item.

1.5 TESTING, ADJUSTING, AND BALANCING

A. The Construction Manager will employ and pay for the testing services of an independent consultant to verify the testing, adjusting, and balancing.

1. Comply with the requirements of Division 01 Section 01 91 00 "Commissioning - CMR" as they relate to the Work of this Section.

B. Reports will be submitted by the independent testing consultant to the Owner's Representative indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.

C. The Owner may employ and pay for the services of an independent consultant to verify testing, adjusting, and balancing which was performed by the Construction Manager.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 75 00 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

1. Inspection procedures.
2. Project record document submittal.
3. Operation and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 11 00 "Summary of Work - CMR".

2. Division 01 Section 01 29 76 "Progress Payment Procedures - CMR".

C. Closeout requirements for specific construction activities may be included in the appropriate Sections in Divisions 02 through 49.

1.3 SUBSTANTIAL COMPLETION

A. General: Basic contract definitions are included in Article 1 of the Division 00 General Conditions of the Contract for Construction - CMR.

B. Preliminary Procedures: Before requesting inspection for Certification of Substantial Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.

a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.

b. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

2. Advise the Owner of pending insurance changeover requirements.

3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.

4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, certificates of compliance, operating certificates, and similar releases.

5. Submit record drawings, maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.

6. Deliver tools, spare parts, extra stock, and similar items.

7. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.

8. Demonstrate, thru operation and testing, the functions of all systems and/or equipment to the satisfaction of the Owner for compliance to the Contract. Complete testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.

9. Complete final cleanup requirements.

10. Certify that required training of personnel is complete.

C. **Inspection Procedures:** The Construction Manager shall be ready and prepared when they request a Substantial Completion inspection. If the inspection reveals that the work is not complete, that there are extensive punchlist items that will take more than ninety (90) days to complete and as the items listed in Article 1.3 above are not complete, the Owner's Representative, Architect, and Owner will determine the inspection has failed.

D. The Construction Manager is responsible for all costs to re-inspect due to a failed inspection. The Owner will issue a deduct change order to cover all costs for re-inspection.

1. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 ACCEPTANCE

A. **Preliminary Procedures:** Before requesting final inspection for "Certificate of Acceptance" and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
4. 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 assumed responsibility for corresponding elements of the Work.
5. Submit consent of surety to Final Payment.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
7. Touch up and otherwise repair and restore marred, exposed finishes, including touchup painting.

B. **Re-inspection Procedure:** The Inspection Group will re-inspect the Work upon receipt of notice from the Owner's Representative that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Owner.

1. Upon completion of re-inspection, the Owner's Representative and DPW PM will prepare a Certificate of Acceptance. If the Work is incomplete, Owner's Representative will advise the Construction Manager of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

1.5 AS-BUILT DOCUMENT SUBMITTALS

A. **General:** The Construction Manager shall not use As-built Drawings for construction purposes. Protect Construction Manager As-built Drawings from deterioration and loss in a secure, fire-resistant location. Provide access to As-built Drawings for the Architect's reference during normal working hours. Keep documents current; do not permanently conceal any work until required information has been recorded. **IMPORTANT NOTE: Failure to keep As-built Documents current is sufficient cause to withhold progress payments.**

1. The Construction Manager shall also hire the services of a Surveyor registered in the State of Connecticut to conduct a final survey to determine the location of exterior underground utility lines and to record the results, and update existing electronic media.
2. The record of exterior underground utilities shall be made at the time of installation on Mylar film drawing and AutoCAD (latest version) compatible disks. The drawing shall bear the seal of the Land Surveyor and a statement of accuracy.

B. **As-built Drawings:** The Construction Manager shall maintain one (1) clean, complete undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Update As-built Drawings on a monthly basis coincident with the submittal of the Application for Payment.

1. Mark record sets with erasable pencil to distinguish between variations in separate categories of the Work.
2. Mark all new information that is not shown on Contract Drawings.
3. Note related change-order numbers where applicable.
4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
5. Upon completion of the work, the Construction Manager shall submit Record Drawings to the Owner's Representative for the Owner's Records who will pass them on to the Architect or Engineer for transferring the changes to the Record Drawing Mylar Tracings.
6. Submit electronic format data of all Coordination Drawings as required by the Owner, at no additional cost.
7. Refer to Section 01 45 00 "Quality Control - CMR", Article 1.3 for required as-built drawings and specifications for fire alarm systems.

C. **Record Specifications:** The Construction Manager shall maintain one (1) complete copy of the Project Manual, including Addenda. Include with the Project Manual one (1) copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.

1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
2. Give particular attention to equals and substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
3. Note related record drawing information and Product Data.
4. Upon completion of the Work, submit Record Specifications to the Owner's Representative for the Owner's records.

D. **Record Product Data:** The Construction Manager shall maintain one (1) copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.

1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
3. Upon completion of markup, submit complete set of Record Product Data to the Owner's Representative for the Owner's records.

E. **Record Sample Submitted:** Immediately prior to Substantial Completion, the Construction Manager shall meet with the Owner's Representative, Architect and the Owner's personnel at the Project Site to determine which Samples are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding delivery to the Owner's Sample storage area.

F. **Miscellaneous Record Submittals:** Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Owner's Representative for the Owner's records.

G. **Maintenance Manuals:** Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch, 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder according to Division 01 Section 01 78 23 "Operation & Maintenance Data - CMR". Included but not limited to the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn-around" cycles.
6. Inspection procedures.

7. Shop Drawings and Product Data.
8. Fixture lamping schedule.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. **Operation and Maintenance Instructions:** Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Startup.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.2 FINAL CLEANING

A. **General:** The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 01 Section 01 50 00 "Temporary Facilities and Controls - CMR."

B. **Cleaning:** Employ professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion and Certification of Occupancy.
2. Interior:
   a. Remove labels that are not permanent labels.
   b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Remove paint spots; wash and polish glass.

c. Clean exposed interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

d. Wash washable surfaces of mechanical, electrical equipment and fixtures and replace filters, clean strainers on mechanical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

e. Clean and polish finish hardware.

f. Clean and polish tile and other glazed surfaces.

g. Clean floors; wax and buff resilient tile. Clean vinyl or rubber base.

h. Vacuum and/or dust walls, ceilings, lighting fixtures, ceiling diffusers and other wall and ceiling items.

i. Remove defacements, streaks, fingerprints and erection marks.

3. Exterior:

a. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth, even-textured surface.

b. Clean exposed exterior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances.

c. Clean roofs, gutters and downspouts.

d. Remove waste and surplus materials, rubbish and construction equipment and facilities from the site, and deposit it legally elsewhere.

e. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Remove paint spots; wash and polish glass.

C. **Pest Control:** Engage an experienced, licensed exterminator to make a final inspection and rid the work of rodents, insects, and other pests. Provide results of final inspection in writing.

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 bury 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 lawfully.

1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner's Representative and DPW PM.

2. Leave building clean and ready for occupancy. If the Construction Manager fails to clean up, the Owner may do so, with the cost charged to the Construction Manager. The Owner will issue a credit change order to cover the costs.

END OF SECTION 01 77 00 - CMR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for operation and maintenance manuals, including the following:

1. Preparing and submitting operation and maintenance manuals for building operating systems and equipment.
2. Preparing and submitting instruction manuals covering the care, preservation, and maintenance of architectural products and finishes.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 33 00 "Submittal Procedures - CMR" specifies preparation of Shop Drawings and Product Data.
2. Division 01 Section 01 75 00 "Starting and Adjusting - CMR" specifies instruction of the Owner and Agency operating personnel in the operation and maintenance of building systems and equipment and the general requirements for starting-up equipment and systems.
3. Division 01 Section 01 77 00 "Closeout Procedures - CMR" specifies general closeout requirements.
4. Division 01 Section 01 78 30 "Warranties and Bonds - CMR" specifies requirements for submittal of warranties and bonds.
5. Appropriate Sections of Divisions 02 through 49 specify special operation and maintenance data requirements for specific pieces of equipment or building operating systems.

1.3 QUALITY ASSURANCE

A. Maintenance Manual Preparation: In preparation of maintenance manuals, use personnel thoroughly trained and experienced in operation and maintenance of equipment or system involved.

1. Where maintenance manuals require written instructions, use personnel skilled in technical writing where necessary for communication of essential data.
2. Where maintenance manuals require drawings or diagrams, use draftsmen capable of preparing drawings clearly in an understandable format.
3. **Instructions for the Owner and Agency Personnel:** The Construction Manager must use experienced instructors thoroughly trained and experienced in operation and maintenance of equipment or system involved, to instruct the Owner's operation and maintenance personnel.
4. **Commissioning (Cx) Coordination:** The Commissioning process requires detailed O&M documentation. The Construction Manager must submit O&M manuals to the Owner's Representative for review and approval by Commissioning Agent (CxA).

1.4 SUBMITTALS

A. Submittal Schedule: Comply with the following schedule for submitting operation and maintenance manuals:

1. Before Substantial Completion, when each installation that requires operation and maintenance manuals is nominally complete, submit four (4) draft copies of each manual to the Owner's Representative, Commissioning Agent (CxA), Agency Representative, and Architect for review. Include a complete index or table of contents of each manual.
   a. The Owner's Representative will return one (1) copy of the draft with comments within twenty - one (21) calendar days of receipt.
   b. Submit four (4) copies of data in final form at least twenty-one (21) calendar days before final inspection. The Owner's Representative will return one (1) copy within twenty-one (21) calendar after final inspection, with comments.
2. After final inspection, make corrections or modifications to comply with the Commissioning Agent's (CxA), Architect's, and Agency Representative's comments. Submit final copies to the Owner's Representative within twenty-one (21) calendar days of receipt of the Commissioning Agent's (CxA), Architect's, and Agency Representative's comments.

B. **Form of Submittal:** Prepare operation and maintenance manuals in the form of an instructional manual for use by the Owner's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder.
1. **Binders:** For each manual, provide heavy-duty, commercial-quality, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2-by-11- inch paper. Provide a clear plastic sleeve on the spine to hold labels describing contents. Provide pockets in the covers to receive folded sheets.
   a. Where two (2) or more binders are necessary to accommodate data, correlate data in each binder into related groupings according to the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.
   b. Identify each binder on front and spine, with the printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter covered. Indicate volume number for multiple volume sets of manuals.
2. **Dividers:** Provide heavy paper dividers with celluloid-covered tabs for each separate section. Mark each tab to indicate contents. Provide a typed description of the product and major parts of equipment included in the section on each divider.
3. **Protective Plastic Jackets:** Provide protective, transparent, plastic jackets designed to enclose diagnostic software for computerized electronic equipment.
4. **Text Material:** Where maintenance manuals require written material, use the manufacturer's standard printed material. If manufacturer's standard printed material is not available, provide specially prepared data, neatly typewritten, on 8-1/2-by-11-inch, 20-lb/sq ft white bond paper.
5. **Drawings:** Where maintenance manuals require drawings or diagrams, provide reinforced, punched binder tabs on drawings and bind in with text.
   a. Where oversize drawings are necessary, fold drawings to the same size as text pages and use as a foldout.
   b. If drawings are too large to be used practically as a foldout, place the drawing, neatly folded, in front or rear pocket of binder. Insert a typewritten page indicating drawing title, description of contents, and drawing location at the appropriate location in the manual.

1.5 MANUAL CONTENT

A. In each manual include information specified in the individual Specification Section and the following information for each major component of building equipment and its controls:
1. General system or equipment description.
2. Design factors and assumptions.
3. Copies of applicable shop drawings and product data.

4. System or equipment identification, including:
   a. Name of manufacturer.
   b. Model number.
   c. Serial number of each component.
5. Operating instructions.
6. Emergency instructions.
7. Wiring diagrams.
8. Inspection and test procedures.
9. Maintenance procedures and schedules.
10. Precautions against improper use and maintenance.
11. Copies of warranties.
12. Repair instructions including spare parts listing.
13. Sources of required maintenance materials and related services.
14. Manual index.

B. Organize each manual into separate sections for each piece of related equipment. As a minimum, each manual shall contain a title page; a table of contents; copies of product data, supplemented by drawings and written text; and copies of each warranty, bond, and service contract issued.

1. Title Page: Provide a title page in a transparent, plastic envelope as the first sheet of each manual. Provide the following information:
   a. Subject matter covered by the manual.
   b. Name and address of the Project.
   c. Date of submittal.
   d. Name, address, and telephone number of the Construction Manager.
   e. Name and address of the Architect and Owner's Representative.
   f. Cross-reference to related systems in other operation and maintenance manuals.

2. Table of Contents: After title page, include a typewritten table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.
   a. Where a system requires more than one volume to accommodate data, provide a comprehensive table of contents for all volumes in each volume of the set.

3. Provide a general information section immediately following table of contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the subcontractor or Installer and the maintenance subcontractor. Clearly delineate the extent of responsibility of each of these entities. Include a local source for replacement parts and equipment.

4. Product Data: Where the manuals include manufacturer's standard printed data, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where the Project includes more than one (1) item in a tabular format, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation, and delete references to information that is not applicable.

5. Written Text: Prepare written text to provide necessary information where manufacturer's standard printed data is not available, and the information is necessary for proper operation and maintenance of equipment or systems. Prepare written text where it is necessary to

provide additional information or to supplement data included in the manual. Organize text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operation or maintenance procedure.

6. **Drawings:** Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems or to provide control or flow diagrams. Coordinate these drawings with information contained in project record drawings to assure correct illustration of the completed installation.
   a. Do not use original Record Documents as part of operation and maintenance manuals.
7. **Warranties and/or Bonds:** Provide a copy of each warranty and/or bond in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to follow in the event of product failure. List circumstances and conditions that would affect validity of warranty or bond.

1.6 MATERIAL AND FINISHES MAINTENANCE MANUAL

A. Submit four (4) copies of each manual, in final form, on material and finishes to the Owner's Representative for distribution. Provide one (1) section for architectural products, including applied materials and finishes. Provide a second section for products designed for moisture protection and products exposed to the weather.
   1. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.

B. **Architectural Products:** Provide manufacturer's data and instructions on care and maintenance of architectural products, including applied materials and finishes.
   1. **Manufacturer's Data:** Provide complete information on architectural products, including the following, as applicable:
      a. Manufacturer's catalog number.
      b. Size.
      c. Material composition.
      d. Color.
      e. Texture.
      f. Reordering information for specially manufactured products.
   2. **Care and Maintenance Instructions:** Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information on cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.

C. **Moisture Protection and Products Exposed to the Weather:** Provide complete manufacturer's data with instructions on inspection, maintenance, and repair of products exposed to the weather or designed for moisture-protection purposes.
   1. **Manufacturer's Data:** Provide manufacturer's data giving detailed information, including the following, as applicable:
      a. Applicable standards.
      b. Chemical composition.
      c. Installation details.
      d. Inspection procedures.
      e. Maintenance information.
      f. Repair procedures.

1.7 EQUIPMENT AND SYSTEMS MAINTENANCE MANUAL

A. Submit four (4) copies of each manual, in final form, on equipment and systems to the Owner's Representative for distribution. Provide separate manuals for each unit of equipment, each operating system, and each electric and electronic system.

1. Refer to individual Specification Sections for additional requirements on operation and maintenance of the various pieces of equipment and operating systems.

B. Equipment and Systems: Provide the following information for each piece of equipment, each building operating system, and each electric or electronic system.

1. Description: Provide a complete description of each unit and related component parts, including the following:

a. Equipment or system function.

b. Operating characteristics.

c. Limiting conditions.

d. Performance curves.

e. Engineering data and tests.

f. Complete nomenclature and number of replacement parts.

2. Manufacturer's Information: For each manufacturer of a component part or piece of equipment, provide the following:

a. Printed operation and maintenance instructions.

b. Assembly drawings and diagrams required for maintenance.

c. List of items recommended to be stocked as spare parts.

3. Maintenance Procedures: Provide information detailing essential maintenance procedures, including the following:

4. Operating Procedures: Provide information on equipment and system operating procedures, including the following:

a. Startup procedures.

b. Equipment or system break-in.

c. Routine and normal operating instructions.

d. Regulation and control procedures.

e. Instructions on stopping.

f. Shutdown and emergency instructions.

g. Summer and winter operating instructions.

h. Required sequences for electric or electronic systems.

i. Special operating instructions.

5. Servicing Schedule: Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.

6. Controls: Provide a description of the sequence of operation and as-installed control diagrams by the control manufacturer for systems requiring controls.

7. Identification Drawings: Provide each Subcontractor's Identification Drawings.

a. Provide as-installed, color-coded, piping diagrams, where required for identification.

8. Valve Tags: Provide charts of valve-tag numbers, with the location and function of each valve.

9. Circuit Directories: For electric and electronic systems, provide complete circuit directories of panel boards, including the following:

a. Controls.

b. Communication.

C. **Electronic Media:**

1. For equipment which requires maintenance by operational personnel, provide a professionally developed DVD for the use of maintenance training for the facility. Each DVD will be accompanied by a written index which can be utilized to find any specific item of information by time or place on the DVD.
2. The Construction Manager is responsible for this production. This DVD will be provided to the Owner's Representative at the same time as the delivery of the other maintenance material.
3. The DVD must be able to be edited for future changes to the equipment and modifications as they occur.

1.8 COMMISSIONING RECORD AND TESTING DATA MANUAL

The CMR shall cooperate with Commissioning Agent (CxA) in the preparation of a separate Manual dedicated to documenting the Commissioning process which will include all certifications and testing data and some repeating of O&M data. Description of this Manual is found in Section 01 91 00 Commissioning – CMR and shall be prepared by the Commissioning Agent (CxA).

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 78 23 - CMR

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Construction Manager's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 01 Section 01 33 00 "Submittal Procedures - CMR" specifies procedures for submitting warranties.

2. Division 01 Section 01 77 00 "Closeout Procedures - CMR" specifies contract closeout procedures.

3. Division 01 Section 01 78 23 "Operation and Maintenance Data- CMR" specifies required operation and maintenance data.

4. Divisions 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

5. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Construction Manager of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Construction Manager.

1.3 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

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 the Contract Documents. The Construction Manager 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: Expressed 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. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. **Rejection of Warranties:** The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Construction Manager presents evidence that entities required to countersign such commitments are willing to do so.

F. The Construction Manager shall guarantee all materials and workmanship for a period of 18 months from the date of Substantial Completion of the Work. In addition, the Construction Manager shall furnish the warranties listed below. Submit four (4) copies of each to the Owner's Representative in the supplier's standard form or in the form given below if there is no standard form available.

1. Section 033000, Floor hardener: 5-year, material and workmanship.
2. Section 075323, Single-Ply Membrane Roofing, Base Flashing and Insulation: 20-year unlimited, materials and installation.
3. Section 074243, Composite Wall Panels: 2-year against rupture, cracks or perforation due to corrosion. Also, 20-year finish against peeling, blistering, fading and chalking as limited by industry standards.
4. Section 077200, Roof Hatches: 5-year product and installation, including weathertightness.
5. Section 079200, Exterior - Interior caulking and sealants: 5-year, material and workmanship.
6. Section 076200, Metal Flashing and Sheet Metal: 3-year, material and workmanship, 20-year on finish.
7. Section 081416, Solid Wood Core and Mineral Core doors: Lifetime for interior doors.
8. Section 083323, Overhead Doors (coiling or sectional): 5-year material and workmanship.
9. Section 084523, Fiberglass-Sandwich-Panel Assemblies: 5-year installation, including weathertightness, and 10-year panel warrantee.
10. Section 086200, Unit Skylights: 5-year material and workmanship, including weathertightness.
11. Section 087100, Closers, Locksets, Exit Bolts: Longest term offered by manufacturer for grade/class of particular item, material and workmanship.
12. Section 088000, Insulating glass: 10-year against failure of hermetic seal, interpane dusting or misting including replacement of unit.
13. Section 085113, Windows: 5-year material and workmanship including weathertightness, 10-year finish warrantee.
14. Section 084113 and Section 084426, Storefront/Curtain Wall: 5-year material and workmanship (insulating glass separate). Air and water infiltration and strength to specified AAMA designation. 10-year finish warrantee.
15. Section 096816, Carpet: 10-year wear and color fastness; 3-year installation.
16. Section 101463, Electronic Message Signage: 5-year material and workmanship.
17. Section 102226.13, Accordion Folding Partitions: 2-year material and workmanship.
18. Section 102800 and Section 088300, Mirrors; 15-years against silver spoilage.
19. Section 142400, Elevators: Material workmanship, installation for 18 months.
20. Section 220533, Electric Heating Cable: 10-years, material and installation.
21. Section 231113.2, Fuel Storage Tank: 30-years, material and installation.
22. Sections 221519, 236326, and 238126, Compressors and Pumps: 5-years, material and installation.
23. Section 265561, Dimming Controls: 8-years, material and installation.
24. Section 262413 and 262416, Switchboards and Panelboards: 5-years, material and installation.
25. Section 263213, Engine Generators: 10-years, material and installation.
26. Section 265100, Emergency Lighting Batteries: 10-years, material and installation.
27. Section 265100, Lighting Ballasts: 5-years, material and installation.
28. Section 329200 and 329300, Plant Material, Turf and Grasses: 12-months, material, installation, and growth.
29. Section 072600, Surface Applied Vapor Reduction Systems: Repair/replace flooring systems that fail due to vapor transmission for 5-years.

G. Submit certification that finish materials are fire rated as specified.

H. Form of Guarantees and Warranties:

Commissioner
Department of Public Works
165 Capitol Avenue
Hartford, Connecticut 06106
(Project Title and Number)

I (We) hereby guarantee and warranty)

the _____ work on the referenced project for a period of _____ years

from _____, 20___ against failures of workmanship and materials in accordance

with the requirements of Section ____, Page ____, Paragraph ____, of the Specifications.

Signed _____

Construction Manager's _____
(or authorized agent)

I. Bonds shall be by approved Surety Companies, made out to the Commissioner, Department of Public Works, on company's standard form.

J. Guarantees, warranties or bonds supplied by Subcontractors, Suppliers or Manufacturers shall reference the project name, number, and location and be certified by the Construction Manager to be for the product and installation on the project and must be countersigned by the Construction Manager.

1.4 SUBMITTALS

A. Submit written warranties prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

B. Forms for special warranties are included in this Section. Prepare a written document utilizing the appropriate form, ready for execution by the Construction Manager, or by the, subcontractor, supplier, or manufacturer. Submit a draft to the Owner, through the Owner's Representative, for approval prior to final execution.

1. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Form of Submittal: At Final Completion compile two (2) copies of each required warranty properly executed by the Construction Manager, or by the subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Construction Manager.
3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not applicable)

END OF SECTION 01 78 30 - CMR

PART 1 – GENERAL COMMISSIONING REQUIREMENTS

1.1 RELATED DOCUMENTS

A. Construction Documents and general provisions of the CMR Agreement Between Owner and Construction Manager and the Guaranteed Maximum Price (GMP) Amendment, including Division 00 General Conditions of the Contract for Construction – CMR and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes equipment and system commissioning, including the following:

1. Completion of commissioning procedures on specific equipment and systems as indicated under "Related Sections" below.
2. Functional testing will include the list of equipment shown in Section 1.11. Contractors shall include initial testing for all phases of the project. See contract phasing drawings for sequencing. The intent of this specification is to include all work necessary to test the equipment installed under each phase including but not limited to revisiting equipment installed under previous phases serving any and all future phases.
3. Verification of operational and functional performance of specific equipment and systems for compliance with the "Design Intent" as described in the "Related Sections" indicated below.
4. The Commissioning Authority (CxA) is not responsible for construction means, methods, job safety or any management function on the job site.

B. **Related Sections**: The following Sections contain requirements that relate to this Section:

1. Section 01 31 00 Project Management And Coordination - CMR specifies procedures for coordinating the Commissioning Process.
2. Division 01 Section 01 33 00 "Submittal Procedures - CMR" specifies procedures for submittal of Product Data and Quality Assurance Submittals.
3. Division 01 Section 01 77 00 "Closeout Procedures- CMR" specifies general closeout requirements.
4. Division 21 Section 21 08 00 "Commissioning of Fire Suppression" specifies closeout and/or commissioning related requirements for specific pieces of equipment or building operating systems.
5. Division 22 Section 22 08 00 "Commissioning of Plumbing" specifies closeout and/or commissioning related requirements for specific pieces of equipment or building operating systems.
6. Division 23 Section 23 08 00 "Commissioning of HVAC" specifies closeout and/or commissioning related requirements for specific pieces of equipment or building operating systems.
7. Division 25 Section 25 08 00 "Commissioning of Integrated Automation" specifies closeout and/or commissioning related requirements for specific pieces of equipment or building operating systems.
8. Division 26 Section 26 08 00 "Commissioning of Electrical Systems" specifies closeout and/or commissioning related requirements for specific pieces of equipment or building operating systems.
9. Division 27 Section 27 08 00 "Commissioning of Communications" specifies closeout and/or commissioning related requirements for specific pieces of equipment or building operating systems.

1.3 DEFINITIONS

A. **Basis of Design (BOD):** A document that records the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

B. **Commissioning Agent (CxA):** An entity identified by the Owner who leads, plans, schedules, and coordinates the commissioning team to implement the Commissioning Process.

C. **Commissioning (Cx) Plan:** A plan that includes a list of all equipment to be commissioned, delineation of roles for each of the primary commissioning participants, and details on the scope, timeline, and deliverables throughout the commissioning process."

C. **Deficiencies and Resolutions List:** List of noted deficiencies discovered as result of commissioning process.

E. **Final Commissioning Report:** Overall final commissioning document (see 1.6, I(2) below), prepared by the Commissioning Agent, which details the actual commissioning procedures performed, inspection and testing results, and the final version of the deficiencies and resolutions list indicating that all issues discovered through the commissioning process have been verified as resolved.

F. **Functional Completion:** Functional Completion is when all remaining TAB (Testing, Adjusting, Balancing) and commissioning responsibilities of the CMR and their subcontractor's (except for seasonal or approved deferred testing and controls training), have been functionally certified as complete by the Owner's Commissioning Authority (CxA) and the Certificate of Functional Completion has been issued.

G. **Functional Performance Testing Process:** Documented testing of system parameters, under actual or simulated operating conditions. Functional testing is the dynamic testing of systems (rather than just components).

H. **Pre-Commissioning Checklists:** Installation and start-up items to be completed by the appropriate party prior to operational verification through Functional Testing.

I. **Physical Inspection Process:** On-site inspection and review of related system components for conformance to the specifications.

J. **Seasonal Commissioning Tests:** Functional Tests that are deferred until the system(s) will experience conditions closer to their intended design conditions.

K. **Trending:** Monitoring using the building control system.

1.4 COORDINATION

A. **Commissioning Team:** The members of the commissioning team consist of the Commissioning Agent (CxA), the DPW Project Manager (PM), the Owner's Representative (OR), Construction Manager at Risk (CMR), , the Architect and Design engineers (particularly the mechanical engineer), the Mechanical Subcontractor, the Electrical Subcontractor, the TAB representative, the Controls Subcontractor, any other installing subcontractors or suppliers of equipment. If known, the Agency's building or plant operator/engineer is also a member of the Commissioning team.

B. **Management:** The CxA is hired by the Owner. The CxA directs and coordinates the commissioning activities and the reports to the OR. All members of the Commissioning Team work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents. Refer to Section 01 91 00 Part 1.4 and 1.5 for additional management details.

C. **Scheduling.** The CxA will work with the OR and CMR according to established protocols to schedule the commissioning activities. The CxA will provide sufficient notice to the OR and CMR for scheduling commissioning activities. The CMR will integrate all commissioning activities into their master CPM schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1. The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The Commissioning Plan—Construction Phase provides a format for this schedule. As construction progresses more detailed schedules are developed by the CxA. The Commissioning Plan also provides a format for detailed schedules.

1.5 DESCRIPTION OF CONSTRUCTION PHASE COMMISSIONING PROCESS

A. As soon as practicable after the "Contract Start Date" the Commissioning Agent (CxA) will conduct a pre-installation commissioning "kick-off" meeting with the Construction Manager's subcontractors. Parties directly affected by the commissioning work will be required to attend. The CxA will explain the commissioning process in detail, and identify specific commissioning related responsibilities of the various parties.

B. Commissioning status meetings will be scheduled to occur during construction to monitor progress and to help facilitate the commissioning process. Construction Manager's subcontractor's representatives will be required to attend these meetings.

C. Once Construction Manager's subcontractors have provided the CxA with written verification indicating completion of installation and startup procedures, the CxA will conduct an on-site physical inspection of the specific systems and equipment.

D. Upon confirmation of system readiness, the CxA will schedule with the Construction Manager's subcontractors to perform functional compliance with the project specifications and drawings. The CxA will oversee the process and will provide the format and documentation for these tests.

E. Deficiencies noted during these tests will be documented on the Deficiencies and Resolutions list. When corrected, issues will be resolved at the time of discovery. The responsible Construction Manager's subcontractor will resolve all other issues at a later date. All deficiencies will be noted by the CxA as either resolved or pending resolution.

F. The construction commissioning process will be complete when all noted deficiencies have been corrected, proved to be compliance with the project specifications or otherwise resolved to the satisfaction of the Owner and when the CxA has issued the Certificate of Functional Completion

1.6 COMMISSIONING AGENT'S DUTIES AND RESPONSIBILITIES

A. Meet and communicate with the Owner's representatives, CMR, subcontractors, equipment manufacturers' representatives, Architect, Engineer and others as needed, to facilitate the commissioning process.

B. Review commissioning related specifications, submittals and construction documents. Communicate noted deficiencies and concerns to the Owner, Architect and Engineer.

C. Develop detailed and specific Functional Testing procedures for equipment and systems to be commissioned.

D. Develop testing, adjusting and balancing (TAB) specifications. Oversee the TAB process.

E. Perform site inspections and verify Construction Manager's subcontractor readiness for the Functional Testing process. Document deficiencies for future resolution.

F. Witness Construction Manager's subcontractor performed Functional Testing process as appropriate to verify Construction Manager's subcontractor compliance with the functional testing procedures. Document deficiencies for future resolution.

G. Provide the Owner, CMR, Architect, and Engineer with a Final Commissioning Report to document the commissioning process and to verify that the commissioning process is complete.

H. Verify that CMR O&M documentation is complete.

1.7 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:

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.

B. Construction Checklists: CxA shall develop construction checklists for each system to be commissioned including interfaces 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.

C. Witness systems, assemblies, equipment, and component startup.

D. 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.

E. 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.

F. 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.

G. 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.

H. 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: 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.
2. BVH Commissioning Portal: The CxA Commissioning Portal is an on-line tracking database developed by BVH Integrated Services. The portal is used by the Commissioning Authority to track issues and assign responsibility for corrective action. All members of the Design/Construction/Commissioning Team will be given access to the Commissioning Portal as required to respond to issues or deficiencies. Open issues will be sorted by the individual trades. Once the Contractor / subcontractor have made any necessary corrections they will update their specific issues on line for re-verification by the commissioning provider.

I. COMMISSIONING RECORD FOR O&M MANUALS

1. The CxA is responsible to compile, organize and index the following commissioning data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to the CMR, to be included with the O&M manuals. Three copies of the manuals will be provided. The format of the manuals shall be:
   1.1 Tab I-1: Commissioning Plan;
   1.2 Tab I-2: Final Commissioning Report (see (2) below)
   1.3 Tab 01: System Type 1 (chiller system, packaged unit, boiler system, etc.);
      1.3.1 Sub-Tab A: Design narrative and criteria, sequences, approvals for equipment in System Type 1;
      1.3.2 Sub-Tab B: Startup plan and report, approvals, corrections, blank Precommissioning Checklists;
         .1 Colored Separator Sheets—for each equipment type (fans, pumps, chiller, etc.);
      1.3.3 Sub-Tab C: Functional tests (completed), trending and analysis, approvals and corrections, training plan, record and approvals, blank functional test forms and a recommended recommissioning schedule.
   1.4 Tab 02: System Type 2.....repeat as per above requirements for System 1.

2. **Final Report Commissioning Report Details.** The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the commissioning authority regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas:
   2.1 Equipment meeting the equipment specifications;
   2.2 Equipment installation,
   2.3 Functional performance and efficiency;

2.4 Equipment documentation and design intent; and

2.5 Operator training. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

2.6 Post-Occupancy Commissioning (Cx) Report:

A Post-Occupancy Commissioning (Cx) Report shall be prepared by the Commissioning Agent (CxA) and [submitted to the DPW PM for review and approval. The approved Report shall be submitted by the State Agency that is responsible for the ongoing care, operation, and maintenance of the building to the CT OPM Secretary and the CT DPW Commissioner within one hundred eighty (180) days after one year of occupancy Date of DPW Acceptance of the Work. The Report shall include results of any post-occupancy survey of building occupants, a description of any adjustments made to equipment or building operation and the reasons for which the changes were made, and one year of all energy usage by source and water usage.

3. Other documentation will be retained by the CxA.

1.8 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. Indicate initial setpoints, reset schedules, sensor locations, etc.

1.9 DUTIES AND RESPONSIBILITIES OF OTHERS FOR COMMISSIONING

A. The commissioning process will require the active participation of persons qualified to represent the Owner, Mechanical Engineer, Electrical Engineer, Construction Manager, Equipment Manufacturers' Representatives, Mechanical Subcontractor, HVAC Subcontractor, Controls Subcontractor, TAB Subcontractor, Electrical Subcontractor, and other specific subcontractors, as deemed appropriate. The CxA will witness the final functional performance commissioning process. Participants shall include in their contracts all costs necessary to participate in and complete the commissioning process.

B. Contractor 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:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. 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.
3. 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.
4. Provide CxA with copies of all approved change orders or other modifications impacting construction when approved.
5. Participate in construction phase coordination meetings.
6. Participate in commissioning inspections.
7. Ensure accurate completion of construction checkout documents for all systems to be commissioned prior to verification site visits by the CxA.
8. Certify readiness of systems to be commissioned prior to functional performance testing.
9. Participate in functional performance testing of systems to be commissioned.
10. 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.
11. Participate in operation and maintenance planning and verification.
12. Participate in operation and maintenance training sessions.
13. Participate in final review at acceptance meeting.
14. Certify the work is complete and systems are operational according to the contract documents, including calibration of controls and any instrumentation.
15. Coordinate subcontractor commissioning activities.
16. Review and approve final commissioning documentation.

C. 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:

    3.1 Schedule as mentioned above
    3.2 Equipment submittals
    3.3 Installation manual submittals
    3.4 Operation and maintenance information submittals

4. Complete construction checkout documents for all systems to be commissioned.
5. Maintain updated Project Record Documents for periodic review by the CxA and submit final record documents at project completion.
6. Certify readiness of systems to be commissioned prior to functional performance testing.
7. Participate in functional performance testing of systems to be commissioned.
8. Participate in test procedures meeting.
9. 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.
10. Participate in operation and maintenance planning, documentation and verification.

11. 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.
12. Participate in training sessions for Owner's operation and maintenance personnel.
13. Participate in final review at acceptance meeting.

D. Operation and Maintenance Manuals

1. The Contractor shall develop the Operation and Maintenance manuals in accordance with the requirements indicated in Divisions 1, 13, 15 and 16.
2. All submittal information indicated in item 1.8A 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

E. The CMR will assure the participation and co-operation of the subcontractors, as required to complete the commissioning process.

F. The Owner will assure the participation of their chosen representatives as required to complete the commissioning process.

G. The Architect will assure the participation of necessary representatives from the Design Team as required to complete the commissioning process. Design team members will provide prompt replies to requests for information issued during the commissioning process.

H. It is the CMR's specific responsibility to complete their respective start-up and checkout procedures, and to insure the complete readiness of equipment and systems, prior to the start of the functional performance testing phase. The CxA shall request written confirmation of system readiness for performance testing, from the appropriate Construction Manager's subcontractor. Once the CxA is provided with confirmation of all related systems completion, the actual date and times for the functional performance testing process will be confirmed. CMR's subcontractor shall provide sufficient time, and qualified representatives, to complete this process at no additional cost to the State.

I. After a second failure of a system to successfully meet the criteria as set forth in the functional performance testing process, the CMR shall reimburse the Owner for all costs associated with any additional re-testing efforts made necessary due to remaining Construction Manager related system deficiencies previously reported by the CMR as corrected. These costs shall also include the costs (where applicable) for the CxA.

G. Training on related systems and equipment operation and maintenance shall only be scheduled to commence after final performance commissioning is satisfactorily completed, and systems are verified to be 100 percent complete and functional.

1.10 SUBMITTALS

A. Refer to Section 01 33 00 Submittal Procedures – CMR.

B. **Pre-Commissioning Checklist Forms:** Submit two signed copies of the checklist forms to the CxA upon completion of all listed items.

C. **Equipment Manufacturer's Startup Forms:** Submit two completed copies of the installation and startup checklists provided by the equipment manufacturers to the CxA.

D. **Test Reports:** Submit two copies of test reports for equipment and systems to the CxA.

E. **Control Schematics:** Submit two copies of the control schematics for equipment, systems, and subsystems to the CxA.

F. **Inspection Records:** Submit two copies of the records of inspections for code compliance, and approved permits and licenses to operate the equipment and systems to the CxA.

G. **Operating Data:** Submit two copies of equipment and system operating data including all necessary instructions to facilitate operation to specified performance standards to the Owner.

H. **Maintenance Data:** Submit two copies of equipment and system maintenance data including all necessary information required to maintain the equipment and systems in continuous operation, such as the testing, balancing and adjusting report and the as-built drawings.

1.11 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned where applicable in this project.

1. Hot Water Heating System: Includes any and all of the following equipment: heating pumps, heating coils, all hot water boilers, hydronic specialties, hydronic balancing, variable frequency drives, controls, valves, unit heaters, cabinet unit heaters and radiation.
2. Cooling System: Includes any and all of the following equipment: Chillers, chilled water pumps, hydronic specialties, hydronic balancing, variable frequency drives, valves, and controls associated with the cooling systems.
3. Air Handling Systems: Includes any and all of the following equipment: As a minimum, all of the air-handling units, roof-top units, heating and ventilation units and energy recovery systems will be thoroughly checked for proper operation and control. The units will be verified for their operation as heating, cooling, heat recovery and ventilation systems, including outdoor air economizer. Unit shut down and start-up under normal and emergency power will be verified. All refrigeration (DX systems) split systems will be verified for proper operation.
4. Supply Air Distribution Systems: All of the installed variable air volume boxes, fan coil units, split systems and associated reheat coils will be tested to provide a thorough evaluation of their operation; all variables will be covered by exposure, occupancy, and critical and sound sensitive areas.
5. Exhaust Fans: All of the general exhaust fans including lab hoods and dust collectors will be verified for proper operation and their interaction with total building air balance.
6. All Direct Digital Controls (DDC) shall be verified for proper operation as they relate to the above equipment including interfaces for remote monitoring. All security and system interlocks associated with the control system shall be commissioned.
7. Spot checking of air and water balancing readings including total building space pressurization.
8. All of the emergency lighting, generator and emergency power transfer switches shall be verified for proper operation and control. Lighting levels shall be recorded and any deficiencies reported.
9. Automatic Lighting Control Systems
10. Occupancy Sensors
11. Fire Alarm System as it interacts with HVAC equipment.

1.12 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 contract documents and the Certificates of Readiness are signed and submitted.
2. Certify that instrumentation and controls associated with the systems to be commissioned have been completed and calibrated and are operating according to 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:

    10.1 Supply and return flow rated for variable flow and constant volume systems in each operational mode, including maximum and minimum flow capacity.
    10.2 Operation of terminal units in both heating and cooling cycles.
    10.3 Minimum outdoor air intake in each operational mode and at minimum and maximum airflows.
    10.4 Building pressurization.
    10.5 Total exhaust airflows and total outdoor air intake.
    10.6 Operation of indoor air quality monitoring systems.

11. Verify proper responses of monitoring and control systems controllers and sensors to include the following:

    11.1 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.
    11.2 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

1.13 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:

   1.1 Mounting and support of equipment.
   1.2 Noise, vibration, air and water leaks.
   1.3 Air filtration, presence and operation of dampers, diffusers, grilles, fire dampers and access doors.
   1.4 Presence of thermostats and other adjustable temperature control devices.
   1.5 Presence of smoke sensors and other safety devices.
   1.6 Instrumentation, gauges, thermometers and flow measuring devices.
   1.7 Access to equipment and filters.
   1.8 Insulation of ductwork is complete.
   1.9 Ductwork is sealed.
   1.10 Power available to equipment.
   1.11 Temperature controls are complete.

      1) Air and water balancing is complete and a hand written report available.

2. Heating and Cooling Systems Equipment and Piping:

   2.1 Service access is acceptable.
   2.2 Proper cycling.
   2.3 Excessive noise, vibration or leaks.
   2.4 Presence of safety devices and controls.
   2.5 Proper identification of all piping, valves, starters and equipment.
   2.6 Pressure testing and flushing of systems.
   2.7 Power available to equipment.
   2.8 Temperature controls are complete.
   2.9 Equipment start-up and checkout by the manufacturer's representatives are complete.
   2.10 Air and water balancing is complete and a hand written report available.

3. Plumbing Systems and Equipment:

   3.1 Service access is acceptable.
   3.2 Proper cycling.
   3.3 Excessive noise, vibration or leaks.
   3.4 Presence of safety devices and controls.
   3.5 Proper identification of all piping, valves, starters and equipment.
   3.6 Pressure testing and flushing of systems.
   3.7 Power available to equipment.
   3.8 Equipment start-up and checkout by the manufacturer's representatives are complete.

4. Fire Protection System and Equipment:

   4.1 Service access is acceptable.
   4.2 Proper identification of all piping, valves, and equipment.
   4.3 Pressure testing and flushing of systems.
   4.4 Power available to equipment.
   4.5 All documentation required by NFPA has been completed
   4.6 All switches and alarm devices have been wired and communicating with the fire alarm system.

5. Building Electrical System and Equipment:

5.1 Service access is acceptable to generator and transfer switches.
5.2 Proper cycling.
5.3 Excessive noise, vibration or leaks.
5.4 Presence of safety devices and controls.
5.5 Proper identification of all starters, switches and equipment.
5.6 Power available to equipment.
5.7 Equipment start-up and checkout by the manufacturer's representatives are complete.
5.8 Fire alarm system is complete and all devices are communicating with the fire alarm master panel.
5.9 All emergency lighting is in place and power is complete.

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. Sensor Calibration:

1. Calibration of all sensors shall be included as part of the construction checklists performed by the Contractors.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 91 00 - CMR

PART 1 GENERAL

1.1 APPLICABLE PUBLICATIONS

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

UNITED STATES ARMY CORPS OF ENGINEERS (COE)

EM-385-1-1 Safety and Health Requirements Manual

ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846 Test Methods for Evaluating Solid Waste, Current Edition.

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR Part 761 Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

REGULATION OF CONNECTICUT STATE AGENCIES

Sections 22a-133k-1 through 22a-133k-3, inclusive, Remediation Standard

1.2 DESCRIPTION

The project SITE encompasses sections of the H.C. Wilcox Technical High School (Wilcox Tech) located at 298 Oregon Road in Meriden, Connecticut. The SITE, which is part of the Connecticut Technical High School System, is owned by the Connecticut Department of Education (CT DOE). The Connecticut Department of Public Works (DPW) is conducting site remediation tasks at this facility prior to the performance of various site renovation and demolition activities.

Remedial action at the SITE includes excavation and off-site disposal of soil adjacent to the buildings with total PCB concentrations $\geq$1 mg/kg contaminated by PCB containing caulk and/or glazing classified as a PCB Bulk Product Waste.

This section includes requirements for excavating and handling PCB contaminated soil from the proposed surface soil remediation areas as shown on the Contract Drawings and described in the PCB Site Remedial Plan.

1.3 DEFINITIONS

1.3.1 Contaminant Zones

Contaminant zones are those areas of active excavation and the waste storage area.

1.3.2 Excavation

The removal of soil, rock, or hard material to obtain a specified depth or elevation.

1.3.3 PCB Bulk Product Wastes

PCB bulk product waste means waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration where the concentration at the time of designation for disposal was ≥50 ppm PCBs.

1.3.4 PCB Remediation Waste with ≥50 ppm PCBs

PCB remediation waste means waste containing PCBs as a result of a spill, release, or other unauthorized disposal, at concentrations ≥ 50 ppm PCBs, regardless of the concentration of the original spill.

1.3.5 PCB Remediation Waste with <50 ppm PCBs

PCB remediation waste means waste containing PCBs as a result of a spill, release, or other unauthorized disposal which are currently at any concentration if the PCBs are spilled or released from a source not authorized for use under this part.

1.3.6 PCB Site Remedial Plan

"Self-Implementing Cleanup Plan, H.C. Wilcox Technical High School", Prepared by TRC, June 2010.

1.3.7 PCB Engineer

To be retained by the Owner, responsible for overseeing excavation work and for performing and evaluating verification sample data.

1.3.8 Owner

The Owner is the Connecticut Department of Public Works and shall be responsible for the Contract and the performance of all the work.

1.3.9 Remedial Action Level

Concentration to which PCB contaminated soil must be removed to verify completion of excavation work.

1.3.10 Soil

The loose surface material of the earth's crust resulting from the chemical and mechanical weathering of rock and organic material.

1.3.11 Suitable Waste Storage Container

A container in which soil is placed for storage prior to transport offsite for disposal that is water tight, lined, and equipped with a cover that prevents the infiltration of rainwater into the container.

1.3.12 Excavated Soil Stockpile

An area where excavated soil is placed following excavation and prior to loading into a waste storage container. At no time will the Contractor create and excavated soil stockpile. All excavated soil is to be placed directly into a suitable waste storage container.

1.3.13 Verification Sampling

Sampling performed to determine the completion of excavation activities as per Subpart O of 40 CFR Part 761.

1.3.14 Waste Storage Area

The secured location in which the Contractor shall store soil prior to offsite transport for disposal. The Contractor shall consult with the Owner and the PCB Engineer to identify the location of Waste Storage Areas prior to generating any wastes. This area shall be secured and signed by the Contractor.

1.4 SUBMITTALS

Prior to performing the excavation work, the Contractor shall submit:

1.4.1 Key Personnel

The Contractor shall submit a list of the key personnel of the Contractor and subcontractors (including addresses and telephone numbers) for use in the event of an emergency. As changes occur and additional information becomes available, the

Contractor shall correct and change the information contained in previous lists. The Contractor's Representative shall be identified on this list.

1.4.2 Waste Characterization Analytical Data, Waste Profiles, and Disposal Approval

The Contractor shall submit all waste characterization analytical data and waste profiles prior to submittal to any proposed waste disposal facility. The Contractor shall submit all Disposal Approvals a minimum of seven (7) days prior to performing excavation work.

1.4.3 Equipment Decontamination Plan

The Contractor shall submit a decontamination plan for all materials and equipment that shall contact PCB Remediation Wastes and that are to be removed from the site following the completion of work. The decontamination plan shall conform to the requirements of §761.79(c). The Contractor shall submit proof of decontamination to the PCB Engineer as required.

1.5 REGULATORY REQUIREMENTS

All soil is to be handled and stored in accordance with the provision of 40 CFR Part 761 Subpart D. The Contractor shall be responsible for all costs associated with investigation and remediation of any releases due to their failure to handle excavated soil in accordance with the regulatory requirements.

1.6 DELIVERY AND STORAGE

The Contractor shall deliver and store materials in a manner to prevent contamination, segregation, freezing, and other damage.

1.7 MEASUREMENT AND PAYMENT

The Contractor's cost proposal shall be based on the following criteria:

a. Measurement for payment shall be based on mass computation using the tonnage recorded by the waste disposal facility on the completed and signed manifests for each

b. No extra payment shall be made for removal of standing water, fencing, decontamination, run-on/run-off controls, dust control, site preparation, site restoration or waste disposal areas. The cost for these items shall be included in the base bid.

1.8 PROTECTION

1.8.1 Utility Location

The Contractor shall contact Connecticut's Call Before You Dig for underground utility markouts in accordance with applicable regulations, and provide a confirmation number for DPW's records. The Contractor shall verify the location of all utilities shown on the Contract Drawings or identified during utility mark-outs.

Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. The Contractor shall perform all work adjacent to utilities as indicated in accordance with procedures outlined by utility company. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, use hand or light equipment excavation. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation as required. The Contractor shall report damage to utility lines or subsurface construction immediately to the PCB Engineer. The Contractor shall be responsible for the repair of all damaged utilities that were previously shown on Contract Drawings or identified during utility mark-outs.

1.8.2 Overhead Utilities

If excavation or backfilling equipment (excavator arms, lifts, dump truck beds, etc.) at the site can potentially come within a 15 foot radius of the overhead electrical lines, a dedicated spotter must be used for each such piece of equipment. The spotter must be in continuous radio and line of sight communication with the equipment operator and be capable of immediately stopping the equipment operation if any portion of the equipment is in danger of penetrating the 15 foot radius overhead electrical line safety zone. The spotter shall be an experienced and qualified equipment operator.

1.8.3 Structures and Surfaces

The Contractor shall protect adjacent structures and surfaces from traffic, erosion settlement, or any other damage. The Contractor shall repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance.

PART 2 PRODUCTS - NONE

PART 3 EXECUTION

3.1 SITE PREPARATION

Prior to performing soil excavations, the Contractor shall secure the excavation area with temporary fencing. The Contractor may move temporary fencing sections to allow for work progress while actively working in an excavation area. However, if no work is actively being performed in an excavation area the temporary fencing will be reinstalled.

3.1.1 Excavation Layout

The Contractor shall mark the limits of proposed initial excavations of contaminated soils prior to performing any excavations. The limits of the excavations shall correspond to those shown on the Contract Drawings.

3.1.2 Sedimentation, Erosion and Run-On Controls

The Contractor shall install in accordance with Section 02112, "Erosion and Sediment Control" and the Contract Drawings.

3.1.3 Waste Storage Areas

If the Contractor chooses to store soil onsite prior to transport offsite for disposal, the Contractor shall construct a secured Waste Storage Area at a location agreed to by the Contractor and the PCB Engineer within contract limit lines. The contract limit lines are to be secured as described elsewhere in these specifications and entry shall be limited to Contractor Personnel only. The Waste Storage Area shall enclose all Suitable Waste Storage Containers actively in use with temporary fencing. The fence shall be marked with a Large M_L mark as specified in 40 CFR Part 761 Subpart C.

3.1.4 Waste Storage

The Contractor shall not store waste onsite in a Suitable Waste Container for a period of more than 30 days. The start of the period of waste storage for each container will start on the day in which wastes are first loaded into a container and will terminate when the container is transported offsite.

The Contractor shall store waste onsite in Suitable Waste Containers. No stockpiling shall be allowed and the Contractor shall be responsible for all costs associated with investigation and remediation of any areas contaminated due to the failure of the Contractor to comply with waste storage requirements.

3.1.5 Decontamination

The Contractor shall decontaminate all moveable equipment that contact PCB Remediation Wastes in accordance with the procedures specified in §761.79(c). The Contractor shall not remove any equipment from the Contaminant Zone until it has been properly decontaminated.

Specifically, the Contractor shall employ double wash/rinse procedures as specified in 40 CFR Part 761 Subpart S or swab non-porous surfaces that have contacted PCB wastes with a solvent as specified in §761.79(c)(2)(i). The Contractor shall segregate all liquid waste streams and be responsible for characterizing these wastes for disposal purposes. Solid wastes generated during decontamination shall be stored for disposal with the other PCB wastes generated during remediation activities.

The PCB Engineer shall be responsible for ensuring that decontamination procedures are followed and that wastes are appropriately characterized and disposed of properly.

3.2 SURFACE PREPARATION

3.2.1 Clearing and Grubbing

Clearing is not required for any of the excavation areas as this will be performed by others. Limited grubbing is required in the excavation to be performed on the northwest side of the A-Wing as there are some roots in place within the excavation area.

The soil removed from any root structure that has been grubbed from an excavation area must remain in the excavation or be placed directly into a Suitable Waste Container. Unless suitably decontaminated and tested as clean, all roots grubbed from an area must be considered to be PCB Remediation Wastes.

3.3 EXCAVATION AND HANDLING OF CONTAMINATED SOILS

3.3.1 Contaminant Zone Operations

Construction equipment such as excavators, front end loaders, dozers and hauling vehicles, used within a Contaminant Zone that have contacted PCB Remediation Wastes shall not be permitted to move outside of the area until they have been properly decontaminated.

All soil within the excavations shall be assumed to be PCB Remediation Wastes <50 ppm unless the Contractor is otherwise instructed by the PCB Engineer. All waste handling and storage procedures, equipment decontamination procedures, and other Contaminant Zone Operations shall conform to the requirements of 40 CFR Part 761 Subpart D.

3.3.2 Dust Control

The Contractor shall utilize an adjacent fire hydrant and appropriate hose for dust control. Water shall be applied to keep fugitive dust under control as needed and as directed by the PCB Engineer. Water will be provided by the DPW from an approved fire hydrant or other suitable source at no extra charge to the Contractor.

3.3.3 Excavation

Excavation shall be shallow and performed in lift intervals no greater than one foot unless otherwise approved by the PCB Engineer. Excavation areas shall be clearly marked with stakes and labels.

Excavation equipment shall be smooth edge blade without ripping teeth. Excavation shall be carried out in such a manner so as to minimize the mixing of soils to underlying soils. No ripping, plowing, harrowing or mixing of soils shall be permitted. Only excavation equipment that provides precise depth control will be permitted. No crane mounted clamshell or dragline excavators will be allowed.

Excavation shall be carried out so as to remove contaminated soils from the edge farthest away from the edge where hauling vehicles will approach the Contaminant Zone. Contaminated soils shall not be moved over areas excavated and tested as below action levels and ready for backfilling, unless hauling vehicles move across the clean area to the edge of the Contaminant Zone. Excavation equipment shall not overfill their buckets so as to allow spillage of soil across other contaminated or clean areas. The loose or excess soil shall be removed from the bucket within the active excavation area prior to moving the soil to the hauling vehicles. The Contractor shall be solely responsible for the cost of excavating, handling, storage, testing and disposal of soils that were previously clean and have tested as contaminated due to deficient Contractor operation practices and methods.

3.3.4 Personal Protective Equipment

The Contractor shall assume that all personnel working within a contaminant zone shall be required to be equipped with Personal Protective Equipment (PPE). The Contractor's health and safety officer will be responsible for determining the appropriate level of personal protection. That determination must be evaluated by a certified industrial hygienist and shall be based on actual laboratory data and monitoring from site operations. All personnel shall be required to go through an approved decontamination procedure. All personal protective garments shall be containerized and not reused after removal. The personal protective garments shall be disposed of as contaminated waste in an approved manner.

3.3.5 Remedial Action Levels

The remedial action level for PCB contaminated soil shall be <1.0 mg/kg as specified in the Regulations of Connecticut State Agencies Sections 22a-133k-1 through 22a-133k-3, inclusive, and the High Occupancy Standard without further restrictions in §761.61(a)(4) of 40 CFR Part 761.

3.8 EXCAVATION COMPLETION

Each excavation shall be considered complete after sufficient verification samples have been collected and analyzed and determined to meet remedial action levels. Verification samples shall be collected and analytical data reviewed by the PCB Engineer.

Following the completion of an excavation, the Contractor shall decontaminate their equipment as required and remove from the area. The Contractor may remove temporary security fencing if the excavation is deemed by the PCB Engineer not to be a site hazard.

END OF SECTION

PART 1: GENERAL

1.1 SCOPE

A. Work under this item shall include activities impacting various materials containing or covered by lead paint and associated work by persons who are knowledgeable, qualified, and trained in the removal, treatment and handling of lead contaminated materials, including the transportation and disposal of non-hazardous and hazardous lead construction and demolition bulky waste containing or contaminated with lead, the recycling of metallic components covered with lead paint, and the subsequent cleaning of the affected environment. Lead paint includes paint found to contain **any** detectable amount of lead by Atomic Absorption Spectrophotometry (AAS) or X-Ray Fluorescence (XRF).

B. All activities shall be performed in accordance with, but not limited to, the current revision of the OSHA Lead in Construction Regulations (29 CFR 1926.62), the USEPA RCRA Hazardous Waste Regulations (40 CFR Parts 260 through 274), and the CTDEP Hazardous Waste Regulations (22a-209-1 and 22a-449(c).

C. The lead paint activity shall include the demolition/renovation, removal and/or disposal of building components coated with lead painted surfaces as identified on the Contract Plans and Specifications.

D. Deviations from these Specifications require the written approval of the Engineer.

1.2 DESCRIPTION OF WORK

A. The following details the extent of each phase of operation designated for this project. Phase areas may be combined or divided at the direction of the Engineer. Proceed through the sequencing of the work phases under the direction of the Engineer.

Non-metallic Components To Be Impacted

➢ LBP has been identified on various non-metallic components throughout the building including cement ceiling in C-wing, wood windows and door frames in C-wing and B-wing, chalkboard in C-wing, wood stair stringer in A-wing south stairwell, glazed concrete block in A-wing, C-wing, B-wing and Boiler Room Corridor. All renovation/demolition work specified in other areas of these Specifications impacting those materials shall be conducted within an established lead control (regulated) area with a remote handwash facility/decontamination system in accordance with OSHA Lead in Construction Standards. Engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the work area and limit the generation of airborne lead. Lead painted debris generated from the renovation/demolition of those materials, shall be containerized and stored on-site with the remainder of the non-metallic

building waste materials. The Engineer will conduct TCLP testing or mass balance calculations on a representative sample of the stored waste materials to determine if the materials shall be disposed of as hazardous or non-hazardous construction waste. Should the waste material be determined to be hazardous, it shall be handled and disposed of in accordance with USEPA/CTDEP Hazardous Waste Regulations.

Metal Components To Be Impacted

➢ LBP has been identified on various metal interior components throughout the building including door lintels, ceilings, columns, corner supports and I-beams. All renovation/demolition work specified in other areas of these Specifications impacting those materials shall be conducted within an established lead control (regulated) area with a remote handwash facility/decontamination system in accordance with OSHA Lead in Construction Standards. Engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the work area and limit the generation of airborne lead. Lead painted debris generated from the renovation/demolition of those materials, shall be containerized and stored on-site with the remainder of the non-metallic building waste materials. All steel and metal generated from the renovation/demolition of the building shall be segregated and recycled as scrap metal at an approved facility. The recycling of scrap metal (regardless of LBP concentration) is exempt from USEPA RCRA and CTDEP Hazardous Waste Regulation.

Surface Preparations

➢ Contractor shall be responsible for any surface preparation required in areas where repainting or refinishing is specified. Surface preparation techniques such as sanding, sandblasting, scraping, powerwashing, etc. which are utilized on surfaces coated with lead paint must be conducted in accordance with the OSHA worker protection and USEPA RCRA/CTDEP waste disposal standards. All work shall be conducted within an established lead control (regulated) area with a remote handwash facility/decontamination system. Engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the work area and limit the generation of airborne lead. Lead painted debris generated from the renovation/demolition of those materials, shall be containerized and stored on-site with the remainder of the non-metallic building waste materials. The Engineer will conduct TCLP testing or mass balance calculations on a representative sample of the stored waste materials to determine if the materials shall be disposed of as hazardous or non-hazardous construction waste. Should the waste material be determined to be hazardous, it shall be handled and disposed of in accordance with USEPA/CTDEP Hazardous Waste Regulations. If the waste material is determined to be non-hazardous, it shall be

disposed of as non-hazardous construction and demolition (C&D) bulky waste at an approved CTDEP Solid Waste landfill.

B. Segregate all steel and metal components generated from the renovation/demolition of the buildings, regardless of lead content, for recycling as scrap metal. Recycling of lead painted metal is exempt from regulation by the USEPA and CTDEP as hazardous waste.

C. Waste characterization sampling (TCLP)/mass balance calculations for leachable lead have not been previously performed by the Engineer on the non-metallic waste building material debris expected to be generated during the renovation/demolition. The Contractor shall segregate and containerize those materials for TCLP testing/mass balance calculations by the Engineer. Based on the results of the sampling/calculations the materials may be characterized as hazardous waste, and if so, must be handled in accordance with CTDEP and USEPA RCRA regulations.

D. The Contractor shall conduct exposure assessments for the tasks required which impact lead paint in accordance with OSHA 29 CFR 1926.62(d) and shall implement appropriate personal protective equipment until negative exposure assessments are developed.

1.3 SUBMITTALS AND NOTICES

A. Prior to the start of **any** work that will generate hazardous lead waste above conditionally exempt small quantities, the Contractor shall obtain from the Engineer/CTDEP a temporary EPA Hazardous Waste Generators ID, unless otherwise directed by the Engineer.

B. Provide a copy of the USEPA permits for disposal and transport of hazardous lead bearing waste for each proposed hauler/disposal facility. A licensed hazardous waste transporter and a licensed hazardous waste treatment/disposal facility shall be secured in conformance with all federal and state regulations and be approved by the Engineer.

C. Fifteen (15) working days prior to beginning work that impacts lead paint, the Contractor shall submit the following to the Engineer:

1. For projects when the intent is to mitigate lead hazards and provide lead-safe conditions for building occupants, a valid CTDPH Lead Abatement Contractor License and copies of employee certifications/licenses as CTDPH Lead Abatement Supervisors or Workers.

2. Copies of all employee certificates, dated within the previous twelve (12) months, relating to OSHA lead awareness and hazard communication training and training in the use of lead-safe work practices.

3. Documentation dated within the previous twelve (12) months, from a physician certifying that all employees who may be exposed to lead in excess of the background level have been provided with an opportunity to be medically monitored to determine whether they are physically capable of working while wearing the respirator required without suffering adverse health affects. In addition, document that personnel have received medical monitoring required in 29 CFR 1926.62. They shall also be informed of the specific types of respirators the employee shall be required to wear and the work he/she will be required to perform as well as special workplace conditions such as high temperature, high humidity and chemical contaminants to which he/she may be exposed. A copy of the medical records of each employee shall be available on the job-site.

4. Documentation dated within the previous six (6) months, of biological monitoring including initial blood lead level and zinc protoporphyrin level test results prior to the workers first entry into the Work Areas.

    a. Workers with blood lead levels in excess of fifty (50) micrograms/deciliter will not be permitted in the Regulated Area. The Contractor shall follow management of employee's blood lead levels in accordance with OSHA 29 CFR 1926.62.

    b. The Contractor shall submit semi-annual blood lead level and zinc protoporphyrin level test documentation to the Engineer for all workers that enter the Regulated Area for projects in excess of six (6) months in duration.

5. Documentation dated within the previous twelve (12) months, of respiratory fit testing for all employees who must don a tight-fitting face piece respirator in order to perform activities impacting lead. This fit testing shall be in accordance with qualitative procedures as detailed in 29 CFR 1910.134.

6. An exposure assessment for each specific lead job which will be performed during the course of this project. The data must meet the requirements of OSHA 29 CFR 1926.62. If data from prior lead project(s) is submitted (i.e. a negative exposure assessment), the following information is required:

    a. Date of project
    b. Description of monitoring, analysis and work operations and practices
    c. Type of activity conducted, concentration and application of lead
    d. Engineering controls
    e. Experience of workers and supervisors

7. Project time schedule for each phase of work.

8. Copies of state-approved certificates for the proposed non-hazardous construction and demolition (C&D) lead debris disposal facility and any concrete/wood or scrap metal recycling facilities.

9. The name and qualifications of the individual acting as the Competent Person for the duration of project activities impacting lead. This individual shall act as the Contractor's OSHA Competent Person during activities impacting lead, shall have a minimum of three years working experience performing activities that impact lead paint, shall be capable of identifying existing lead hazards and shall have the authority to implement corrective measures to eliminate such hazards. The Competent Person shall be on-site at all times during activities impacting lead, shall comply with applicable Federal, State and Local regulations which mandate work practices, and shall be capable of performing the work of this contract. No other individual shall later be substituted as Competent Person without prior approval by the Engineer.

D. No activity shall commence until a copy of all required submittals have been received and found acceptable to the Engineer. Those employees added to the Contractor's original list will be allowed to perform work only upon submittal of all required paperwork to, and review by, the Engineer.

E. Provide the Engineer, within thirty (30) days of completion of the project site work, a compliance package; which shall include, but not be limited to, the following:

1. Copies of the abatement contractor's license (if applicable);
2. Worker licenses, training certificates, medical clearance and respiratory fit testing documentation;
3. Competent persons (supervisor) job log;
4. OSHA-compliant personnel air sampling data and exposure assessments;
5. Completed waste shipment papers for non-hazardous lead construction and demolition (C&D) bulky waste and/or concrete/wood/scrap metal recycling
6. Completed certified hazardous waste manifests for hazardous lead debris.

PART 2: PRODUCTS

2.1 MATERIALS

A. All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description.

B. No damaged or deteriorating materials shall be used. If material becomes contaminated with lead, the material shall be decontaminated or disposed of as lead-containing waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

C. Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating four (4) or six (6) mil thickness.

D. Six (6) mil polyethylene disposable bags shall have pre-printed OSHA/EPA/DOT labels and shall be transparent.

E. Tape (or equivalent) capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

F. The cleaning agent detergent shall be lead specific, such as TriSodium Phosphate (TSP).

G. Any chemical stripper and chemical neutralizer to be utilized shall be compatible with the substrate as well as with each other.

H. Labels and warning signs shall conform to OSHA 29 CFR 1926.62, USEPA 40 CFR 260 through 274 and USDOT 49 CFR 172 as appropriate.

I. Any planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable federal, state and local regulations.

J. Air filtration devices and vacuum units shall be equipped with HEPA filters.

2.2 TOOLS AND EQUIPMENT

A. The Contractor shall provide tools and equipment that are suitable for lead paint related activity:

1. Air monitoring equipment of the type and quantity required to monitor operations and conduct personnel exposure surveillance in accordance with OSHA requirements.

2. Electrical equipment, protective devices and power cables shall conform to all applicable codes.

3. Where lead exposures are above the OSHA Action Level or PEL, the Contractor shall provide wash facilities/shower stalls and plumbing that

include sufficient hose length and drain system or an acceptable alternate. One shower stall shall be provided for each eight workers.

4. Where lead exposures are above the OSHA PEL, the Contractor shall provide exhaust air filtration units that are equipped with HEPA filters to provide local exhaust ventilation at the work area to reduce airborne lead emissions.

5. The Contractor shall provide vacuum units of suitable size and capabilities for the project which have HEPA filters capable of trapping and retaining at least 99.97 percent of all monodispersed particles of three micrometers in diameter or larger.

6. The Contractor shall provide ladders and/or scaffolds of adequate length, strength and sufficient quantity to support the work schedule. Scaffolds shall be equipped with safety rails and kick boards in compliance with OSHA requirements.

7. Protective clothing, respirators, and HEPA P100 filter cartridges shall be provided in sufficient quantities for the project.

8. Equipment suitable for building renovation/demolition and proper waste/debris collection/packing/removal, (e.g. excavators, grapples, backhoes, roll-offs, etc.) shall be provided by the Contractor as required.

PART 3: EXECUTION

3.1 GENERAL REQUIREMENTS

A. All employees of the Contractor who perform work impacting lead paint shall be properly trained to perform such duties.

B. All labor, materials, tools, equipment, services, testing, insurance (with specific coverage for work on asbestos), and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations, industry standards and codes, and these Specifications shall be provided by the Contractor. The Contractor shall be prepared to work all shifts and weekends throughout the course of this project.

C. Prior to beginning work, the Engineer and Contractor shall perform a visual survey of each work area and review conditions at the site for safety reasons. In addition, the Contractor shall instruct all workers in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this project.

D. The Contractor shall:

1. Shutdown and isolate heating, cooling, and ventilating air systems to prevent contamination and particulate dispersal to the other areas of the building.

2. Shut down and lock out electrical power, including all receptacles and light fixtures, when feasible. The use or isolation of electrical power will be coordinated with all other ongoing uses of electrical power at the site.

3. Coordinate all power and fire alarm isolation with the appropriate representatives.

4. When necessary, provide temporary power and adequate lighting and ensure safe installation of electrical equipment, including ground fault protection and power cables, in compliance with applicable electrical codes and OSHA requirements. The Contractor is responsible for proper connection and installation of electrical wiring.

E. Ladders and/or scaffolds to be utilized throughout this project shall be in compliance with OSHA requirements, and of adequate length, strength and sufficient quantity to support the scope of work. Use of ladders/scaffolds shall be in conformance with OSHA 29 CFR 1926 Subpart L and X requirements.

F. Work performed at heights exceeding six feet (6') shall be performed in accordance with the OSHA Fall Protection Standard 29 CFR 1926 Subpart M including the use of fall arrest systems as applicable.

G. Electrical service may not be available at the site. Costs for supplying electrical service shall be the responsibility of the Contractor.

H. Water service may not be available at the site. The Contractor shall supply sufficient water for each shift to operate the wash facility/decontamination shower units in addition to the water needed at the work area.

I. Data for random lead testing conducted on surfaces throughout the buildings as well as hazardous waste characterization results are available from the Engineer for informational purposes only. Under no circumstances shall this information be the sole means used by the Contractor for determining the extent of lead painted materials. The Contractor shall be responsible for verification of all field conditions affecting performance of the work as described in these Specifications in accordance with OSHA, USEPA, USDOT and CTDEP standards. Compliance with the applicable requirements is solely the responsibility of the Contractor.

J. Activity impacting lead painted surfaces shall be performed in a manner which minimizes the spread of lead dust contamination and generation of airborne lead.

K. The Engineer will provide a Project Monitor to oversee the activities of the Contractor. No activity impacting lead paint shall be performed until the Project Monitor is on-site. Environmental sampling, including ambient air sampling, TCLP waste stream sampling and/or dust wipe sampling, shall be conducted throughout the project as deemed necessary.

3.2 ESTABLISHMENT OF REGULATED WORK AREAS

The Contractor shall prepare a Regulated Area as follows:

A. In all areas where airborne exposures may exceed the OSHA PEL, post warning signs meeting the requirements of OSHA 29 CFR 1926.62 at each regulated area.

B. In addition, signs shall be posted at all approaches to regulated areas so that an employee may read the sign and take the necessary protective steps before entering the area. These signs shall read:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

C. Establish a Regulated Area, through the use of appropriate barrier tape, etc. and control unauthorized access into the area throughout the lead paint related activity.

D. Implement appropriate engineering controls such as critical barriers, poly drop cloths, negative pressure, local exhaust ventilation, wet dust suppression methods, etc. to prevent the spread of lead contamination from the Regulated Area.

E. For exterior work areas, the Contractor shall use a High Efficiency Particulate Air (HEPA) filtered vacuum dust collection system to remove any visible existing paint chips from the ground to a distance of 20' out from the base of the exterior surface scheduled for lead paint activity prior to commencement of work and extend a 6 mil polyethylene sheet drop cloth on the ground adjacent to the exterior surface scheduled for lead paint activity to contain debris/contamination.

3.3 WORKER DECONTAMINATION AREAS

A. The Contractor shall provide handwash facilities in compliance with 29 CFR 1926.51(f) and 29 CFR 1926.62 regardless of airborne lead exposure. This wash facility will consist, at least, of potable water, towels, soap, and a HEPA vacuum.

B. If air monitoring data by the Contractor or Project Monitor shows that employee exposure to airborne lead exceeds the OSHA PEL (50 $\mu g/m^3$), shower rooms must be utilized. The Shower Room shall be of sufficient capacity to accommodate the number of workers. One shower stall shall be provided for each eight (8) workers. Showers shall be equipped with hot and cold or warm running water through the use of electric hot water heaters supplied by the Contractor. Shower water shall be collected and filtered using best available technology and dumped down an approved sanitary drain. Shower stalls and plumbing shall include sufficient hose length and drain system or an acceptable alternate.

3.4 PERSONNEL PROTECTION

A. Exposure Assessments: The Contractor shall initially determine if any employee performing construction tasks impacting lead paint may be exposed to lead at or above the OSHA Action Level of 30 micrograms per cubic meter (30 $\mu g/m^3$). Assessments shall be based on initial air monitoring results as well as other relevant information. The Contractor may rely on historical air monitoring data obtained within the past 12 months under workplace conditions closely resembling the process, type of material, control methods, work practices and environmental conditions used and prevailing in the Contractors current operations to satisfy the exposure assessment requirements. Monitoring shall continue as specified in the OSHA standard until a negative exposure assessment is developed.

B. Until a negative exposure assessment is developed for the required tasks impacting lead paint, the Contractor shall ensure that all workers and authorized person entering the Regulated Area wear protective clothing and respirators in accordance with OSHA 29 CFR 1926.62. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings. Sufficient quantities shall be provided to last throughout the duration of the project.

C. Protective clothing provided by the Contractor and used during chemical removal operations shall be impervious to caustic materials. Gloves provided by the Contractor and used during chemical removal shall be of neoprene composition with glove extenders.

D. Respiratory protective equipment shall be provided and selection shall conform to 30 CFR Part 11, 29 CFR Part 1910.134, and 29 CFR Part 1926.62. A formal respiratory protection program must be implemented in accordance with 29 CFR Part 1926.62 and Part 1910.134.

3.5 LEAD PAINT ACTIVITY PROCEDURES

A. Ensure that the Competent Person is on the job at all times.

B. Do not begin abatement work until authorized by the Engineer, following a pre-abatement visual inspection by the Project Monitor.

C. The Contractor shall ensure proper entry and exit procedures for workers and authorized persons who enter and leave the Regulated Area. All workers and authorized persons shall leave the Regulated Area and proceed directly to the wash or shower facilities where they will HEPA vacuum gross debris from work suit, remove and dispose of work suit, wash and dry face and hands, and vacuum clothes. Do not remove lead chips or dust by blowing or shaking of clothing. Wash water shall be collected, filtered, and disposed of in accordance with federal, state and local water discharge standards.

D. No one shall eat, drink, smoke, chew gum or tobacco, or apply cosmetics while in the Regulated Area.

E. Utilize appropriate engineering controls (e.g. wet methods) as directed by 29 CFR 1926.62 to control lead emissions and contamination.

F. Properly contain wastes containing lead paint for appropriate transport/disposal.

G. Stop all work in the regulated area and take steps to decontaminate non-work areas and eliminate causes of such contamination should lead contamination be discovered in areas outside of the regulated area.

H. Special Requirements:

1. Demolition/Renovation:

    a. Demolish/renovate in a manner which minimizes the spread of lead contamination and generation of lead dust.

    b. Implement dust suppression controls, such as misters, local exhausts ventilation, etc. to minimize the generation of airborne lead dust.

    c. Segregate work areas from non-work areas through the use or barrier tape, poly criticals, etc.

    d. Clean up immediately after renovation/demolition has been completed

2. Chemical Removal:

    a. Apply chemical stripper in quantities and for durations specified by manufacturer.

b. Scrape lead paint from surface down to bare substrate with no trace of residual pigment. Use sanding, hand scraping, and dental picks to supplement chemical methods as required to remove residual pigment.

c. Apply neutralizer compatible with substrate and chemical agent to substrate following removal in accordance with manufacturer's instructions.

d. Protect adjacent surfaces from damage from chemical removal.

e. Maintain a portable eyewash station in the work area.

f. Wear respirators that will protect workers from chemical vapors.

g. Do not apply caustic agents to aluminum surfaces.

3. Paint Stabilization/Liquid Encapsulation:

a. Remove surface dust, dirt, mildew, scale, rust or other debris by scrubbing with detergent (lead-specific detergent solution) and rinsing. Remove loose paint using wet scraping methods until a sound surface is achieved. Remove unsound substrate not firmly adhered and repair with an appropriate patching material.

b. Remove and reinstall or protect electrical receptacles, hardware, and wall mounted objects from being painted-over by encapsulant. Protect adjacent finishes from paint splatter or other damage.

c. Apply encapsulant in a continuous coat. Number of coats is as specified in the manufacturer's instructions for application. Encapsulant shall be approved by the CTDPH for use. Use encapsulants only on substrates and locations approved for use in the manufacturers instructions.

d. Do not use new coats of paint or primer, wall paper cover and contact paper as encapsulants.

e. Do not apply encapsulants to friction or impact surfaces.

f. Prior to application of encapsulants, perform the tape, X-cut tape and patch tests in accordance with the CTDPH guidance document information on Applying Liquid Encapsulants to Interior Surfaces for Property Owners and Lead Professionals to determine if the surface is suitable for encapsulation.

4. Mechanical Paint Removal:

   a. Provide sanders, grinders, rotary wire brushes, or needle gun removers equipped with a HEPA filtered vacuum dust collection system. Cowling on the dust collection system for orbital-type tools must be capable of maintaining a continuous tight seal with the surface being abated. Cowling on the dust collection system for reciprocating-type tools shall promote an effective vacuum flow of loosened dust and debris. Inflexible cowlings may be used on flat surfaces only. Flexible contoured cowlings are required for curved or irregular surfaces.

   b. Provide HEPA vacuums that are high performance designed to provide maximum static lift and maximum vacuum system flow at the actual operating vacuum condition with the shroud in use. The HEPA vacuum shall be equipped with a pivoting vacuum head.

   c. Remove all lead paint from surface down to bare substrate with no trace of residual pigment. Use chemical methods, hand scraping, and dental picks to supplement abrasive removal methods as required to remove residual pigment.

   d. Protect adjacent surfaces from damage from abrasive removal techniques.

   e. "Sandblasting" type removal techniques should be performed within full containment negative pressure enclosures.

5. Component Removal/Replacement:

   a. Wet down components which are to be removed to reduce the amount of dust generated during the removal process.

   b. Remove components utilizing hand tools, and follow appropriate safety procedures during removal. Remove the building components by approved methods which will provide the least disturbance to the substrate material. Do not damage adjacent surfaces.

   c. Clean up immediately after component removals have been completed. Remove any dust located behind the component removed.

3.6 PROHIBITED REMOVAL METHODS

A. The use of heat guns in excess of 700 degrees Fahrenheit to remove lead paint is prohibited.

B. The use of sand, steel grit, water, air, CO_2, baking soda, or any other blasting media to remove lead or lead paint without the use of a HEPA ventilated contained negative pressure enclosure is prohibited.

C. Power tool assisted grinding, sanding, cutting, or wire brushing of lead paint without the use of cowled HEPA vacuum dust collection systems is prohibited.

D. Lead paint burning, busting of rivets painted with lead paint, welding of materials painted with lead paint, and torch cutting of materials painted with lead paint is prohibited. Where cutting, welding, busting, or torch cutting of materials is required, pre-remove the lead paint in the area affected.

E. Use of chemical strippers containing Methylene Chloride is prohibited.

F. Compressed air shall not be utilized to remove lead paint.

3.7 AIR MONITORING REQUIREMENTS

A. The Contractor shall:

1. Provide air monitoring equipment including sample filter cassettes of the type and quantity required to properly monitor operations and personnel exposure surveillance throughout the duration of the project.

2. Conduct initial exposure monitoring to determine if any employee performing construction tasks impacting lead paint may be exposed to lead at or above the OSHA Action Level of 30 micrograms per cubic meter. Monitoring shall continue as specified in the OSHA standard until a negative exposure assessment is developed.

3. Conduct personnel exposure assessment air sampling, as necessary, to assure that workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.62. Documentation of air sampling results must be recorded at the work site within twenty-four (24) hours and shall be available for review until the job is complete.

B. The Project Monitor will:

1. Collect air samples in accordance with the current revision of the NIOSH 7082 or 7702 Method of Air Sampling for Airborne Lead while overseeing the activities of the Contractor. Frequency and duration of the air sampling during abatement will be representative of the actual conditions at the site. The size and configuration of the project will be a factor in the number of samples required to monitor the activities and shall be determined by the Project Monitor.

C. As determined by AAS, XRF, or equivalent analysis, if air samples collected outside of the Regulated Area during abatement activities indicate airborne lead concentrations greater than original background levels or greater than 30 ug/m^3, whichever is larger, an examination of the Regulated Area perimeter shall be conducted and the integrity of barriers shall be restored. Cleanup of surfaces outside the Regulated Area using HEPA vacuum equipment or wet cleaning techniques shall be done prior to resuming abatement activities.

D. Abatement outside the initial designated work area(s) will not be paid for by the Engineer. The Contractor will be responsible for all costs incurred from these abatement activities.

3.8 CLEAN-UP AND VISUAL INSPECTION

A. Remove and containerize all lead waste material and visible accumulations of debris, paint chips and associated items.

B. During clean up the Contractor shall utilize rags and sponges wetted with lead-specific detergent and water as well as HEPA filtered vacuum equipment.

C. The Engineer will conduct a visual inspection of the work areas in order to document that all surfaces have been maintained as free as practicable of accumulations of lead in accordance with OSHA 29 CFR 1926.62(h). If visible accumulations of waste, debris, lead paint chips or dust are found in the work area, the Contractor shall repeat the cleaning, at the Contractor's expense, until the area is in compliance. The visual inspection will detect incomplete work, damage caused by the abatement activity, and inadequate clean up of the work site.

D. Dust wipe clearance testing, in accordance with CTDPH/USEPA/HUD protocols, will also be performed by the Engineer <u>if so detailed in the Scope of Work; Construction Methods – Lead Abatement Provisions – Lead Abatement Procedures.</u> If lead dust wipe levels are above CTDPH/EPA/HUD clearance criteria, the Contractor shall re-clean the work area and retesting shall be conducted at the Contractors expense. The testing and cleaning sequence shall be repeated until the clearance criteria levels have been achieved.

3.9 POST ABATEMENT WORK AREA DEREGULATION

A. Following the visual inspection, (and clearance testing if appropriate,) any engineering controls implemented may be removed and the Work Area deregulated.

B. A final visual inspection of the work area shall be conducted by the Competent Person and the Project Monitor to ensure that all visible accumulations of suspect

materials have been removed and that no equipment or materials associated with the abatement project remain.

C. The Contractor shall restore all work areas and auxiliary areas utilized during work to conditions equal to or better than original. Any damage caused during the performance of the work activity shall be repaired by the Contractor at no additional expense to the Engineer.

3.10 NON-HAZARDOUS WASTE DISPOSAL/RECYCLING

A. Non-metallic building debris waste materials tested and found to be non-hazardous Construction and Demolition (C&D) bulky waste shall be disposed of properly at a CTDEP approved Solid Waste landfill.

B. Metallic debris shall be segregated and recycled as scrap metal at an approved metal recycling facility. The Contractor shall submit to the Engineer all documentation necessary to demonstrate the selected recycling facility is able to accept lead-painted scrap metal.

C. Concrete, brick, etc. coated with <u>any amount of lead paint</u> cannot be crushed, recycled or buried on-site to minimize waste disposal. Only CTDEP defined "clean fill" can be recycled on-site or sent to a recycling facility.

3.11 HAZARDOUS LEAD WASTE DISPOSAL

A. If required to dispose of any hazardous waste, the Contractor shall utilize a certified/permitted transporter for hazardous waste in compliance with DOT 49 CFR Part 172 and USEPA 40 CFR 260-274 and a permitted hazardous waste treatment storage disposal facility (TSDF) in compliance with USEPA 40 CFR 260-274.

B. Hazardous lead bearing material must be offered for transportation and transported in compliance with the Code of Federal Regulations, Title 49, Chapter 1, Part 173, Subparts A, B, C, and D and Paragraph 178.118. Transport vehicles (hopper or dump type) must be free from leaks and discharge openings must be securely closed during transportation. All storage containers (roll offs or drums) shall have a protective liner and removable lid. These containers shall not have any indentations or damage that would allow seepage of the contained material.

C. The disposal of hazardous lead bearing material must be in compliance with the requirements of, and authorized by, the Office of Solid Waste Management, Department of Environmental Protection, State of Connecticut, and the USEPA.

D. The disposal of hazardous lead bearing waste shall comply with the requirements of the Resource Conservation and Recovery Act (RCRA).

E. Unless previous waste characterizations have been completed by the Engineer, all generated waste shall be containerized and stored on-site for hazardous waste determination via TCLP testing. TCLP testing and analysis shall be the responsibility of the Engineer.

F. The Contractor shall collect the wash water generated by the worker shower, wash facilities, or steam cleaning operations in 55 gallon drums and filter the water using a 2 stage filtration system composed of:

1. 5 micron porosity in-line cartridge particulate filter followed by:
2. Activated carbon filter in-line cartridge

Hold the filtered water for testing by the Engineer prior to discharge to the sanitary sewer.

G. The dumpsters/containers containing hazardous waste are to be kept covered and locked when not in active use for the loading of materials.

H. All containers of hazardous lead bearing material shall be labeled in accordance with 29 CFR 1926.62 and EPA 40 CFR 260-270.

I. All hazardous lead-bearing waste removed from the site by the Contractor shall be containerized in lined roll-offs or barrels. Store waste materials in U.S. Department of Transportation (49 CFR 178) approved containers. Properly label and placard each container to identify the type of waste (49 CFR 172) and the date the container was filled. The disposal containers shall be labeled with a six inch square, yellow, weatherproof, hazardous waste sticker in accordance with U.S. DOT regulations, by the Contractor.

J. The Contractor may not store containerized hazardous lead waste on the job site for in excess of 90 calendar days from the accumulation start date.

K. When required to dispose of hazardous waste, the Contractor shall utilize a certified/permitted transporter for hazardous waste in compliance with USDOT 49 CFR Part 172 and USEPA 40 CFR 260-274 and a permitted hazardous waste treatment storage disposal facility (TSDF) in compliance with USEPA 40 CFR 260-274.

L. The Contractor shall complete a Uniform Hazardous Waste Manifest, EPA Form 8700-22, and submit to the Engineer for review and generator sign-off prior to each load of hazardous waste scheduled to leave the site. Completed copies of the manifest shall be delivered by the Contractor to the Engineer within 30 calendar days following the date the load leaves the site.

M. When all necessary procedures have been completed, then the hazardous waste shall be shipped to the hazardous waste disposal facility.

N. Any spillage of debris during disposal operation, i.e., loading, transport and unloading, shall be cleaned up in accordance with the Code of Federal Regulations, Title 40, Chapter 1, Part 25, Subparts C and D, at the Contractor's expense.

O. The Contractor is liable for any fines, costs or remediation costs incurred as a result of the failure to be in compliance with this special provision and all federal, state and local laws.

P. Final payment requisitions for the contract will not be processed until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials delivered is returned and a copy is furnished to the Engineer.

END OF SECTION

SECTION 024116 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of buildings.
2. Removing below-grade construction.
3. Disconnecting, capping or sealing, site utilities.

B. Related Sections include the following:

1. Division 01 Section "Summary" for use of the premises and phasing requirements.
2. Division 01 Section "Construction Progress Documentation, Photographic Documentation" for preconstruction photographs taken before building demolition.
3. Division 01 Section "Temporary Facilities and Controls" for temporary construction, protection facilities, and environmental-protection measures for building demolition operations.
4. Division 02 Section "Selective Structure Demolition" for partial demolition of buildings, structures, and site improvements.
5. Division 22 Sections for demolishing or relocating site plumbing items.
6. Division 26 Sections for demolishing or relocating site electrical items.
7. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.

1.3 DEFINITIONS

A. Demolish: Completely remove and legally dispose of off-site.

B. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 SUBMITTALS

A. Proposed Protection Measures: Submit informational report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain.

B. Schedule of Building Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping or re-routing of utility services.

C. Building Demolition Plans: Drawings indicating the following:

1. Locations of temporary protection and means of egress for adjacent occupied buildings.

D. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by building demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before the Work begins.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

C. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 REGULATORY REQUIREMENTS

A. Contractor shall obtain a Demolition Permit form the Town of Meriden, including preparation of Application to Demolish, affidavits, fees, and utility termination documentation required.

B. Contractor shall perform demolition in accordance with sections 29-401-1 to 29-401-5, inclusive of the Regulations of Connecticut State Agencies, known as the State Demolition Code.

1.8 PROJECT CONDITIONS

A. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

B. Owner assumes no responsibility for buildings and structures to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Hazardous Materials: Hazardous materials are present in buildings and structures to be demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

D. On-site storage or sale of removed items or materials is not permitted.

1.9 COORDINATION

A. Arrange demolition schedule so as not to interfere with operations of adjacent occupied buildings.

B. Coordinate demolition with project phasing.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.2 PREPARATION

A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.

B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
   3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.

C. Existing Utilities: Refer to Divisions 22 and 26 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

D. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

   1. Strengthen or add new supports when required during progress of demolition.

3.3 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.

   1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
   2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.

      a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 01 Section "Temporary Facilities and Controls."

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

A. General: Demolish indicated existing buildings completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least 30 minutes after flame cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, completely.

D. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 5 feet outside footprint indicated for new construction.
1. Refer to Division 31 Section "Site Clearing" for utilities outside footprint indicated.

3.6 SITE RESTORATION

A. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.9 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 024116

SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

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. This Section includes the following:

1. Demolition and removal of selected portions of building or structure.
2. Salvage of existing items to be reused or recycled.

B. Related Sections include the following:

1. Division 01 Section "Summary" for use of premises, and phasing, and Owner-occupancy requirements.
2. Division 01 Section "Photographic Documentation" for preconstruction photographs taken before selective demolition operations.
3. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
4. Division 01 Section "Cutting and Patching" for cutting and patching procedures.
5. Division 02 Section "Structure Demolition" for demolition of entire buildings, structures, and site improvements.
6. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to

Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.5 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Locations of proposed dust- and noise-control temporary partitions and means of egress.
6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
7. Means of protection for items to remain and items in path of waste removal from building.

B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

C. Predemolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

1.7 REGULATORY REQUIREMENTS

A. Contractor shall obtain a Demolition Permit form the Town of Meriden, including preparation of Application to Demolish, affidavits, fees, and utility termination documentation required.

B. Contractor shall perform demolition in accordance with sections 29-401-1 to 29-401-5, inclusive of the Regulations of Connecticut State Agencies, known as the State Demolition Code.

1.8 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

1. Comply with requirements specified in Division 01 Section "Summary."

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Materials covered by warrantees include but are not limited to the following:
1. Roofing.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs, preconstruction videotapes, and/or templates.

1. Comply with requirements specified in Division 01 Section "Photographic Documentation."

G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

   a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden

space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations for 30 minutes after operations.

5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.

1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

E. Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Refer to Division 07 Sections "Preparation for Re-Roofing" and "EPDM Membrane Roofing" for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

F. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Coordinate removal and handling of hazardous materials with work included in other sections.

B. Remove various building components containing materials which may be considered hazardous or will require special handling and disposal. An inventory of Miscellaneous Hazardous Materials and a Lead-Based Paint survey are provided as appendices to the Contract Documents. The removal work includes the following materials:
   1. Lead-acid electrolyte batteries.
   2. Mercury.
   3. Ballasts

1.2 DEFINITIONS

A. Spill – Means intentional or unintentional spills, leaks and other uncontrolled discharges when the release results in any quantity of hazardous or universal waste, or petroleum product running off or about to run off the external surface of the equipment or other source as well as the contamination resulting from those releases.

B. Universal Waste – Any of the following hazardous wastes that are managed under the universal waste requirements of 40 CFR 273:
   1. Batteries
   2. Thermostats and Switches

1.3 REFERENCES

A. The current issue of each document shall govern. Where conflict among requirements or with these specifications exists, the more stringent requirements shall apply.
   1. Environmental Protection Agency (EPA)

      40 CFR 260 - Hazardous Waste Management Systems: General.

      40 CFR 261 - Identification and Listing of Hazardous Waste.

      40 CFR 262 - Generators of Hazardous Waste.

      40 CFR 263 - Transporters of Hazardous Waste

      40 CFR 264 - Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 265 - Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 268 - Land Disposal Restrictions

2. State of Connecticut, Department of Environmental Protection (DEP)

Section 22a-209-1 through 22a-209-16 - Solid Waste Management Regulations.

Section 22a-449(c)-100 through 22a-449(c)110 and 22a-449(c)-119 - Connecticut Hazardous Waste Regulations

1.4 SUBMITTALS

A. Submit for Consultants' review and information the below listed data not less than 5 working days prior to start of activity.
   1. Safety plan for worker protection and protection of adjacent construction.
   2. Spill cleanup contingency plan.
   3. Name, location and evidence of current licensing or legal approval of disposal facility to receive construction/demolition waste, special and hazardous wastes. Submit manifests and record documentation of shipments. The following minimum information shall be included:
      a. Facility name and address.
      b. Name, title and telephone number of contact person.
      c. Copies of waste licenses or permits to confirm that they are permitted to accept the waste materials.
      d. Lists matching each facility with the materials from the project to be sent to each, and specify whether the facility is a recycling, treatment, storage, or disposal facility.
      e. Confirmation from facility that they will accept the types and quantities of wastes being generated from the Work.
   4. Submit a plan for the removal and disposal of hazardous materials to ensure compliance with applicable regulations. This removal work includes the following materials:
      a. Materials containing lead.
      b. Lead-acid electrolyte batteries.
      c. Mercury-containing thermostats and switches.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable Federal, State and Local codes and ordinances for handling, recycling and disposal of hazardous or universal waste materials.

B. Lock out /Tag out electrical power, including all devices and light fixtures in accordance with the Owner's lock out/tag out program. Isolate and remove system components as indicated or required. Coordinate all power and alarm system isolation with the Owner.

C. Do not close or obstruct access or egress from occupied areas of the building.

1.6 SEQUENCING

A. Sequence removal and handling of regulated materials with work included in other sections. Removal activities which could disturb asbestos-containing materials shall be performed after establishment of engineering controls as specified in Section 02080.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide, erect, and maintain temporary barriers, including work area containment at locations necessary to protect adjacent construction and eliminate unauthorized entry into the work area. Provide appropriate signage to identify building evacuation routes during construction.

3.2 REMOVAL REQUIREMENTS

A. Perform removals to the extent specified, indicated or necessary to access concealed asbestos-containing materials and to remove other hazardous materials specified herein. Conduct demolition and removal activities to minimize interference with adjacent construction scheduled to be retained.

B. Cease operations immediately if adjacent construction appears to be in danger. Notify the Owner. Do not resume operations until directed by the Owner.

C. Should any spill occur during the removal of hazardous materials, notify the Owner immediately. Cleanup of spills shall be in accordance with the approved spill cleanup contingency plan.

3.3 LEAD-ACID BATTERY ELECTROLYTE

A. Dispose of batteries containing lead-acid electrolytes in accordance with all applicable regulations governing hazardous waste disposal. Refer to Section 012000 of Division 1 for Unit Prices governing this work.

3.4 MERCURY

A. The Design Consultant will identify, fluorescent bulbs, thermostats, switches, gages and miscellaneous equipment containing mercury. The Contractor is responsible for removal and disposal of these items. Refer to Section 012000 of Division 1 for Unit Prices governing this work.

Waste generated by this process shall be recycled or disposed of in accordance with applicable regulations.

3.5 BALLASTS

A. Retain the services of a licensed electrician to disconnect the power from active lights prior to ballast removal. Conform to all OSHA lock-out/tag-out procedures.

B. Ballasts that contain PCBs are regulated under TSCA (40 CFR 761.60(b)(2)(ii)).

C. Intact fluorescent and HID ballasts that are not leaking shall be recycled by an approved TSCA recycling facility. Leaking PCB-containing ballasts must be incinerated at a USEPA-approved high-temperature incinerator. Leaking PCB units can be identified by an oily tar-like substance. All materials including the ballast that contact this substance are considered PCB waste, and are subject to TSCA requirements. Fluorescent and HID ballasts which are labeled "No PCBs" may contain DEHP and shall be managed the same way as PCB ballasts, properly packed for recycling/destruction. All other ballasts shall be assumed to be PCB containing.

D. Ballasts shall be placed in DOT approved drums containing a sorbent material for proper transport.

E. All waste drums shall be identified with the following yellow label:

CAUTION: Contains PCBs (Polychlorinated Biphenyls)

F. A uniform Hazardous Waste Manifest must be prepared by the Contractor and accompany the waste wherever it travels. Each handler of the waste must sign the manifest and keep one copy. When the waste reaches its destination, the owner of that facility returns a copy of the manifest to the generator to confirm that the waste arrived. The Contractor shall ensure the Engineer receives a completed copy of the waste manifest as well as provide the Engineer with documents verifying destruction of the PCBs whether they are incinerated at high temperatures or recycled.

3.7 DISPOSAL

A. Contractor is encouraged to salvage material, and equipment for reuse and to recycle solid waste including items such as specified in Section 22a-241b-2 of the RCSA.

B. Construction and demolition waste remaining after salvage and recycling is to be disposed of at a landfill approved by the Connecticut Department of Environmental Protection for the disposal of construction and demolition waste.

END OF SECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. All drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Coordinate asbestos abatement with the work described on the drawings and in all other specification sections.

1.2 SUMMARY

A. The work specified herein shall be the abatement of asbestos-containing materials by persons who are knowledgeable, qualified, and trained in the removal, treatment, handling, and disposal of asbestos-containing material, and the subsequent cleaning of the affected environment. The Contractor shall have a Competent Person in control on the job site at all times during asbestos abatement work. This person must comply with applicable Federal, State and Local regulations which mandate work practices, and be capable of performing the work of this Section.

B. The Contractor shall be licensed by the State of Connecticut in accordance with State of Connecticut Regulations, Sections 20-440-1 through 9 and 20-441. Should any portion of the work be subcontracted, the subcontractor must be licensed in accordance with these regulations. Site supervisors and workers shall be certified in accordance with Sections 20-437 and 20-438 of the Connecticut General Statutes and Section 20-440-5 of the Regulations of Connecticut State Agencies. The licensing and certification requirements are available from the Environmental Health Services Division, Department of Public Health, 410 Capitol Avenue, P.O. Box 340308, Hartford, CT 06134-0308.

C. The State will retain the services of a Project Monitor for protection of its interests and those using the building. Pre-abatement, during abatement and post-abatement sampling will be conducted by the State's Project Monitor as deemed necessary. OSHA required personnel monitoring shall be conducted by the Contractor.

D. Restore all work areas and auxiliary areas utilized during abatement to conditions equal to or better than original. Any damage caused during the performance of abatement activities shall be repaired by the Contractor at no additional expense to the State. The Contractor is responsible for protecting all objects in work areas that are permanent fixtures or are too large to remove.

E. The Contractor shall be responsible for the following general requirements:

1. Obtain all approvals and permits, and submit all notifications required.

2. Provide, erect, and maintain all planking, bracing, shoring, barricades, and warning signs.

3. Unless otherwise specified, all equipment, fixtures, piping, debris and miscellaneous waste materials resulting from abatement shall become the property of the Contractor and shall be removed from the premises in a timely manner. Dispose of all wastes in accordance with all applicable Federal, State and Local requirements.

4. Contractor shall provide OSHA required personal monitoring to ensure adequate respiratory protection for each worker.

F. Protect and preserve in operating condition, all utilities traversing the building and site. Damage to any utility due to work under this Contract shall be repaired to the satisfaction of the State at no cost to the State.

1.3 DESCRIPTION OF WORK

A. The Contractor shall supply all labor, materials, equipment, services, insurance (with specific coverage for work on asbestos) and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations and these specifications.

B. The asbestos abatement work shall include the removal of exposed and concealed friable and non-friable asbestos-containing materials (ACM) as shown on the drawings and specified herein.

C. Submit proposed schedule of working hours and days to Construction Administrator prior to the start of abatement in each construction phase. **The abatement schedule shall conform to and be fully consistent with the overall project phasing schedule and sequencing, which may include night, evening and weekend work for specified phases.**

D. The project includes removal of the following asbestos-containing materials: vinyl floor tile and mastic; thermal systems insulation; glue daubs (behind chalkboards, mirrors and other furnishings); exterior masonry wall sections with embedded asbestos-containing waterproofing felt/tar; cementitious composite flooring treatment ("Asbestolith"); sink undercoating/pan sealant; window caulk and glazing; roof flashing; and other miscellaneous materials.

E. Retain a licensed electrician to make temporary electrical connection to existing building service and provide power sufficient to complete specified work. Coordinate with the electrical work specified in other Sections. Install temporary construction lighting for safe and adequate illumination of the abatement work areas. Ensure the immediate availability of backup power sources (e.g. temporary generators) to power abatement equipment in the event of an outage.

F. Prior to beginning each phase of abatement work, the Contractor shall prepare a written plan (including sketches) describing the location and construction of containment barriers and proposed means, routes and timing for moving asbestos and non-asbestos waste materials out of the building. Submit the plan to the Construction Administrator and School for review and approval and modify as directed. The building elevator may be used for loadout of asbestos-containing waste only during times specifically permitted by the Construction Administrator and never during regular school hours. The Contractor shall carefully observe weight limits and provide temporary protection of the elevator interior to prevent scratches or damage. The Contractor is responsible for any damage to the elevator caused by his activities.

G. Conduct selective demolition of non-asbestos materials where required to access asbestos for abatement.

H. Remove both asbestos and non-asbestos ceiling systems where indicated on the plans. Ceiling demolition shall include entire grid/support system (including T-grid, lath, moldings, trim, hangers, fasteners and all appurtenances). Non-asbestos ceiling construction which becomes contaminated with asbestos in the course of the work shall be disposed of as asbestos waste at Contractor's expense.

1.4 DEFINITIONS

Accessible - A space easily accessed, and which can be entered or seen without demolition.

Agency - The authoritative force, usually at the state level, or their representative.

ASHARA - Asbestos School Hazard Abatement Reauthorization Act - U. S. EPA regulation 40 CFR Part 763 under Section 203 of Title II of the Toxic Substances Control Act (TSCA), 15 U.S.C. 2643. This rule mandates inspections, accreditation of persons involved with asbestos, and final air clearances following abatement in public and private schools, and public and commercial buildings.

Alternative Work Practice (AWP) - State of Connecticut Department of Public Health approved deviation from Asbestos Standards (Sections 19a-332a-1 to 19a-332a-16 inclusive). The procedures described in this specification do not include Alternative Work Practice methods. The Contractor may use Alternative Work Practice methods with the advance approval of DPH, the Design Consultant and State`s Project Monitor. Approval of alternative work practice procedures shall not relieve the Contractor from any codes, regulations or standards required by this specification.

Asbestos - The asbestiform varieties of actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite.

Asbestos-Containing Material (ACM) - Material composed of asbestos of any type and in an amount greater than one percent by weight, either alone or mixed with other fibrous or nonfibrous material.

Asbestos-Containing Waste Materials - Mill tailings or any waste that contains commercial asbestos. This term includes filters from control devices, friable asbestos waste material, and bags or other similar packaging contaminated with commercial asbestos. As applied to demolition and renovations operations, this term also includes regulated asbestos-containing material waste and materials contaminated with asbestos including disposable equipment and clothing.

Asbestos Control Area - An area where asbestos abatement operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris. Two examples of an Asbestos Control Area are a "full containment" and a "glove-bag."

Authorized Asbestos Disposal Facility - A location approved by the Connecticut Department of Environmental Protection for handling and disposing of asbestos waste or by an equivalent regulatory agency if the material is disposed of outside the State of Connecticut.

Category I Non-Friable Asbestos-Containing Material (ACM) - Asbestos-containing packing, gaskets, resilient floor coverings and asphalt roofing products containing more than 1 percent asbestos as determined using the method specified in Appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy.

Category II Non-Friable ACM - Any material, excluding Category I non-friable ACM, containing more than 1 percent asbestos as determined using the method specified in Appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Class I Asbestos Work - Activities involving the removal of Thermal Systems Insulation (TSI) and surfacing ACM and PACM.

Class II Asbestos Work - Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic.

Class III Asbestos Work - Repair and maintenance operations, where ACM, including thermal system and surfacing material, is likely to be disturbed.

Class IV Asbestos Work - Maintenance and custodial activities during which employees contact ACM and PACM and activities to clean up waste and debris containing ACM and PACM.

Competent Person - In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the work place and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f): in addition for Class I and Class II work who is specially trained in

a training course which meet the criteria of 40 CFR 763 (Appendix C to Subpart E - Asbestos Model Accreditation Plan).

Concealed Space - Space which is out of sight. Examples of a concealed space include area above hard ceilings; below floors; between double walls; furred-in areas; pipe and duct shafts; and similar spaces which cannot be examined without invasive removal of building components or destruction of finishes.

Contractor - The asbestos abatement firm retained by the State to perform the work of this project, alternately referred to as the "abatement contractor", "asbestos contractor", "Contractor" or pronouns which imply them.

Critical Barrier - A minimum of two layers of six (6) mil polyethylene sheeting taped securely over windows, doorways, diffusers, grilles and any other openings between the Work Area and uncontaminated areas outside of the Work Area, including the outside of the building.

Demolition - The wrecking or taking out of any load-supporting structural member of a facility together with any related handling operations or the intentional burning of any facility.

DEP - The Connecticut Department of Environmental Protection, 79 Elm Street, Hartford, CT 06106.

Differential Pressure - A difference in the static air pressure between the Work Area and occupied areas, and is developed by the use of HEPA filtered exhaust fans. This differential is generally in the range of 0.02 to 0.04 inches of water column.

DPH - The Connecticut Department of Public Health, 410 Capitol Avenue, Hartford, CT 06134.

Encapsulation - The treatment of asbestos-containing materials to prevent the release of fibers as the encapsulant creates a membrane over the surface (bridging encapsulant) or penetrates the material and binds its components together (penetrating encapsulant).

Engineering Controls - Controls to include, but not be limited to, pressure differential equipment, decontamination enclosures, critical barriers and related procedures.

Equipment Decontamination Enclosure System - The portion of a Decontamination Enclosure System designed for controlled transfer of materials and equipment into or out of the Work Area, typically consisting of a Washroom and a Holding Area.

Exposed - Open to view.

Fiber - A particulate form of asbestos five microns or longer, with a length-to-diameter ratio of at

least 3 to 1.

Fixed Object - A piece of equipment or furniture in the Work Area which cannot be removed from the Work Area, as determined by the State.

Friable Asbestos-Containing Material (ACM) - Material containing more than one percent asbestos which has been applied on ceilings, walls, structural members, piping, duct work, or any other part of a building, which when dry may be crumbled, pulverized or reduced to powder by hand pressure. The term includes non-friable asbestos-containing material after such previously non-friable material becomes damaged to the extent that when dry it may be crumbled, pulverized or reduced to powder by hand pressure.

Friable Asbestos-Containing Building Material (ACBM) - Any friable ACM that is in or on interior structural members or other parts of a school or public or commercial building.

Glove-Bag Technique - A method with limited applications for removing small amounts of friable asbestos-containing material from short piping runs, valves, joints, elbows, and other non-planar surfaces in a non-contaminated work area. Information on glove-bag installation, equipment and supplies, and work practices is contained in 29 CFR 1926.1101. The glove-bag assembly is a manufactured or fabricated device consisting of a glove-bag (typically constructed of six (6) mil polyethylene or polyvinyl chloride plastic), two inward projecting long sleeves, an internal tool pouch, and a labeled receptacle for asbestos waste. The glove-bag is constructed and installed in such a manner that it surrounds the object or material to be removed. This technique requires AWP application and may only be used if pre-approved by DPH or with the approval of the Design Consultant, State's Project Monitor and DPH when not pre-approved.

Hard Barrier - Barrier constructed of metal framing 16" O.C. with 5/8" gypsum wallboard on both sides, joints taped and edges sealed with fire-rated caulking.

HEPA Filter Equipment - High-efficiency particulate air (HEPA) filtered vacuum and/or exhaust ventilation equipment with a filter system capable of trapping and retaining asbestos fibers. Filters shall be of 99.97 percent efficiency for retaining fibers of 0.3 microns in diameter or larger.

Inaccessible - A space not accessible, and which cannot be entered or seen without demolition.

Lock-down - The procedure of spraying polyethylene sheeting and building materials with an encapsulant type sealant to seal in non-visible asbestos-containing residue.

Major Fiber Release Episode - Any uncontrolled or unintentional disturbance of ACBM, resulting in a visible emission, which involves the falling or dislodging of more than 3 square or 3 linear feet of friable ACBM.

Mini-Containment - A procedure using a single layer of polyethylene sheeting to contain the Work Area. Access to the mini-containment is controlled by an air lock which also serves as a Holding Area. This procedure requires AWP application and may only be used if pre-approved by DPH or with the approval of the Design Consultant, State's Project Monitor and DPH when not pre-approved.

Minor Fiber Release Episode - Any uncontrolled or unintentional disturbance of ACBM, resulting in a visible emission, which involves the falling or dislodging of 3 square or linear feet or less of friable ACBM.

Movable Object - A piece of equipment or furniture in the Work Area which can be removed from the Work Area, as determined by the State.

Negative Initial Exposure Assessment - A demonstration by the employer which complies with the criteria in 29 CFR 1926.1101(f)(2)(iii) that employee exposure during an operation is expected to be consistently below the PEL.

Negative Pressure Enclosure (NPE) - An airtight enclosure for abatement where differential pressure is produced using exhaust ventilation equipment with HEPA filters.

Non-Friable Asbestos-Containing Material - Material containing more than 1 percent asbestos as determined using the method specified in Appendix A, subpart F, 40 CFR part 763, section 1, Polarized Light Microscopy, that when dry cannot be crumbled, pulverized or reduced to powder by hand pressure.

Owner or Operator of a Demolition or Renovation Activity - Any person who owns, leases, operates, controls or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls or supervises the demolition or renovation, or both.

Permissible Exposure Limits (PEL's) - (1) Time-weighted Average Limit (TWA). The employer shall ensure that no employee is exposed to an airborne concentration of asbestos in excess of 0.1 fiber per cubic centimeter (f/cc) of air as an eight (8) hour time-weighted average (TWA). (2) Excursion Limit. The employer shall ensure that no employee is exposed to an airborne concentration of asbestos in excess of 1.0 fiber per cubic centimeter of air (1 f/cc) as averaged over a sampling period of thirty (30) minutes.

Pre-Clean - The process of cleaning an area before asbestos abatement activities begin to ensure all dust and debris in the area considered to be asbestos-containing are properly contained and disposed of. This increases the likelihood the area will pass aggressive air sampling clearance requirements after asbestos-containing materials have been removed.

Presumed Asbestos-Containing Material - Thermal system insulation and surfacing material found in

buildings constructed no later than 1980. The designation of PACM may be rebutted pursuant to 29 CFR 1926.1101 paragraph (k) (5).

Project Monitor - The certified and licensed individual contracted or employed by the building owner or Contractor to supervise and/or conduct air monitoring and analysis schemes. This individual is responsible for recognition of technical deficiencies in procedures during both planning and on-site phases of an abatement project. Requirements for Project Monitor are defined in the Connecticut Department of Public Health Regulations (Sections 20-440-1 to 20-440-9 and 20-441). In addition to these requirements, this person shall be listed in the American Industrial Hygiene Association's Asbestos Analysts Registry.

Regulated Area - Area established by the employer to demarcate areas where Class I, II and III work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; a work area within which airborne concentrations of asbestos exceed or there is a reasonable possibility they may exceed the PEL.

Regulated Asbestos-Containing Material (RACM) - (a) Friable asbestos material, (b) Category I non-friable ACM that has become friable, © Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

Renovation - Altering a facility or one or more facility components in any way, including the stripping or removal of RACM from a facility component. Operations in which load-supporting members are wrecked or taken out are demolition.

Repair - Overhauling, rebuilding, reconstructing or reconditioning of structures or substrates where asbestos, tremolite, anthophyllite or actinolite is present.

Response Action - A method including removal, encapsulation, enclosure, repair and operation and maintenance, that protects human health and the environment from friable ACBM.

Unfinished Space - Space used for storage, utilities or work area where appearance is not a factor. Examples of an unfinished space include crawlspace; pipe tunnel and similar spaces.

Visible Emissions - Any emissions, which are visually detectable without the aid of instruments, coming from RACM or asbestos-containing waste material or from any asbestos milling, manufacturing, or fabricating operation. This does not include condensed, uncombined water vapor.

Visible Residue - Any debris or dust on surfaces in areas within the Work Area where asbestos abatement has taken place and which is visible to the unaided eye. All visible residue is assumed to contain asbestos.

Waste Generator - Any owner or operator of a source whose act or process produces asbestos-containing waste material.

Waste Shipment Record - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

Wet Cleaning - The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with water, and afterwards thoroughly decontaminated or disposed of as asbestos-contaminated waste.

Work Area - Specific area or location where the actual work is being performed or such other area of a facility which the Commissioner determines may be hazardous to public health as a result of such asbestos abatement.

Worker Decontamination Enclosure System - The portion of a Decontamination Enclosure System designed for controlled passage of workers and authorized visitors, typically consisting of a Clean Room, a Shower Room and an Equipment Room.

1.5 REFERENCES

A. The current issue of each document shall govern. Where conflict among requirements or with these specifications exists, the more stringent requirements shall apply.

1. Occupational Safety and Health Administration (OSHA)

29 CFR 1910.134 - Respiratory Protection.

29 CFR 1910.146 - Permit Required Confined Spaces

29 CFR 1910.1001 - Asbestos, Tremolite, Anthophyllite, and Actinolite.

29 CFR 1926.21 - Safety Training and Education.
29 CFR 1926.24 - Fire Safety.

29 CFR 1926.32 - Definitions.

29 CFR 1926.50 - Medical services and first aid.

29 CFR 1926.51 - Sanitation.

29 CFR 1926.55 - Gases, vapors, fumes, dusts, and mists.

29 CFR 1926.59 - Hazard Communication.

29 CFR 1926.200 - Accident Prevention Signs and Tags.

29 CFR 1926.417 - Lockout and Tagging of Circuits.

29 CFR 1926.500-1926.503 - Fall Protection.

29 CFR 1926.1101 - Asbestos.

2. Environmental Protection Agency (EPA)

40 CFR 61, Subpart M - National Emission Standards for Hazardous Air Pollutants; Asbestos NESHAP Revision; Final Rule.

40 CFR 763, Subpart E - Asbestos School Hazard Abatement Reauthorization Act (ASHARA).

40 CFR 763, Subpart G - Worker Protection Rule.

40 CFR 763, Appendix C to Subpart E - Asbestos Model Accreditation Plan (MAP).

3. State of Connecticut, Department of Public Health Regulations (DPH)

Section 19a-332a-1 through 19a-332a-16 - Standards for Asbestos Abatement.

Section 19a-332e-1 through 19a-332e-8 - Civil Penalties for Violation of Asbestos Abatement Laws.

Section 19a-333-1 through 19a-333-13 - Asbestos Containing Materials in Schools Regulations.

Section 20-440-1 through 20-440-9 - Licensure and Training Requirements for Persons Engaged in Asbestos Abatement and Asbestos Consultation Services.

Section 20-441 - Refresher Training.

4. American National Standards Institute (ANSI)

ANSI Z9.2 - Fundamentals Governing the Design and Operation of Local Exhaust Systems.

ANSI Z88.2 - Respiratory Protection.

5. American Society of Testing and Materials (ASTM)

ASTM E 84 - Surface Burning Characteristics of Building Materials.

ASTM E 96 - Water Vapor Transmission of Materials.

ASTM E 119 - Fire Tests of Building and Construction Materials.

ASTM E 736 - Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.

ASTM E 1368 - Visual Inspection of Asbestos Abatement Projects.

ASTM E 1494 - Encapsulants for Spray- or Trowel- Applied Friable Asbestos-Containing Building Materials.

6. Underwriters Laboratories, Inc. (UL)

UL 586 - High-Efficiency, Particulate, Air Filter Units.

1.6 DOCUMENTATION

A. Submit two copies of the following documentation to ensure compliance with the applicable regulations. An up to date copy shall be retained at the job site at all times.

B. Manufacturer's Catalog Data:

Local Exhaust Equipment
Vacuum Equipment
Respirators
Pressure Differential Automatic Recording Instrument
Surfactant
Chemical Encapsulant
Polyethylene Sheeting
Airless Sprayers
Portable Shower Units
MSDS for All Materials Delivered to the Site

C. School in Session (SIS) Compliance Documentation:

1. Copy of asbestos abatement contractor's license.

2. Layout sketch for each phase showing asbestos removal work areas and depicting containment boundaries, personnel decontamination enclosure location, equipment decontamination enclosure location, waste removal routes and path to waste storage location.

3. Quantity and location of HEPA equipment including air exhaust locations.

4. Asbestos abatement emergency contingency plan including emergency 24-hour contact information.

5. Contractor may be required to modify the plans described in items 2 through 4 above upon review by the Owner and DPH.

D. Statements:

State Notification
Worker Medical Certification
Worker Training Certification
Worker Respirator Fit Testing
OSHA Laboratory Certification
Contractor's Project Monitor Certification
Landfill Approval
Safety Plan
Respiratory Protection Plan
Initial Exposure Assessment

1. Copies of all required notifications, approvals and permits for the removal, disposal and transport of asbestos-containing or contaminated materials.

2. Documentation from a physician certifying that all employees who may be exposed to airborne asbestos in excess of the background level have been provided with an opportunity to be medically monitored to determine whether they are physically capable of working while wearing the respirator required without suffering adverse health affects. In addition, document that personnel have received medical monitoring required in 29 CFR 1926.1101. Physicians shall be informed of the specific types of respirators the employee will be required to wear and the work he/she will be required to perform as well as special work place conditions such as high temperature, high humidity and chemical contaminants which to which he/she may be exposed.

3. Documentation certifying that all employees have received training in the proper handling of materials that contain asbestos; understand the health implications and risks involved,

including the illnesses possible from exposure to airborne asbestos fibers; understand the use and limits of respiratory equipment to be used; and understand the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in 29 CFR 1926.1101 on an initial and annual basis.

4. Documentation certifying training of the Contractor's designated Competent Person supervising the abatement as defined in 29 CFR 1926.32 (f) and 29 CFR 1926.1101 (b).

5. Documentation of respiratory fit testing for all employees who must enter the Work Area. This fit testing shall be in accordance with qualitative procedures as detailed in 29 CFR 1926.1101.

6. Qualifications of the person proposed for air sampling to assure workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.1101. The Project Monitor shall be licensed by Connecticut DPH. Include the name and address of the testing laboratory proposed to perform air monitoring on behalf of the Contractor, along with their NIOSH PAT Program I.D. number.

7. Establish and supervise in accordance with 29 CFR 1926.21, a program for the education and training of workers in the recognition, avoidance and prevention of unsafe conditions and the regulations applicable to the work environment to control or eliminate any hazards or other exposure to illness or injury. Include any site specific information to address health and safety procedures unique to this project.

8. Establish a written Respiratory Protection Plan in accordance with 29 CFR 1910.134. This plan shall establish procedures governing the selection and use of respirators and shall include such information as training in the proper use of respirators; medical examination of workers to determine whether or not they may be assigned an activity where respiratory protection is required; training in proper use and limitations of respirators; respirator fit testing; regular inspection and evaluation of the continued effectiveness of the program; and other elements included in the standard.

9. Establish a written Hazard Communication Plan in accordance with 29 CFR 1910.1200 (e) and 29 CFR 1926.59 (e). The plan shall establish procedures describing how the standard will be complied with; describe how MSDS's will be obtained and made available for each hazardous chemical used in the work area; describe how information and training will be provided to employees; explain how workers will be informed of hazards connected with non-routine tasks such as dealing with accidental spills and leaks; and contain information on how subcontractors will be informed about hazards their employees may encounter while working in the facility.

10. Demonstrate that employees exposure will be below the PEL's. For Class I asbestos work

until the employer conducts exposure monitoring and documents that employees on that job will not be exposed in excess of the PEL's, or otherwise makes a negative exposure assessment, the employer shall presume that employees are exposed in excess of the TWA and excursion limit.

E. Records:

Sign-in/out Logs
Personal Air Sampling Results
Waste Shipment Records
Pressure Differential Recording Data
NPE Inspection and Smoke Test Logs
Rental Equipment Statements

1. When rental equipment is to be used in removal areas or to transport waste materials, submit a copy of written notification provided to the rental company informing them of the nature of use of the rented equipment.

1.7 PERSONNEL PROTECTION

A. Respiratory protection shall meet the requirements of OSHA as required in 29 CFR 1910.134 and 29 CFR 1926.1101. Provide appropriate respiratory protection for each worker and ensure usage during potential asbestos exposure.

B. Select respirators from among those jointly approved as being acceptable for protection by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11. Provide an adequate supply of filter elements for respirators in use.

C. Minimum respiratory protection shall be as follows:

Airborne concentration of asbestos, or conditions of use.	Required Respirator
Not in excess of 5 f/cc (50 x PEL)	Any powered air purifying respirator equipped with high efficiency filters or any supplied-air respirator operated in continuous flow mode.
Not in excess of 100 f/cc	Full facepiece supplied

(1000 x PEL)	air respirator operated in pressure demand mode.
Greater than 100 f/cc (>1000 x PEL) or unknown concentration equipped with an auxiliary	Full facepiece supplied air respirator operated in pressure demand mode, positive pressure self-contained breathing apparatus.

a. Respirators assigned for higher airborne fiber concentrations may be used at lower concentrations, or when required respirator use is independent of concentration.

b. A high-efficiency filter means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 microns in diameter or larger.

D. Provide and require all workers to wear protective clothing in Work Areas where asbestos fiber concentrations exceed permissible limits established by OSHA. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings. Ensure all contaminated protective clothing remains in the Equipment Room for reuse or disposal as contaminated waste.

E. Provide all authorized persons entering contaminated areas with proper respirators and protective clothing.

F. Ensure that all workers and authorized persons enter and leave the Asbestos Control Area through the Worker Decontamination Enclosure System.

1.8 EQUIPMENT REMOVAL PROCEDURE

A. Clean surfaces of contaminated containers and equipment thoroughly by vacuuming with HEPA filtered equipment and wet wiping before moving such items into the Equipment Decontamination Enclosure System for final cleaning and removal to uncontaminated areas. Ensure that personnel do not leave the Asbestos Control Area through the Equipment Decontamination Enclosure System.

1.9 SEQUENCE OF WORK

A. The following general sequence of work shall be used for asbestos abatement:

1. Coordinate an inspection of each work phase area with the Construction Administrator and Agency to determine pre-existing damage to facility components.

2. Release of floor area (phase) to the Contractor.

3 Install temporary lighting and other temporary utilities required for the project and ensure that they are operational prior to the initiation of asbestos work.

4. Shut down and isolate heating, cooling, and ventilation air systems to prevent contamination and fiber dispersal to other areas of the structure.

5. Establish critical barriers, decontamination enclosures and HEPA-filtered negative air flow in the Work Areas, in accordance with DPH regulations. Coordinate the locations of decontamination enclosures and negative air units with the State's Project Monitor.

6. Clean fixed objects designated to remain in the Work Areas using HEPA vacuums and/or wet cleaning methods as appropriate and enclose with a minimum of one layer of 6-mil polyethylene sheeting sealed with tape.

7. Thoroughly preclean all surfaces of the Work Areas using HEPA vacuums and/or wet cleaning methods as appropriate. Remove all visible dust and debris from the Work Areas.

8. Secure polyethylene sheeting to wall and floor surfaces as specified.

9. Following completion of each negative pressure enclosure, the Contractor shall advise the Construction Administrator and State's Project Monitor of the need for a pre-abatement inspection. This process will also likely involve inspection by the Connecticut Department of Public Health (DPH). The Contractor is responsible for correcting any deficiencies and making all modifications required by the State's Project Monitor and/or DPH. The Contractor shall have no claim of additional compensation or delay resulting from work required to fulfill the directives of the State's Project Monitor and/or DPH.

10. When inspection of the negative pressure enclosure is satisfactorily completed, the Contractor will be given written approval to proceed with abatement work by the Construction Administrator. The Contractor shall then proceed with the removal of asbestos-containing materials in conformance with this specification, the plans, and all applicable regulations.

11. As a general guideline sequence removal so that ceiling material is removed first, wall material second and floor material last.

12. Perform final cleaning followed by dismantling of containments after air sampling by the State's Project Monitor has verified that Work Area is safe for reoccupancy.

13. Cleanup and return Work Areas to their original condition of cleanliness or better.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description. Do not use damaged or deteriorating materials. Material that becomes contaminated with asbestos shall be decontaminated or disposed of as asbestos waste.

1.11 UNIT PRICES

A. Unit prices applicable for asbestos abatement over and above work specified in the Contract Documents are included in the "Unit Price Schedule - Additional Asbestos Abatement" elsewhere in this package. Unit prices apply to additions to the scope of work (if applicable) and to the items listed below which cannot be precisely quantified prior to extensive selective demolition.

B. Base bid shall include the removal of the following quantities of concealed ACM (in walls and ceilings): **200 linear feet of pipe insulation and 400 pipe fittings**. Unit prices included in the Contract Documents will apply to determine cost in the event that actual quantities of these materials differ from the base bid quantities.

1.12 SCHOOL IN SESSION (SIS) COMPLIANCE REQUIREMENTS

A. No asbestos removal activities are permitted during regular school hours.

B. Asbestos removal shall be conducted in accordance with applicable DPH regulations and DPH Circular Letter EHS #2006-33.

C. The contractor shall be responsible for developing the required "School in Session" abatement plan with the Connecticut DPH in order to perform abatement while students are present in the building. This DPH approved plan should be submitted to the abatement contractor and the State's Project Monitor no later than ten (10) working days from the start of each required phase. The contractor shall revise the plans in accordance with directives from the Construction Administrator and DPH. No asbestos removal is permitted in an occupied school facility until approved by DPH.

D. The State's Project Monitor will conduct daily air sampling at prescribed locations throughout the project. Samples will be collected and read via phase contrast microscopy (PCM) twice per shift. All air samples in occupied areas shall be analyzed at the site prior to the end of the shift, by an analyst currently listed on the AIHA Asbestos Analysts registry and the Connecticut DPH Laboratory Certification Program. The results of the analysis of all samples shall be made available prior to return of students on the next day following the date of collection of the samples.

E. If during asbestos abatement activities, any occupied area air sample analyzed by PCM is either

overloaded with particulate or exceeds 0.010 f/cc or the background level, whichever is higher, the sample shall be analyzed by the NIOSH 7402 Transmission Electron Microscopy (TEM) method. Results of the analysis of the TEM samples shall be submitted to the Construction Administrator and State's Project Monitor, who will forward them to the DPH and school officials.

F. If any occupied area air sample analyzed by NIOSH 7402 TEM method is either overloaded with particulate and cannot be analyzed or, if upon analysis the sample fiber concentration exceeds 0.005 f/cc, the area outside the established asbestos work area will be considered contaminated with asbestos. The Project Designer will conduct an assessment of the contamination and the asbestos contractor shall re-establish engineering controls, isolation barriers, abatement work practices, etc. and clean the affected area. An area of the school evacuated due to air sampling data as described above shall not be occupied until: i) the area is cleaned via wet wipe techniques using amended water and HEPA vacuum procedures by the asbestos contractor; and ii) air sampling and analysis of the area satisfies the DPH criteria for re-occupancy. The Contractor is responsible for the cost of all work required to achieve decontamination in accordance with DPH criteria.

PART 2 PRODUCTS

2.1 MATERIALS

A. Fire retardant polyethylene sheeting in roll size to minimize the frequency of joints, shall be delivered to job site with factory label indicating four (4) or six (6) mil.

B. Polyethylene disposable bags shall be six (6) mil with pre-printed label. Disposable bags shall be opaque.

C. Tape shall be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces. Tape must be capable of adhering under both dry and wet conditions.

D. Surfactant (wetting agent) shall consist of fifty (50) percent polyoxyethylene ether and fifty (50) percent polyoxyethylene ester, or equivalent, and shall be mixed with water to provide a concentration one (1) ounce surfactant to five (5) gallons of water or as directed by the manufacturer.

E. Containers must be impermeable and shall be both air and watertight. Containers shall be labeled in accordance with OSHA Standard 29 CFR 1926.1101 and EPA 40 CFR Part 61.152 as appropriate.

F. Labels and signs shall conform to OSHA Standard 29 CFR 1926.1101.

G. Lockdown encapsulant shall be approved by the Design Consultant. Usage shall be in accordance with manufacturer's printed technical data. Encapsulant must be compatible with new materials being installed. Encapsulant shall be clear.

H. Glove-bag assembly shall be manufactured of six (6) mil transparent polyethylene or PVC with two (2) inward projecting long sleeve gloves, an internal pouch for tools, and an attached labeled receptacle for waste.

I. Use mechanical mastic removal equipment to the extent feasible. Chemical mastic removers may be used for edges, corners and smaller rooms. Mastic removal chemicals shall be low odor and non-citrus based. Flashpoint shall be in excess of 140° F.

2.2 TOOLS AND EQUIPMENT

A. Tools and equipment shall be suitable for asbestos removal.

B. Protective clothing, respirators, filter cartridges, air filters and sample filter cassettes shall be provided in sufficient quantities for the project.

C. Electrical equipment, protective devices, and power cables shall conform to all applicable codes.

D. Shower stalls and plumbing shall include sufficient hose length and drain system or an acceptable alternative. Showers shall be equipped with hot and cold or warm running water. One shower stall shall be provided for each eight workers.

E. Exhaust air filtration units shall be equipped with HEPA filters capable of providing sufficient air exhaust to create a minimum pressure differential of 0.02 inches of water column, and to allow a sufficient flow of air through the area. An automatic warning system shall be incorporated into the equipment to indicate pressure drop or unit failure. No air movement system or air filtering equipment shall discharge unfiltered air outside the Asbestos Control Area.

F. Pressure differential automatic recording instrument shall be provided to ensure exhaust air filtration devices provide the minimum pressure differential required between the Work Area and occupied areas of the facility.

G. Spray equipment shall be capable of mixing wetting agent with water and capable of generating sufficient pressure and volume. Hose length shall be sufficient to reach all of the Asbestos Control Area.

H. Vacuum units, of suitable size and capabilities for the project, shall have HEPA filters capable of trapping and retaining at least 99.97 percent of all monodispersed particles of 0.3 microns in diameter or larger.

I. Ladders and/or scaffolds shall be of adequate length, strength and sufficient quantity to support the

work schedule.

J. Other materials such as lumber, nails and hardware necessary to construct and dismantle the decontamination enclosures and the barriers that isolate the Work Area shall be provided as appropriate for the work.

K. Mechanical mastic removal equipment shall be suitable for the application.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS FOR ASBESTOS REMOVAL

A. A Competent Person shall be on the job at all times to ensure the establishment and maintenance of the Negative Pressure Enclosure (NPE) and proper work practices throughout the project. Before beginning work within the NPE and at the beginning of each shift, the NPE shall be inspected for breaches and smoke tested for leaks, and any leaks sealed. Results of NPE inspections and smoke tests shall be logged.

B. Spray asbestos materials with amended water, using airless spray equipment capable of providing a "mist" application to reduce the release of fibers during the removal operation. In order to maintain indoor asbestos concentrations at a minimum, remove the wet asbestos in manageable sections. Materials shall not be allowed to dry out once disturbed. Material drop shall not exceed 8 feet. For heights up to 15 feet provide inclined chutes or scaffolding to intercept drop. For heights exceeding 15 feet provide enclosed dust-proof chutes.

C. Containerize asbestos-containing waste material removed daily. Containerize waste material more frequently if necessary to prevent it from drying out. Fill disposal containers (six (6) mil polyethylene bags or fiber drums) as removal proceeds, seal filled containers, apply caution labels and clean containers before removal to wash area. **Observe manufacturer's specified weight limits for containers. Do not overfill.** Waste containers shall be labeled in accordance with OSHA 1926.1101 and shall be both water and air tight. Each container shall be labeled with the name of the Contractor and the name of the work site as required by EPA NESHAP regulations. Bags shall be securely sealed to prevent accidental opening and leakage by taping in gooseneck fashion. For vinyl asbestos tile and other materials with sharp edges, waste bags shall be placed in drums for staging and transportation to the disposal site. Bags shall be decontaminated by wet cleaning and HEPA vacuuming before being placed in clean drums and sealed with locking ring tops.

D. Large components removed intact may be wrapped in two (2) layers of six (6) mil polyethylene sheeting secured with tape for transport to the waste disposal site. Small components and asbestos containing waste with sharp-edged components (e.g., nails, screws, metal lath, tin sheeting) which could tear polyethylene bags and sheeting shall be placed in clean drums and sealed with locking ring tops.

E. Non-asbestos demolition waste will be placed in dumpsters supplied by the Contractor and properly disposed of by the Contractor. Non-asbestos demolition waste which becomes contaminated with asbestos (as determined by the State's Project Monitor) shall be properly decontaminated by HEPA vacuuming and or wet wiping prior to being brought out of containment. Items which are difficult or labor intensive to decontaminate shall be properly containerized and placed in a secure, properly labeled asbestos waste dumpster supplied by the Contractor.

F. Wet clean each container thoroughly before moving to the holding area. Ensure that workers do not enter from uncontaminated areas into the washroom or the work area. Ensure that contaminated workers do not exit the work area through the equipment decontamination enclosure.

G. If at any time during asbestos removal, should the State's Project Monitor suspect contamination of areas outside the work area, the Contractor shall stop all abatement work and take steps to decontaminate these areas and eliminate causes of such contamination. Unprotected individuals shall be prohibited from entering contaminated areas until air sampling and visual inspections determine that satisfactory decontamination has been achieved.

3.2 PREPARATION OF WORK AREA ENCLOSURE SYSTEM

A. Prior to beginning work, the Construction Administrator and Contractor shall perform a visual survey of each Work Area and list all pre-existing damage to building components and items scheduled for salvage. The Contractor shall submit to the Construction Administrator a list of damaged areas not scheduled for repair under this Contract. Documentation must include photographs and/or video of the work areas.

B. Post warning signs meeting the specifications of OSHA 29 CFR 1910.1001 and 29 CFR 1926.1101 at each Regulated Area. In addition, signs shall be posted at all approaches to Regulated Areas so that an employee may read the sign and take the necessary protective steps before entering the area. Additional signs may require posting following construction of work place enclosure barriers.

C. Utilize engineering controls and personnel protective equipment while installing enclosures and supports when asbestos-containing materials may be disturbed.

D. The Contractor shall utilize a licensed electrician to shut down and lock out electrical power in the Work Areas, including all receptacles and light fixtures. Protect receptacles and light fixtures remaining in the Work Areas with six (6) mil polyethylene and seal with tape. Cover fire alarm system components remaining in the Work Areas with six (6) mil polyethylene and seal with tape. The Contractor is responsible for all power and fire alarm isolation but shall coordinate these activities with the Owner's designated representatives.

E. Provide temporary lighting and ensure safe installation, including ground fault protection, of

temporary power sources and equipment in compliance with applicable electrical code and OSHA requirements. The Contractor is responsible for proper connection and installation of temporary electrical wiring. Only three prong grounded power cords are to be used in the work area.

F. Shut down and isolate heating, cooling, and ventilating air systems from the Work Area to prevent contamination and fiber dispersal to other areas of the building. Seal all vents.

G. Seal off all operable windows, ducts, grilles, diffusers, and any other openings between the Work Areas and the uncontaminated areas outside of the Work Areas with critical barriers. Doorways and corridors which will not be used for passage during work must be sealed with hard barriers. Install hard barriers in the following additional areas: locations specifically called out on the contract drawings; any openings into the work areas with dimensions larger than two (2) feet in both directions; and any locations where the designated work area boundary does not coincide with an existing building wall designated to remain. Hard barriers shall be constructed of metal framing 16" O.C. with 5/8" gypsum wallboard on both sides, joints taped and edges sealed with fire-rated caulking.

H. Pre-clean fixed objects within the Work Areas using HEPA filtered vacuum equipment and/or wet cleaning methods and enclose with one layer of six (6) mil polyethylene sheeting sealed with tape.

I. Clean the Work Areas using HEPA filtered vacuum equipment and/or wet cleaning methods as appropriate. Do not use methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters.

J. Cover floor and wall surfaces with polyethylene sheeting sealed with duct tape. Polyethylene shall be applied alternately to floors and walls. Cover floors first, with a layer of six (6) mil polyethylene sheeting, so that polyethylene extends at least twelve (12) inches up on walls. Cover walls with a layer of four (4) mil polyethylene sheeting to twelve (12) inches beyond the wall floor intersection, thus overlapping the floor material by a minimum of twenty-four (24) inches. Repeat the process for the second layer of polyethylene where required. There shall be no seams in the polyethylene sheeting at wall-to-floor joints. Modify containment as applicable based on approved Alternative Work Practice(s).

K. Conspicuously label and maintain emergency and fire exits from the Asbestos Control Area satisfactory to fire officials.

L. Following successful completion of the pre-abatement inspection outlined in Paragraph 1.9 A. 9. of this section, perform asbestos abatement as indicated on the contract drawings and in this specification.

3.3 WORKER DECONTAMINATION ENCLOSURE SYSTEM

A. Establish contiguous to the work area, a worker decontamination enclosure system consisting of equipment room, shower room and clean room in series. Access to the work area shall only be through this enclosure.

B. Access between rooms in the worker decontamination enclosure system shall be through double flap curtained openings (air locks). Other effective designs are permissible. The clean room, shower room and equipment room located within the worker decontamination enclosure, shall be completely sealed ensuring sole source of air flow into the asbestos control area originates from the outside uncontaminated areas.

C. The clean room shall be adequately sized to accommodate workers and shall be equipped with a suitable number of hooks, lockers, shelves, etc., for workers to store personal articles and clothing. Changing areas of the clean room shall be suitably screened from areas occupied by the public.

D. The shower room shall be of sufficient capacity to accommodate the number of workers. Supply warm water to showers. Provide one shower for each eight workers. No worker or other person shall leave an asbestos control area without showering.

3.4 EQUIPMENT DECONTAMINATION ENCLOSURE SYSTEM

A. Establish contiguous to the work area, an equipment decontamination enclosure system consisting of two (2) totally enclosed chambers divided by a double flap curtained opening. Other effective designs are permissible. No personnel shall enter or exit through this unit.

3.5 SEPARATION OF WORK AREAS FROM OCCUPIED AREAS

A. Occupied areas and/or building space not within the asbestos control area shall be separated from asbestos abatement Work Areas by means of airtight barriers. Barriers at openings with dimensions exceeding two (2) feet in both directions shall be blocked with hard barriers. Hard barriers shall also be installed to separate work areas from student occupied building areas.

B. Do not impair required building exits from any occupied building area. Where normal exits have been blocked by the asbestos work, provide temporary exit signs directing building occupants to the nearest available exit location.

C. Before beginning work within the enclosure and at the beginning of each shift, the negative pressure enclosure (NPE) shall be inspected for leaks, and any leaks sealed.

D. Create a pressure differential in the range of 0.02 to 0.04 inches of water column between the work area and occupied areas by the use of acceptable pressure differential equipment. Continuously monitor the pressure differential between the work area and occupied areas utilizing recording type equipment to ensure exhaust air filtration equipment maintains a minimum pressure differential of

0.02 inches of water column.

3.6 REMOVAL OF NON-FRIABLE RESILIENT FLOORING AND ASSOCIATED MASTIC

A. Resilient flooring shall be removed by approved methods, which minimize the release of asbestos fibers.

B. Precautions shall be taken to prevent the leakage of contaminated liquids containing solvents to other areas of the building. Should leakage occur, the Contractor shall take immediate steps to clean up the material and prevent future occurrences of the leak. Solvents shall be used in strict accordance with the manufacturer's written recommendations.

C. Wherever feasible, mechanical equipment should be used to remove flooring mastic. Ensure surfaces have been adequately wetted to prevent dust emissions prior to operation of mechanical mastic removal equipment. Operate bead-blast equipment with care and leave a level floor service to the extent feasible.

3.7 REMOVAL OF FRIABLE ASBESTOS MATERIALS

A. Remove friable asbestos materials identified in accordance with the specific description of work to be accomplished.

B. Removal of existing walls, partitions, suspended ceilings, light fixtures, alarm system components and other non-asbestos construction in the path of asbestos materials to be removed shall be performed <u>after</u> negative pressure enclosure has been established.

C. Secure polyethylene sheeting to wall and floor surfaces as specified. Polyethylene shall be applied alternately to floors and walls. Cover floors first, with a layer of six (6) mil polyethylene sheeting, so that polyethylene extends at least twelve (12) inches up on walls. Cover walls with a layer of four (4) mil polyethylene sheeting to twelve (12) inches beyond the wall floor intersection, thus overlapping the floor material by a minimum of twenty-four (24) inches. Repeat the process for the second layer of polyethylene where required. There shall be no seams in the plastic sheet at wall-to-floor joints.

D. Non-ACM insulation which becomes contaminated with asbestos shall be disposed of as asbestos waste.

E. Spray friable asbestos materials with amended water, using airless spray equipment capable of providing a "mist" application to reduce the release of asbestos fibers during the removal operation. In order to maintain indoor asbestos concentrations at a minimum, remove the wet asbestos in manageable sections. Materials shall not be allowed to dry out. Material drop shall not exceed eight (8) feet. For heights up to fifteen (15) feet, provide inclined chutes or scaffolding to intercept drop.

For heights exceeding fifteen (15) feet provide enclosed dust-proof chutes.

F. After completion of stripping work, all surfaces from which asbestos has been removed shall be wet brushed, using a nylon brush, wet wiped and sponged or cleaned by an equivalent method to remove all visible material (wire brushes are not permitted). During this work the surfaces being cleaned shall be kept wet.

3.8 REMOVAL OF WINDOWS FROM BUILDING EXTERIOR

A. This section applies to all of the windows with asbestos-containing frame caulk and/or glazing as depicted on the plans.

B. Establish a temporary barrier around the work zone in order to prevent entry by unauthorized persons. The barrier shall consist of signage, plastic temporary fencing, hazard tape or other method acceptable to the State's Project Monitor. The barrier shall extend at least ten feet in all directions from the asbestos abatement activity.

C. Post warning signs meeting the specifications of OSHA 29 CFR 1910.1001 and 29 CFR 1926.1101 at all approaches to the work zone.

D. A critical barrier consisting of one layer of 6-mil polyethylene sheeting shall be placed over each window opening from the interior of the building. The critical barrier shall be installed in such a manner that it remains in place when the window is removed from the exterior.

E. A dropcloth consisting of one layer of 6-mil polyethylene sheeting shall be placed on the ground below each window to be removed, of sufficient size to collect any falling material during removal of the window.

F. Establish a one-chamber decontamination area proximal to the abatement area. Work clothing shall be cleaned with HEPA vacuums in the decontamination area. All equipment and containers filled with asbestos-containing material must be cleaned in the decontamination area using HEPA vacuums and/or wet methods prior to removing them from the work area.

G. Prior to removing each window, the Contractor shall remove asbestos-containing window caulk from around the window frame to the extent feasible. Caulk shall be removed using wet methods. After the frame is removed, all caulk remaining on the masonry window opening (including any caulk in recessed tracks and crevices) shall also be removed.

H. After removal of each window, the contractor will wrap the window unit in two layers of 6-mil polyethylene sheeting sealed with tape for disposal as asbestos waste.

3.9 ASBESTOS-CONTAINING ROOFING REMOVAL

A. A Competent Person shall be on the job at all times to ensure that proper work practices are followed for the project. Prior to the start of work, and as needed during the job, the Competent Person shall inspect the work site and determine whether the roofing material is nonfriable and will likely stay nonfriable during removal. The findings of the inspection by the Competent Person shall be recorded in the written exposure assessment and shall be used as a basis for the exposure assessment.

B. Prior to the start of removal of asbestos-containing roofing material, establish a control area around the perimeter of the work zone. The control area shall extend a minimum of ten feet in all directions from the work zone. A single six (6) mil drop cloth shall be placed on the ground around the perimeter of the work zone, extending at least six (6) feet out from the building, in order to catch any falling material.

C. Post warning signs meeting the specifications of OSHA 29 CFR 1910.1001 and 29 CFR 1926.1101 at all approaches to the Work Zones/Regulated Areas. Post signs at each ladder or scaffold leading up to the roof so that an employee may read the sign and take the necessary protective steps before entering the Regulated Area.

D. Seal (with duct tape and 6-mil polyethylene sheeting) roof level heating and ventilation air intakes that may entrain dust from the roofing abatement activities. Seal any other penetrations through the roof.

E. Remove asbestos-containing roofing material in an intact state to the extent feasible. All work shall be conducted under the supervision of a Competent Person. Where feasible, remove asbestos-containing flashings using manual methods. Permissible methods include the use of spud, spade, flat-blade or slicing tools, such as axes, mattocks, pry bars, spud bars, crow bars, shovels, flat-blade knives, and utility knives, to slice, cut, strip-off, or pry-up the material. A power roof cutter shall not be used directly on asbestos-containing flashing/caulk. A power roof cutter may be used to cut the non-asbestos roof deck at the edge or perimeter of flashings, thereby allowing the flashings to be removed intact. Power roof cutters shall be equipped with a HEPA-filtered dust collector. Continuously mist asbestos-containing roofing material ahead of the power roof cutter. This requirement is optional if the Competent Person determines in writing that the misting decreases worker safety.

F. Utilize wet methods to remove asbestos-containing roofing materials unless such methods are not feasible or will create safety hazards, as determined in writing by the Competent Person.

G. HEPA vacuum dust and debris left after the removal of the asbestos-containing flashing.

H. Establish a one-chamber decontamination area contiguous to the work zone. Work clothing shall be cleaned with HEPA vacuums in the decontamination area. All equipment and containers filled with

asbestos-containing material must be cleaned in the decontamination area using HEPA vacuums and/or wet methods prior to removing them from the work area. Establish a worker hand washing facility in the decontamination area consisting of running potable water, a wash basin, soap and towels. No personnel shall leave the roof area unless first decontaminated by washing to remove all asbestos debris.

I. Asbestos-containing roofing material shall be carried or passed to the ground by hand or lowered by crane or hoist. Do not drop asbestos-containing roofing material to the ground or into a dumpster.

J. All asbestos-containing roofing material removed during the work shift shall be transferred to the leak tight disposal dumpster by the end of the work shift.

3.10 REMOVAL OF EXTERIOR WALL SECTIONS WITH EMBEDDED ACM

A. Much of the existing building contains embedded asbestos waterproofing membrane felt/tar in exterior wall sections. Specific locations of this material are depicted on the Contract Drawings. The Contractor is responsible for identifying all locations where exterior wall openings (including but not limited to penetrations, drillholes and/or demolitions) are required to complete the project. Locations of required openings may be expressly or implicitly denoted in the Contract Documents.

B. Where required openings described in the paragraph above intersect wall construction with embedded asbestos-containing membrane, the work shall be conducted as asbestos abatement.

C. Specified building demolition work (demolition of the existing C-Wing) and openings/penetrations involving removal of exterior wall construction with embedded ACM shall be conducted in accordance with the following protocols:

1) Establish and maintain a Regulated Area around the building perimeter with appropriate temporary fencing and signage required by OSHA regulations. Perimeter control shall be adequate to preclude access to the area by unauthorized persons.

2) Construct a worker decontamination facility contiguous to the regulated area meeting the requirements of the Regulations of Connecticut State Agencies (RCSA) Section 19a-332a-6.

3) Utilize water to maintain masonry and other demolition material in a wet condition during demolition and loading work.

4) Load and dispose of all masonry with adhered ACM tar/felt as asbestos waste. Non-asbestos containing masonry debris resulting from the exterior wall demolition shall be disposed of as non-hazardous waste. **The State's Project Monitor shall make the final determinations concerning whether specific portions of masonry rubble will require disposal as asbestos waste (based on the presence or absence of adhered tar). The Contractor shall**

follow the direction of the State's Project Monitor at all times.

5) Following completion of exterior wall demolition and machine loading of waste, complete any necessary fine cleaning (raking and sweeping) of site areas to ensure that all asbestos-containing waste material resulting from the demolition is contained and removed.

6) Follow any additional regulatory requirements applicable to the work.

3.11 REMOVAL OF ASBESTOS-CONTAINING CEMENTITIOUS FLOORING

A. Portions of the existing building contain cementitious asbestos flooring (AKA "Asbestolith"). Specific locations of this material are depicted on the Contract Drawings. Conduct removal of the flooring in these areas as asbestos abatement. The average thickness of cementitious flooring is provided on the contract drawings (thickness is likely to be greater in isolated spots). Conduct removal using bobcats with hydraulic breaker attachments, bead blast equipment or equivalent method. Minimize damage to underlying concrete floor slab to the extent feasible. Provide a description of removal methodology to the Construction Administrator and State's Project Monitor prior to initiating work.

3.12 CLEAN-UP PROCEDURE

A. Remove and containerize all visible accumulations of asbestos-containing and/or asbestos-contaminated debris which may have splattered or collected on the polyethylene wall covering. Carefully remove the cleaned outer layer of polyethylene from the walls, fold inward as material is being removed, and place in disposal containers. Any debris which may have leaked behind the outer layer shall be removed by HEPA vacuuming and/or wet cleaning.

B. Remove contamination from the exteriors of the negative air machines, scaffolding, ladders, extension cords, hoses and other equipment inside the work area. Cleaning may be accomplished by brushing, HEPA vacuuming and/or wet cleaning.

C. Carefully remove the outer layer of polyethylene from the floor, fold inward as material is being removed, and place in disposable containers. Any debris which may have leaked behind the outer layer shall be removed by HEPA vacuuming and/or wet cleaning.

D. The State's Project Monitor shall conduct a thorough visual inspection utilizing a high-intensity flashlight, with the containment barriers in place, to detect visible accumulations of dust or bulk asbestos-containing materials remaining in the work area. Should dust, debris or residue be detected, the Contractor shall repeat the cleaning, at the Contractor's expense, until the area is in compliance. The visual inspection will detect incomplete work, damage caused by the abatement activity, and inadequate clean-up of the work site.

E. Once the area has been recleaned, any equipment, tools or materials not required for completion of the work, shall be removed from the work area. Negative air filtration devices shall remain in place and operating for the remainder of the clean-up operation.

F. Following the completion of recleaning, the State's Project Monitor shall perform a final visual inspection. All surfaces within the work area, including ledges, beams and hidden locations shall be inspected for visible residue. Evidence of asbestos contamination identified during the inspection will necessitate further cleaning as heretofore specified. The area shall be re-cleaned at the Contractor's expense until the standard of cleaning is achieved.

G. Apply a lock-down encapsulant to all surfaces within the work area from which asbestos has been removed and the cleaned inner layer of polyethylene.

H. Once the lock-down encapsulant has sufficiently dried, air sampling for reoccupancy clearance shall be undertaken using aggressive sampling techniques. Analysis of clearance samples shall follow State of Connecticut Regulations, Section 19a-333-7. Areas which do not comply shall continue to be cleaned by and at the Contractor's expense, until the specified standard of cleaning is achieved as evidenced by results of air testing.

I. When the work area passes the reoccupancy clearance, controls established by this specification may be removed. Carefully remove the polyethylene wall covering, fold inward as material is being removed, and place in disposal containers. Any debris which may have leaked behind the inner layer shall be removed by HEPA vacuuming and/or wet cleaning.

J. Carefully remove the inner layer of polyethylene from the floor, fold inward as material is being removed, and place in disposal containers. Any debris which may have leaked behind the inner layer of polyethylene shall be removed by HEPA vacuuming and/or wet cleaning. Critical barriers and other engineering controls established for the area shall remain in place. After the floor is uncovered, HEPA vacuum corners and crevices.

K. Wet wipe the walls beginning at the point farthest away from the negative air filtration units using cotton rags or lint free paper towels. Rags and towels shall be disposed of after each use. Workers should avoid the use of dirty rags to insure proper cleaning of surfaces. Mop the entire floor with a clean mop head and amended water. Water shall be changed frequently. Waste water shall be filtered using best available technology and dumped down an approved drain.

L. Remove all remaining polyethylene, including critical barriers, and decontamination enclosure systems, leaving negative air filtration devices in operation. HEPA vacuum and/or wet wipe any visible residue which is uncovered during this process.

M. HEPA vacuum cleaners shall be emptied of collected material prior to removal from the work area except at the end of the cleaning sequence when the vacuums are to be sealed in two layers of 6 mil polyethylene and removed with subsequent cleaning at the next abatement site.

N. The negative air filtration units shall be damp cleaned and sealed in two layers of 6 mil polyethylene sheeting prior to removal from the work area. Replacement of filters shall be done prior to the beginning of the Contractor's next abatement project after installation of containment barriers.

3.13 REOCCUPANCY CLEARANCE AIR SAMPLING

A. At a minimum, air sampling by the State's Project Monitor will be conducted in accordance with the following schedule:

Abatement Activity	Pre-Abatement	During Abatement	Post-Abatement
Greater than 160 SF or 260 LF	PCM	PCM	TEM
Equal to or less than 160 SF or 260 LF	PCM	PCM	PCM
Tent and Glove-bag Procedures	- - -	PCM	PCM
Demolitions	- - -	PCM	PCM

B. Frequency and duration of the air sampling during abatement will be representative of the actual conditions during the abatement. The size of the asbestos project will be a factor in the number of samples required to monitor the abatement activities. In addition to OSHA compliance monitoring (personal sampling accomplished by the Contractor) the following minimum schedule of samples will be required:

1. Background Samples:

   a) Outside of building - 2.
   b) Adjacent Area(s) inside building - 2.

   c) Work Area - 3 or if areas are separated (such as rooms) at least one (1) sample per area equaling a minimum of three (3).

2. During Abatement:

   a) Outside of building at the exhaust of air filtering device - 2 per shift.

b) Work Area - 2 per shift.

c) Adjacent area inside building - 2 per shift.

d) Outside of the Equipment Decontamination Enclosure System - 1 during removal of ACM waste.

3. Post-Abatement:

a) Work Area - At least five (5) per homogenous work site or as prescribed by applicable regulations.

C. Post-abatement clearance air monitoring requirements are as follows:

1. Air sampling will not begin until at least 12 hours after wet cleaning has been completed and lockdown encapsulant applied. No visible water or condensation shall remain in the work area.

2. Sampling equipment will be placed at random around the work area. If the work area contains the number of rooms equivalent to the number of required samples based on floor area, a sampler shall be placed in each room. When the number of rooms is greater than the number of samples a representative number of rooms will be selected.

3. The representative samplers placed outside the work area but within the building will be located to avoid any air that might escape through the isolation barriers and will be approximately 50 feet from the entrance to the work area, and 25 feet from the isolation barriers.

4. The following aggressive air sampling procedures will be used within the work area during all air clearance monitoring:

a) Before starting the sampling pumps, direct the exhaust from forced air equipment (such as a 1 horsepower leaf blower) against all walls, ceilings, floors, ledges and other surfaces in the work area. This should take at least 5 minutes per 1000 SF of floor area.

b) Place a 20-inch fan in the center of the room. Use one fan per 10,000 cubic feet of room space. Place the fan on slow speed and point it toward the ceiling.

c) Start the sampling pumps and sample for the required time.

d) Turn off the pump and then the fan(s) when sampling is complete.

5. Air volumes for clearance sampling shall be sufficient to accurately determine (to a 95 percent probability) fiber concentrations to 0.010 f/cc.

6. Each homogeneous work area which does not meet the clearance criteria shall be thoroughly recleaned by the Contractor using HEPA vacuuming and/or wet cleaning, with the negative pressure ventilation system in operation. New samples shall be collected in the work area as described above. The process shall be repeated until the work area passes the test, with the cost of repeat sampling being borne entirely by the Contractor.

7. For an asbestos abatement project with more than one homogeneous work area, the release criterion shall be applied independently to each work area.

3.14 CONTRACTOR RESPONSIBILITY

A. Conduct air sampling, as necessary, to assure that workers are using appropriate respiratory protection in accordance with 29 CFR 1926.1101. Monitor to determine the airborne concentrations of asbestos to which employees are exposed. Determinations of employee exposure shall be made from breathing zone air samples that are representative of the 8-hour TWA and 30-minute short-term exposures of each employee. Documentation of air sampling results must be recorded at the work site within twenty-four (24) hours of receipt of results, and shall be available for review until the job is complete.

3.15 DISPOSAL OF ASBESTOS

A. Disposal of asbestos-containing and/or asbestos contaminated material shall occur at an authorized site and must be in compliance with the requirements of, and authorized by the Connecticut Department of Environmental Protection.

B. Disposal approval shall be obtained prior to commencement of asbestos removal.

C. Warning signs must be attached to vehicles used to transport asbestos-containing waste. Warning signs shall be posted during loading and unloading of disposal containers and shall comply with applicable regulations. The signs must be posted so that they are plainly visible.

D. Waste removal dumpsters and cargo areas of transport vehicles shall be lined with a layer of six (6) mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first, and shall be extended up sidewalls 12-inches. Wall sheeting shall overlap floor sheeting 24-inches and shall be taped into place.

E. Each asbestos waste pickup will be documented using chain of custody forms stipulated in EPA regulations 40 CFR Part 61. The Contractor shall forward a copy of the custody document to the

Construction Administrator and Agency Representative within 24 hours after the material has left the site and forward a copy of the completed document signed by the disposal facility promptly upon receipt by the Contractor.

3.16 ACTION CRITERIA

A. If air samples collected outside of the work area during abatement activities indicate airborne fiber concentrations greater than original background levels or greater than 0.010 f/cc, as determined by Phase Contrast Microscopy, whichever is larger, an examination of the work area perimeter shall be conducted and the integrity of barriers shall be restored. Cleanup of surfaces outside the work area using HEPA vacuum equipment or wet cleaning techniques shall be done prior to resuming abatement activities.

END OF SECTION

Unit Price Schedule – Additional Asbestos Abatement:

1. **This Schedule applies only to items above and beyond the scope specified in the Contract Documents.** Unit price items #2 through #18 are to be used when additional asbestos-containing material is identified within an existing containment. If additional material is identified outside of an existing containment, items #2 through #18 are to be used in conjunction with item #1. Item #19 is applicable where additional barriers are called for by the Construction Administrator. Cost associated with the use of unit price items is inclusive of all labor, equipment, materials, transportation, disposal and overhead and profit.

Item	Item Description	Unit	Add
1	Containment Area - -Set up of containment area (up to 400 square foot area) including decontamination unit for abatement of ACM. This price to be used in conjunction with unit prices listed below for removal of ACM outside of an existing containment	EA	$1,300.00
2	Removal of pipe insulation	LF	$20.00
3	Glove bag removal of pipe fitting insulation	EA	$50.00
4	Removal of resilient flooring and associated mastic	SF	$5.00
5	Removal of vinyl wall cove base and associated mastic	LF	$2.50
6	Removal of poured composition (Asbestolith) flooring (1/4" thick)	SF	$2.50
7	Removal of floor levelastic	SF	$1.50
8	Removal of wood flooring and underlying felt paper or mastic vapor barrier	SF	$7.00
9	Removal of paneling, chalkboards, tack boards, mirrors including cleaning wall surfaces of associated mastic	SF	$5.00
10	Removal of suspended acoustic ceiling	SF	$1.00
11	Removal of plaster or gypsum wallboard partition or ceiling	SF	$1.75
12	Removal of CMU wall	SF	$4.00
13	Removal of HVAC ductwork	SF	$1.00
14	Removal of pipe flange gasket	EA	$25.00
15	Removal of Transite sheet	SF	$12.50
16	Removal of fire door or door glazing	EA	$125.00
17	Removal of Transite lab top, table or fume hood	SF	$5.00
18	Removal of exterior Transite pipe or conduit	LF	$25.00
19	Hard Barrier - Work area separation consisting of metal studs 16"o.c., 5/8" fire rated gypsum wallboard both sides, joints taped and edges sealed with caulk.	SF	$12.50

PART 1 GENERAL

1.1 APPLICABLE PUBLICATIONS

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

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to this work.

"Self-Implementing Cleanup Plan, H.C. Wilcox Technical High School," prepared by TRC Environmental Corporation, June 2010 (located in Appendix 3). ("PCB Site Remedial Plan")

"Contractor Certification Form for PCB Abatement" (located in Appendix 4).

U.S. Environmental Protection Agency, "H.C. Wilcox Technical High School PCB Cleanup and Disposal Approval", July 29, 2010 (located in Appendix 4).

Section 020226, Excavation of PCB Remediation Waste Soils Specifications

U.S. Environmental Protection Agency, 40 CFR Part 761, Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

1.2 DESCRIPTION

Work under this item shall include the abatement of: PCB-containing caulk and glazing (Federally-regulated and non-federally regulated PCB) and removal of abutting building materials (concrete, brick, metal door framing, and windows, including window framing, as identified in the Contract Plans and PCB Site Remedial Plan) that are coated with PCB-containing caulk and/or glazing ("PCB Waste").

The work shall be performed by persons who are knowledgeable, qualified, trained and licensed in the removal, treatment, handling, and disposal of PCB contaminated wastes and the subsequent cleaning of the affected environment. Where areas to be abated contain materials with PCBs and asbestos the workers should have all the required asbestos licensing/training as required in Specification Section 28213.

1.2.1 REQUIREMENTS

Federally-regulated PCB-containing caulk and/or glazing (classified as PCB Bulk Product Waste) is defined as any building material manufactured with total PCB concentrations ≥50 mg/kg by weight. All Federally-regulated caulk and glazing shall be removed by the Contractor and all associated building materials in contact with the subject caulk and glazing shall be removed by the Contractor to a depth of at least six

inches (6") unless otherwise indicated by the PCB Engineer that more material requires removal. Building material abutting caulks identified as IE1 and IE2 as shown on the Contract Drawings, shall be removed to a depth of at least twelve (12) inches of building materials on either side of the caulk. Metal door frames abutting the subject caulk shall be removed and disposed of as PCB Bulk Product Waste and the associated doors shall be removed prior to abatement activities and shall not be considered PCB Waste. Windows with the subject PCB-containing glazing and associate metal frames shall be removed and disposed of as PCB Bulk Product Waste.

The Owner shall hire a PCB Engineer for the duration of the PCB abatement work. The PCB Engineer shall provide a Project Monitor to oversee the activities of the Contractor. After removal, verification sampling shall be performed by the Project Monitor. PCB Bulk Product Wastes and abutting building materials shall be considered removed when all verification samples are <1 mg/kg total PCBs.

Non-federally regulated PCB-containing caulk and/or glazing is defined as any building material manufactured with total PCB concentrations ≥1 mg/kg and < 50 mg/kg. All non-federally regulated caulk and glazing shall be removed from the site and disposed of per these Specifications by the Contractor.

In demolition/renovation areas, building materials in contact with the non-federally regulated caulk and glazing shall be removed by the Contractor to a depth of six inches (6") and disposed of by the Contractor as PCB Bulk Product Waste.

Work in non-demolition/renovation areas, shall be scheduled during school vacations, when school is not in session. Such work shall be started and completed within such schedule. Work shall be completed at least ten (10) days prior to students returning to school. Building materials in contact with the non-federally regulated caulk and glazing shall be appropriately cleaned by the Contractor as per these Specifications. Verification samples of the remaining, cleaned building materials shall then be taken by the Project Monitor. If total PCB concentrations in the remaining building materials are ≥1 mg/kg, then an encapsulant, per these Specifications, shall be applied by the Contractor to the area where the caulk and/or glazing were in contact with building materials and new caulk or glazing shall be applied by the Contractor. If total PCB concentrations in the remaining building materials are <1 mg/kg, then the building materials shall be left in place as is.

These Specifications govern all work activities that disturb PCB-containing caulk and glazing and associated building material. All activities shall be performed in accordance with, but not limited to, OSHA Regulation 29 CFR 1926, EPA PCB Regulation 40 CFR Part 761, RCSA 22a-463 through -469 inclusive, and the PCB Site Remedial Plan where applicable.

Abatement work shall include the removal, transportation, and disposal of all PCB Wastes as identified on the Contract Documents, the PCB Site Remedial Plan, and Specifications prior to any phased or planned renovation/demolition work involving

the subject PCB areas. All PCB abatement material to be disposed of, except for soil remediation as covered under separate project Specifications, shall be disposed of by the Contractor as PCB Bulk Product Waste in accordance with 40 CFR Part 761.

Deviations from these Specifications require the written approval from the Owner.

1.3 DEFINITIONS

1.3.1 Contaminant Zones

Contaminant zones are those areas of active abatement and the waste storage area.

1.3.2 Abatement

The removal of PCB contaminated building materials in the manner specified in this section.

1.3.3 Federally-Regulated PCB Bulk Product Wastes

Federally-regulated PCB Bulk Product Waste, as defined in §761.3, means waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration where the concentration at the time of designation for disposal is ≥50 ppm PCBs.

1.3.4 Non-federally Regulated PCB Waste

Non-federally regulated PCB waste means waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration where the concentration at the time of designation for disposal is ≥1 mg/kg and < 50 mg/kg PCBs.

1.3.5 PCB Waste

PCB waste means PCB-containing caulk and glazing (Federally-regulated and non-federally regulated PCB) and abutting building materials to the subject caulk and glazing.

1.3.6 PCB Site Remedial Plan

"Self-Implementing Cleanup Plan, H.C. Wilcox Technical High School", Prepared by TRC, June 2010 (Appendix 3).

1.3.7 Remedial Action Level

Concentration to which PCB contaminated building materials must be removed to verify completion of the abatement work.

1.3.8 PCB Contaminated Building Materials

Consists of those caulks and glazings identified as PCB Bulk Product Wastes and/or non-federally regulated materials. Also may include the building materials in which the caulks and glazings are in contact with which includes, but not limited to, window frames, window glass, brick, concrete, mortar, metal, and stone window sills.

1.3.9 Suitable Waste Storage Container

A container in which PCB wastes are placed for storage prior to transport offsite for disposal that is water tight, lined, and equipped with a cover that prevents the infiltration of rainwater into the container.

1.3.10 Verification Sampling

Sampling performed by the Project Monitor to determine the completion of abatement activities as per the PCB Site Remedial Plan.

1.3.11 Waste Storage Area

The secured location in which the Contractor shall store PCB wastes prior to offsite transport for disposal. The Contractor shall consult with the Owner and the PCB Engineer to identify the location of Waste Storage Areas prior to generating any wastes. This area shall be secured and signed by the Contractor.

1.3.12 PCB Engineer

Responsible for overseeing PCB abatement work and for performing and evaluating verification sample data on behalf of the Owner. The PCB Engineer shall be represented daily onsite by the Project Monitor.

1.3.13 Owner

The Owner is the State of Connecticut, Department of Public Works, as further defined in the General Conditions.

1.3.14 Project Monitor

The onsite representative for the PCB Engineer responsible for overseeing daily work activities. The Project Monitor shall approve all containments prior to performance of abatement work, sampling during and after abatement activities, and for verifying that abatement has been successfully performed and allowing containments to be removed.

1.3.15 Contractor Certification Form for PCB Abatement

The Contractor shall be required to certify that he has read and understands the PCB Site Remedial Plan, all associated email correspondence between the Department of Public Works and the United States Environmental Protection Agency (EPA), and the EPA Approval Notice. By signing the Contractor Certification Form for PCB Abatement, the Contractor agrees to abide by the Conditions specified in the EPA Approval Notice. The Contractor Certification Form for PCB Abatement (and associated email correspondence and EPA Approval Notice) is located in Appendix 4.

1.4 SUBMITTALS

Prior to the performance of the work described in this section the Contractor shall submit to the Owner and Construction Administrator the following on the schedule indicated:

1.4.1 The following must be provided to the Owner, Construction Administrator, and the PCB Engineer within seven (7) days after execution of the Contract.

As related to the PCB abatement work, site-specific Health and Safety Plan including the Emergency Response Plan and provisions for decontamination and a contingency plan for unforeseen emergencies. The PCB Engineer shall review such plan only to determine if the plan meets basic regulatory requirements and the minimum requirements of these Specifications. The review will not determine the adequacy of the plan to address all potential hazards, as that remains the sole responsibility of the Contractor.

Contractor Certification Form for PCB Abatement (Appendix 4)

Current certification of employee's OSHA health and safety training (HAZWOPER).

Certification of additional required health and safety training for Supervisors.

Qualifications and experience of the Site Safety Officer (SSO).

1.4.2 Prior to any worker accessing the site to perform the work described in this section, the Contractor shall provide documentation, typed on company letterhead and signed by the Contractor, certifying that all employees assigned to the PCB abatement work listed therein have received the following:

Medical monitoring within the previous twelve (12) months, as required in 29 CFR 1910.120;

Respirator fit testing within the previous twelve (12) months as detailed in 29 CFR 1910.134 (for all employees who must also don a tight-fitting face piece respirator).

1.4.3 At least seven (7) days prior to performing any abatement work that shall generate PCB wastes, the Contractor shall submit copies of the EPA/State-approved permits for the proposed Chemical Waste landfill and a waste profile approved by the proposed landfill indicating that the waste materials to be generated are acceptable to the facility.

1.4.4 Seven (7) days prior to the start of abatement work, material information for the proposed encapsulant indicating that these materials conform to the specifications contained within.

1.4.5 No abatement shall commence until a copy of all required submittals have been received and found acceptable to the Owner and the PCB Engineer. Those employees added to the Contractor's original list will be allowed to perform work only upon submittal, and receipt of, all the above required paperwork to the Owner and PCB Engineer.

1.4.6 Copies of all permits, licenses, certifications, including but not limited to, manifests and/or bill of lading for the removal, transport, and disposal of PCB waste material shall be submitted to the Owner and PCB Engineer no later than five (5) business days after the Contractor receives such documents.

1.4.7 Notice shall be provided to the Owner and the PCB Engineer at least five (5) business days prior to the start of work under this Specification. Such notice shall include an estimated completion date. If this work is phased over the duration of the project, then such notification requirements shall apply to each phase.

1.5 REGULATORY REQUIREMENTS

1.5.1 All abatement and decontamination wastes are to be handled and stored in accordance with the provision of 40 CFR Part 761 Subpart D. The Contractor shall be responsible for all costs associated with investigation and remediation of any releases due to their failure to handle abatement wastes in accordance with the regulatory requirements.

1.6 DELIVERY AND STORAGE

1.6.1 The Contractor shall deliver and store materials in a manner to prevent contamination, segregation, freezing, and other damage.

1.7 MEASUREMENT AND PAYMENT

The Contractor's cost proposal shall be based on the following criteria:

Measurement for payment shall be based on a lump sum price for the removal of all PCB Wastes.

No extra payment shall be made for the construction and removal of containments, any required barrier installation and removal, decontamination, dust control, site

preparation, site restoration or waste disposal areas. The cost for these items shall be included in the base bid.

Contractor shall use add deduct prices provided for determining cost for additional work if required. If additional areas requiring work is found outside of an area that would already require containment, the Contractor shall use the lump sum price of the containment plus the unit prices abatement work required. If there is a reduction in the work or the requirements of the work as described in the Contract Documents, the deduct price shall be calculated using the lump sum and unit prices provided.

1.8 PROTECTION

1.8.1 Structures and Surfaces

The Contractor shall protect adjacent structures and surfaces from traffic or any other damage. The Contractor shall repair and reestablish damaged building materials that are to remain in place prior to acceptance of the work.

PART 2 PRODUCTS

2.1 All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description.

2.2 No damaged or deteriorating materials shall be used. If material becomes contaminated with PCBs, the material shall be disposed of as PCB waste material. The cost to dispose of this material shall be at the expense of the Contractor.

2.3 Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating four (4) or six (6) mil thickness.

2.4 Tape (or equivalent) capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

2.5 Containers for storage, transportation and disposal of PCB-containing waste material shall be impermeable and both air and watertight.

2.6 Labels and warning signs shall conform to OSHA 29 CFR 1926, USEPA 40 CFR Part 761, and USDOT 49 CFR Part 172 as appropriate.

2.7 Any planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable federal, state and local regulations.

2.8 Air filtration devices and vacuum units shall be equipped with HEPA filters.

PART 3 EXECUTION

3.1 General Requirements for PCB Containing Building Material Abatement.

All labor, materials, tools, equipment, services, testing, insurance, and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations, industry standards and codes, and these Specifications shall be provided by the Contractor. The Contractor shall be prepared to work all shifts and weekends throughout the course of this work.

Prior to beginning work per these Specifications, the PCB Engineer and Contractor shall perform a visual survey of each work area and review conditions at the site for safety reasons. In addition, the Contractor shall instruct all workers in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this work.

3.2 Prior to the performance of any abatement work, the Contractor shall perform the following tasks.

Shutdown and isolate heating, cooling, and ventilating air systems to prevent contamination to the other areas of the buildings.

Shut down and lock out electrical power, including all receptacles and light fixtures, when feasible. The use or isolation of electrical power will be coordinated with all other ongoing uses of electrical power at the site.

Coordinate all power and fire alarm isolation with the appropriate representatives.

When necessary, provide temporary power and adequate lighting and ensure safe installation of electrical equipment, including ground fault protection and power cables, in compliance with applicable electrical codes and OSHA requirements. The Contractor is responsible for proper connection and installation of electrical wiring.

3.3 If sufficient electrical service is unavailable, the Contractor may need to supply electrical power to the site by fuel operated generator(s). Electrical power supply shall be sufficient for all equipment required for this work in operation throughout the duration of the work.

3.4 Negative pressure must be maintained in each active work area, until the area achieves satisfactory reoccupancy criteria and is approved by the Project Monitor to be deregulated.

3.5 Water service may not be available at the site. Contractor shall supply sufficient water for each shift to operate the decontamination units as well as to maintain the work areas adequately wet.

3.6 Ladders and/or scaffolds shall be in compliance with OSHA requirements, and of adequate length, strength and sufficient quantity to support the scope of work. Use of ladders/scaffolds shall be in conformance with OSHA 29 CFR 1926 Subpart L and X requirements.

3.7 Work performed at heights exceeding six feet (6') shall be performed in accordance with the OSHA Fall Protection Standard 29 CFR 1926 Subpart M including the use of fall arrest systems as applicable.

3.8 Data provided regarding PCB sampling conducted throughout the structure(s) is for informational purposes only. Under no circumstances shall this information be the sole means used by the Contractor for determining the presence and location of all PCB Waste. The Contractor shall verify all field conditions affecting performance of the work as described in these Specifications in accordance with applicable OSHA, USEPA, USDOT, and CTDEP standards. Compliance with the applicable requirements is solely the responsibility of the Contractor.

3.9 The PCB Engineer will provide a Project Monitor to oversee the activities of the Contractor. No PCB abatement work shall be performed until the Project Monitor is on-site.

3.10 All interior and exterior abatement areas are to be established in the same manner.

The abatement Contractor shall establish a Control Area around each area where removal actions are being performed. Only properly trained personnel associated with the removal or abatement will be allowed within the Control Areas that will be established by placing barriers with signs indicating that access to the area is restricted. The Contractor's field inspector will maintain the Control Areas and escort unauthorized personnel from the area promptly. Only those personnel actively working on the removal, abatement, and soil excavation actions will be allowed within the Regulated/Containment Area and they shall be equipped with appropriate Personal Protective Equipment (PPE).

The Contractor shall pre-clean the work areas using HEPA filtered equipment (vacuum) and/or wet methods as appropriate, collecting and properly containing all dust and debris identified as PCB Waste. Vacuum units, of suitable size and capabilities for the project, shall have HEPA filters capable of trapping and retaining at least 99.97 percent of all monodispersed particles of three micrometers in diameter or larger. Do not use methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters.

After pre-cleaning, movable objects shall be removed from the work areas with the utmost care to prevent damage of any kind and relocated to a temporary storage location coordinated with the PCB Engineer. The Contractor is responsible for protecting all fixed objects that are permanent fixtures or are too large to remove and

remain inside the Regulated Area. Fixed objects shall be enclosed with one layer of six (6) mil polyethylene sheeting sealed with tape.

The Contractor shall establish remote to the Regulated Area but within the Control Area, a Worker Decontamination Enclosure System consisting of Equipment Room, Shower Room and Clean Room in series.

The Shower Room shall be of sufficient capacity to accommodate the number of workers. One shower stall shall be provided for each eight (8) workers. Showers shall be equipped with hot and cold or warm running water through the use of electric hot water heaters supplied by the Contractor. No worker or other person shall leave a Regulated Area without showering. Shower water shall be collected.

The Contractor shall ensure that no personnel or equipment be permitted to leave the Control Area until proper decontamination procedures (including HEPA vacuuming, wet wiping and showering) to remove all PCB debris have occurred. No PCB-contaminated materials or persons shall enter the Clean Room.

The Contractor shall seal off all windows, doorways, skylights, ducts, grilles, diffusers, vents, light fixtures, electrical receptacles, suspended ceiling tile systems and any other openings between the Regulated Area and the uncontaminated areas outside of the Regulated Area, including the outside of the building, with critical barriers consisting of a minimum of one (1) layer of six (6) mil polyethylene sheeting securing the edges with tape. Doorways and corridors which will not be used for passage during work and separate the regulated areas from occupied areas must be sealed with fixed critical barriers constructed of 2" x 4" wood or metal framing 16" O.C., with ½" plywood on the occupied side and two layers of six (6) mil polyethylene sheeting on the Regulated Area side to prevent unauthorized access or air flow.

A Negative Pressure Enclosure (NPE) shall be constructed by the Contractor via covering of floor and wall surfaces with polyethylene sheeting sealed with tape. Polyethylene shall be applied alternately to floors and walls. Cover floors first, with a layer of six (6) mil polyethylene sheeting, so that polyethylene extends at least twelve (12) inches up on wall. Cover wall with a layer of six (6) mil polyethylene sheeting to twelve (12) inches beyond the wall/floor intersection, thus overlapping the floor material by a minimum of twenty-four (24) inches. Repeat the process for the second layer of polyethylene. There shall be no seams at wall-to-floor joints. Contiguous to the NPE, construct a single chamber airlock from six (6) mil polyethylene sheeting for entry/exit purposes into the regulated area.

Conspicuously label and maintain emergency and fire exits from the Regulated Area satisfactory to fire officials.

The Contractor shall create a negative pressure differential in the range of 0.02 to 0.04 inches of water column between the Regulated Area and surrounding areas by

the use of acceptable negative air pressure equipment. Exhaust air filtration units shall be equipped with HEPA filters capable of providing sufficient air exhaust to create a minimum pressure differential of 0.02 inches of water column, and to allow a sufficient flow of air through the area providing 4 air changes per hour. The Contractor shall provide a sufficient quantity of HEPA air filters to maintain the pressure differential throughout the duration of the project. An automatic warning system shall be incorporated into the equipment to indicate pressure drop or unit failure. Continuously monitor the pressure differential between the Regulated Area and surrounding area to ensure exhaust air filtration equipment maintains a minimum pressure differential of 0.02 inches of water column. The Contractor shall provide actual air flow measurement of filtration units while the unit is in place and calculate actual air exchange rates. No air movement system or air filtering equipment shall discharge unfiltered air outside the Regulated Area.

The Contractor shall post warning signs to deter unauthorized personnel from entry. Additional signs may require posting following construction of workplace enclosure barriers.

3.11 Personnel Protection

The Contractor shall utilize all appropriate engineering controls and safety and protective equipment while performing the work in accordance with applicable OSHA, USEPA, USDOT, CTDEP, CTDPH regulations, and other Contract provisions.

The Contractor shall provide and require all workers to wear protective clothing in the Regulated Areas where PCB contamination exists. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings.

Respiratory protection shall be provided and shall meet the requirements of OSHA as required in 29 CFR 1910.134. A formal respiratory protection program must be implemented in accordance with 29 CFR 1910.134. The Contractor shall provide respirators from among those approved as being acceptable for protection by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part ll.

All other necessary personnel protective equipment (i.e. hardhat, work boots, safety glasses, hearing protection, etc.) required to perform the PCB abatement work activities shall conform to all applicable federal, state and local regulations and other applicable provisions of the Contract.

All other qualified and authorized persons by the Owner and/or Contractor entering into a Regulated Area shall be required to adhere to the requirements of personnel protection as stated in this section and all other applicable provisions of the Contract. All unqualified and unauthorized persons shall be escorted outside of the Regulated

Area and if due to other provisions of the Contract, escorted outside of the project site during the PCB work.

3.12 PCB Abatement Procedures

The Site Supervisor, as the OSHA Competent Person shall be at the site at all times during the performance of abatement work.

The Contractor shall not begin abatement work until authorized by the Project Monitor, following a pre-abatement visual inspection.

All workers and authorized persons shall enter and leave the Regulated Area through the contiguous airlock, leaving contaminated protective clothing in the airlock for disposal of as PCB contaminated waste. No one shall eat, drink, smoke, chew gum or tobacco, or apply cosmetics while in a Regulated Area.

The following details the extent of each phase of operation designated for this work. Phase areas may be combined or divided at the direction of the PCB Engineer. Proceed through the sequencing of the work phases under the direction of the Engineer.

See the PCB Site Remedial Plan and other Contract Drawings provided for the site for specific locations of PCB containing caulks and glazing. The specific locations for these materials and amount of associated building materials to be removed as well are indicated on these drawings and the PCB Site Remedial Plan.

During removal, the Contractor shall spray PCB containing building material with water using airless spray equipment capable of providing a "mist" application to reduce airborne dust. Hose length shall be sufficient to reach all of the Regulated Area. Do not “flood” the area with hose type water supply equipment with the potential to create water releases from the regulated area.

The Contractor shall employ mechanical methods such as cutting, grinding, and pneumatic hammers to remove PCB contaminated wastes. The methods employed must not damage the integrity of the containment structure and shall not create a breach through which contaminated dust may escape. The Contractor shall be responsible for all costs associated with decontamination and remediation in the case of a containment breach.

In order to minimize PCB concentrations inside the Regulated Area, the Contractor shall remove the materials in manageable sections. In addition, PCB Waste materials removed from any elevated level shall be carefully lowered to the floor.

The Contractor shall promptly place the PCB Waste material in disposal containers (six (6) mil polyethylene bags/ poly-lined dumpsters, etc.) as it is removed. Large components removed intact may be wrapped in one (1) layer of six (6) mil

polyethylene sheeting secured with tape. As the disposal containers are filled, the Contractor shall promptly seal the containers, apply caution labels and clean the containers before transportation to the airlock. Bags shall be securely sealed to prevent accidental opening and leakage by taping in gooseneck fashion. Small components and PCB Waste material with sharp-edged components (e.g. nails, screws, metal lath, tin sheeting) which could tear polyethylene bags and sheeting shall be placed in clean drums and sealed with locking ring tops. Drums may not be placed intact into final waste disposal containers intact and may be reused by the Contractor after the contents have been emptied. However, any drums use to handle wastes must be broken down and disposed of properly with other PCB wastes.

All waste containers shall be leak-tight. Containers shall be decontaminated by wet cleaning and HEPA vacuuming within the airlock prior to exiting the regulated area. Wet clean each container thoroughly before moving to a Waste Holding Area.

If at any time during PCB Waste removal, the Project Monitor should suspect contamination of areas outside the Regulated Area, the Contractor shall immediately stop all abatement work and take steps to decontaminate these areas and eliminate causes of such contamination. Unprotected individuals shall be prohibited from entering contaminated areas.

After completion of abatement work, all surfaces from which PCB Waste has been removed shall be wet brushed, using a nylon brush, wet wiped and sponged or cleaned by an equivalent method to remove all visible material (wire brushes are not permitted). Cleaning shall also include the use of HEPA filtered vacuum equipment.

The Contractor shall also remove and containerize all visible accumulations of PCB Waste and/or PCB contaminated debris which may have splattered or collected on the polyethylene engineering controls/barriers.

The Contractor shall clean surfaces of contaminated containers and equipment thoroughly by vacuuming with HEPA filtered equipment and wet sponging or wiping before moving such items into the airlock for final cleaning and removal to uncontaminated areas.

The Contractor shall remove contamination from the exteriors of the air filtration devices, scaffolding, ladders, extension cords, hoses and other equipment inside the Regulated Area. Cleaning may be accomplished by brushing, HEPA vacuuming and/or wet cleaning. The Contractor shall wet wipe the Regulated Area beginning at the point farthest away from the negative air filtration units using cotton rags or lint free paper towels. Rags and towels shall be disposed of after each use. Workers should avoid the use of dirty rags to insure proper cleaning of surfaces. Mop the entire floor with a clean mop head and amended water. Water shall be changed frequently

Once the Regulated Area surfaces have dried, the Project Monitor shall perform a thorough post abatement visual inspection. The Project Monitor will visually inspect the Regulated Area and the surrounding Control Area to determine that the Contractor has sufficiently decontaminated and removed any dust that might contain PCBs. All surfaces within the Regulated Area, including but not limited to ledges, beams, and hidden locations shall be inspected for visible residue. Evidence of dust contamination that would be indicative of PCB contamination identified during this inspection will necessitate further cleaning as heretofore specified. The area shall be re-cleaned at the Contractor's expense, until the standard of cleaning is achieved.

Once the area has received a satisfactory post-abatement visual inspection, any equipment, tools or materials not required for completion of the work, shall be removed by the Contractor from the Regulated Area. Negative air filtration devices shall remain in place and operating for the remainder of the clean-up operation.

3.13 Phased PCB Abatement Procedures

Should the potential exist for an unsafe condition to be produced by removing PCB contaminated building materials prior to removing clean materials, then the Contractor shall notify the Owner and the PCB Engineer and Project Monitor of such concerns and mitigate potentially unsafe conditions.

Should PCB contaminated building material need to remain to prevent an unsafe situation, the PCB Engineer shall collect the required verification samples prior to the performance of any demolition in the area. The Contractor shall then physically demark the line of clean building materials as determined by the verification sampling on the structure by painting or otherwise marking the structure so that it is clearly visible.

Once the area is marked, the Contractor may remove clean building materials as described elsewhere in the Contract Document. After the clean building materials have been removed to the marked line, PCB Contaminated building materials shall be abated according to the procedures stated in section 3.12 of this specification.

3.14 Post-Abatement Reoccupancy Procedures

The Project Monitor shall collect verification samples as per the EPA Region 1 Standard Operating Procedure for Sampling Concrete at the frequency specified in the approved PCB Site Remedial Plan. The verification samples will be analyzed for PCBs using EPA Methods 3540 and 8082. Analysis of verification samples will be expedited but the Contractor shall expect 48 to 72 hours (these hours do not include weekend and/or holiday hours) delay until analytical results are available.

Federally and Non-federally Regulated PCB Waste (demolition/renovation areas): In areas where PCB Wastes have been removed along with the associated building materials, the remedial standard to be achieved by all verification samples is <1

mg/kg total PCBs. If this standard is achieved then additional reoccupancy work will be performed. If the remedial standard is exceeded, the Contractor shall be instructed to remove additional building materials as instructed by the Project Monitor.

Non-federally Regulated PCB Waste (non-demolition areas): Work involving non-federally regulated PCB waste in non-demolition/renovation areas, shall be scheduled during school vacations, when school is not in session. Such work shall be started and completed within such schedule. Work shall be completed at least ten (10) days prior to students returning to school. In non-demolition/renovation areas, non-federally regulated PCB-containing caulks and/or glazing shall be removed and the associated building materials shall be cleaned in accordance with these Specifications and left in place. The remedial standard to be achieved by the verification samples collected from the associated building materials is <1 mg/kg total PCBs. If this standard is achieved in the building materials left in place, then additional reoccupancy work will be performed. If this standard is not achieved, then an encapsulant shall be applied by the Contractor to the area where the caulk and glazing were in contact with building materials and after the encapsulant has cured, new caulk or glazing shall be applied by the Contractor.

Following the collection and analysis of verification samples indicating that remediation goals have been achieved or the encapsulation of other materials, the Project Monitor shall collect wipe samples of surfaces within the Containment Area to determine if the decontamination performed by the Contractor has been sufficient to remove potentially PCB containing dust. The PCB Engineer shall obtain expedited analyses of these samples from an outside laboratory, but the Contractor shall expect 48 to 72 hours (these hours do not include weekend and/or holiday hours) delay until analytical results are available. The PCB Engineer shall instruct the Contractor to perform additional decontamination if wipe sample results are ≥1.0 μg/100 cm2. Areas which do not comply shall continue to be cleaned by and at the Contractors expense, until the specified Standard of Cleaning is achieved as evidenced by results of wipe testing. When the Regulated Area passes the re-occupancy clearance, controls established by these Specifications may be removed.

Wipe sampling will not begin until after the area has received an acceptable post abatement visual inspection and verification sample results indicate compliance with remedial standards.

Analysis shall follow the requirements of EPA Methods 3540 and 8082.

Each homogeneous Regulated Area which does not meet the clearance criteria shall be thoroughly recleaned using HEPA vacuuming and/or wet cleaning, with the negative pressure ventilation system in operation. New samples shall be collected in the Regulated Area. The process shall be repeated until the Regulated Area passes the test, with the cost of repeat sampling being borne entirely by the Contractor.

For a PCB Waste abatement project with more than one homogeneous Regulated Area, the release criterion shall be applied independently to each Regulated Area.

These clearance sampling procedures shall be implemented for both interior and exterior NPE work areas.

3.15 Post Abatement Work Area Deregulation

The Contractor shall remove all remaining polyethylene, including critical barriers, and airlocks with the negative air filtration devices in operation. HEPA vacuum and/or wet wipe any visible residue which is uncovered during this process. All waste generated during this disassembly process shall be discarded as PCB Bulk Product Waste.

A final visual inspection of the work area shall be conducted by the PCB Engineer and the Project Monitor to ensure that all visible accumulations of PCB Waste materials have been removed and that no equipment or materials associated with the abatement work remain.

The Contractor shall restore all work areas and auxiliary areas utilized during work to conditions equal to or better than original. Any damage caused during the performance of the work activity shall be repaired by the Contractor at no additional expense to the Owner.

3.16 Encapsulation Procedures

The contractor shall encapsulate building materials located in areas where renovation/demolition is not being performed as indicated on the Contract Drawings and these Specifications with an elastomeric, crack bridging, anti-carbonation, protective coating to be applied as the encapsulant. Following completion of encapsulant application, including cure time, the Contractor shall reinstall caulk as per and meeting the specifications contained within Section 079200 – Joint Sealants.

The Contractor shall install materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

All encapsulant materials shall be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material shall be removed from the site immediately. All materials shall be stored off the ground and protect from rain, freezing or excessive heat until ready for use.

The Contractor shall not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature are 45°F (7°C)

and rising. Precautions shall be taken by the Contractor to avoid damage to any surface near the work zone due to mixing and handling of the specified material.

The encapsulant shall be Sikagard 550W (or 670W) Elastocolor, as manufactured by Sika Corporation, 1682 Marion Williamsport Road, Marion, Ohio, or equivalent. The Contractor shall provide submittals for the encapsulant to be used prior to bringing the materials onsite for use.

Elastomeric Acrylic Coating shall be one hundred percent (100%) Acrylic Emulsion with the following properties:

3.16.1 Water vapor permeable

3.16.2 Can bridge dynamically moving cracks

3.16.3 Crack bridging properties maintained at low temperatures

3.16.4 The material shall be resistant to dirt pick-up and mildew

3.16.5 Pot Life: indefinite

3.16.6 Tack Free Time 6 Hours @ 73°F, 50% Relative Humidity. Final Cure < 24 Hours

3.16.7 Carbon Dioxide Diffusion: μCO2 214,000 Carbon Dioxide Diffusion Resistance at 16 mils (400 microns)

3.16.8 SdCO2 = 299 ft. (equivalent air thickness) i.e. Approx. 9-in. of standard concrete cover.

3.16.9 Water Vapor Diffusion: μH2O 2,146 Water Vapor Diffusion Resistance at 16 mils SdH2O = 2.6 ft. (0.8m)

3.16.10 Moisture Vapor permeability (ASTM E96) 14.5 perms

3.16.11 Tensile Properties (ASTM D-412 Modified)

3.16.12 7 day-Tensile strength 190 psi (1.3 MPa) - Elongation at break 820% - 340% @ 0°F (-18°C)

3.16.13 Crack Bridging (at 16 mils = 400 microns DFT

3.16.14 Static (at –4°F/-20°C) 30 mils (0.75mm)

3.16.15 Dynamic>1000 cycles (at –4°F/-20°C) 12 mils (0.30mm)

3.16.16 Resistance to wind driven rain (TT-C-555B): No passage of water through coating

3.16.17 Weathering (ASTM G-23) 10,000 hours excellent, no chalking or cracking.

3.16.18 Solids Content: by weight – 62% by volume – 55%

3.16.19 Flame Spread and Smoke Development (ASTM E-84-94)

3.16.20 Flame Spread 5 Smoke Development 5 Class Rating A

Note: Tests above were performed with the material and curing conditions @ 71°F – 75°F and 45-55% relative humidity.

Building substrate to which the encapsulant coating is to be applied must be clean, sound, and free of surface contaminants. Remove dust, laitance, grease, oils, curing compounds, form release agents and all foreign particles by mechanical means. Substrate shall be in accordance with ICRI Guideline No. 03732 for coatings and fall within CSP1 to CSP3.

The Contractor shall stir materials to ensure uniformity using a low speed (400-600 rpm) drill and paddle. To minimize color variation, blend two batches of material. For small defects and cracks the Contractor shall apply Surface Filler by "Brush Grade" encapsulant generously over the center of the cracks. The Contractor shall feather material over a two-inch wide area and allow a minimum 24 hours to cure before overcoating. For large defects and cracks (cracks >20mils) the Contractor shall blow out the cut with oil-free compressed air and fill the crack with joint sealant conforming to specifications allowing for a small crest to remain as this will compensate for any shrinkage that might occur. The Contractor shall allow 24 hours-minimum cure before over coating with encapsulant.

For the final coating application, the Contractor shall apply by brush or roller over the entire area to be encapsulated by moving in one direction. The Contractor shall apply a minimum of two coats. Each coat should be applied at a rate not to exceed 100 sq. ft. per gallon. The total dry film thickness shall be minimum 8 - 10 dry mils per coat. Allow a minimum of 2 hours prior to re-coating. When applying the coating, never stop the application until the entire surface has been coated. Always stop application at an edge, corner, or joint.

3.17 Waste Disposal

If the Contractor chooses to store soil onsite prior to transport offsite for disposal, the Contractor shall construct a secured Waste Storage Area at a location agreed to by the Contractor and the PCB Engineer within contract limit lines. The contract limit lines are to be secured as described elsewhere in these specifications and entry shall be limited to Contractor Personnel only. The Waste Storage Area shall enclose all Suitable Waste Storage Containers actively in use with temporary fencing. The fence shall be marked with a Large M_L mark as specified in 40 CFR Part 761 Subpart C.

Unless otherwise specified by the Owner, all removed materials and debris resulting from execution of this work shall become the responsibility of the Contractor and removed from the premises. Materials not scheduled for reuse shall be removed from the site and disposed of in accordance with all applicable Federal, State and Local requirements.

Waste removal dumpsters and cargo areas of transport vehicles shall be lined with a layer of six (6) mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first, and shall be extended up sidewalls 12-inches. Wall sheeting shall overlap floor sheeting 24-inches and shall be

taped into place. A single liner may be employed as long as it entirely covers the interior of the waste container.

All containers used to transport PCB Waste for disposal must be marked with a Large ML mark as specified in 40 CFR Part 761 Subpart C. The signs must be posted so that they are plainly visible.

Ensure all waste containers (bags, etc.) are properly packed, sealed and labeled with USEPA and USDOT shipping labels. For each shipment of PCB Waste, the Contractor shall complete a PCB waste shipment manifest.

Authorized representatives signing waste shipment records on behalf of the generator must have USDOT Shipper Certification training in accordance with HMR 49 CFR Parts 171-180.

Transport vehicles hauling PCB Waste shall have appropriate USDOT placards visible on all four (4) sides of the vehicle.

The Contractor shall dispose of PCB Waste at a TSCA-permitted facility.

Any PCB Waste materials which also contain other hazardous contaminants shall be disposed of in accordance with the EPA's Resource Conservation and Recovery Act (RCRA), CTDEP and ConnDOT requirements. Materials may be required to be stored on-site and tested by the Project Monitor to determine proper waste disposal requirements.

3.18 Decontamination

The Contractor shall decontaminate all moveable equipment that contact PCB Wastes in accordance with the procedures specified in §761.79(c). The Contractor shall not remove any equipment from the Contaminant Zone until it has been properly decontaminated.

Specifically, the Contractor shall employ double wash/rinse procedures as specified in 40 CFR Part 761 Subpart S or swab non-porous surfaces that have contacted PCB wastes with a solvent as specified in §761.79(c)(2)(i). The Contractor shall segregate all liquid waste streams and be responsible for characterizing these wastes for disposal purposes. Solid wastes generated during decontamination shall be stored for disposal with the other PCB wastes generated during remediation activities.

The PCB Engineer shall be responsible for ensuring that decontamination procedures are followed and that wastes are appropriately characterized and disposed of properly.

3.19 Project Closeout Data:

Provide the Owner and PCB Engineer, within 30 days after PCB Waste has been disposed of, a compliance package; which shall include, but not be limited to, the following:

3.19.1 Site Supervisor job log;
3.19.2 Completed waste shipment records.

The Contractor shall submit the original completed waste shipment records to the PCB Engineer.

3.20 Method of Measurement:

No measurement will be made for the abatement work in this Section. The completed work shall be paid as a lump sum. The lump sum bid price for PCB abatement shall include the specialty services of the PCB Removal Contractor including: labor, materials, equipment, insurance, permits, notifications, submittals, personal air sampling, personal protection equipment, temporary enclosures, utility costs, incidentals, fees and labor incidental to the removal of PCB Wastes, including close out documentation.

Measurement for payment for waste disposal will be on a per ton basis. The unit price for PCB Bulk Product Waste Disposal shall include providing adequate containers for storage of PCB wastes until they are removed from the site and the transport and disposal of these materials at a TSCA-permitted facility. Payment for the disposal of PCB Bulk Product Waste disposal shall be made when the Contractor submits manifests with the mass of waste disposed and signed by the receiving facility and the Certificates of Disposal provided by the waste disposal facility for each manifested load to the Engineer. Once the manifest and Certificate of Disposal has been received, the Owner shall make payment to the Contractor.

Deducts from payment for containments without negative pressure will be made on a per containment basis. The deduct cost shall account for construction of containment as described in this section without the negative pressure generating air handling units and HEPA filtration of discharge air.

Pay Item	Pay Unit
PCB Abatement	Lump Sum
PCB Waste Disposal	Per Ton

Unit Price Schedule – Additional or Reduced PCB Abatement

This schedule applies only to items beyond the scope specified in the Contract Documents or if there is a reduction in the scope of work or the requirements of the work. Costs associated with the use of unit price items is inclusive of all labor, equipment, materials, and overhead and profit.

Item	Item Description	Unit	Add/Deduct Cost
1	Containment Area – Set up of containment area (up to 400 square feet area) as described in these specifications.	EA	$1,300
2	Containment Area – Set up of containment area (up to 400 square feet area) as described in these specifications except for installation of equipment used to create and maintain negative pressure.	EA	$1,100
3	PCB Contaminated caulk abatement with removal of 6" of building materials on either side of the caulked joint.	LF	$4.73
4	PCB Contaminated caulk abatement with removal of 12" of building materials on either side of the caulked joint	LF	$8.78
5	PCB Contaminated caulk abatement with no removal of building materials	LF	$3.15
6	Removal of door and contaminated caulk	EA	$125

SECTION 033000 - CONCRETE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work of this section.

1.2 DESCRIPTION OF WORK

A. The extent of concrete work is shown on drawings.

Related sections include the following:

Concrete Walks and Ramps:	Division 2 and 3
Reglets for masonry anchors:	Division 4
Steel stair nosing:	Division 5
Bituminous Dampproofing:	Division 7
Reinforced masonry:	Division 4

1.3 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. American Concrete Institute (ACI):

   ACI 117-90 Standard Specifications for Tolerances for Concrete Construction and Materials

   ACI 301-99 Specifications for Structural Concrete

   ACI 303.1-97 Standard Specifications for Cast-in-place Architectural Concrete

   ACI 306.1-90 Standard Specifications for Cold Weather Concreting

   ACI 318-02 Building Code Requirements for Reinforced Concrete and Commentary

2. For additional detailed information and recommendations on concrete and concreting, consult the following ACI standard practice and guide documents for procedures and practices:

   ACI 211.1-91 Standard Practice for Selecting Proportions for Normal, Heavyweight & Mass Concrete

   ACI 211.2-98 Standard Practice for Selecting Proportions for Structural Lightweight Concrete

ACI 302.1R-96 Guide for Concrete Floor and Slab Construction

ACI 305R-99 Hot Weather Concreting

ACI 308.1-98 Standard Specification for Curing Concrete

ACI 309R-96 Guide for Consolidation of Concrete

ACI 311.4R-00 Guide for Concrete Inspection

ACI 315-99 Details and Detailing of Concrete Reinforcement

ACI 347-01 Guide to Formwork for Concrete

3. American Society for Testing and Material (ASTM):

ASTM C94 Test Method for Compressive Strength of Cylindrical Concrete Specimens

ASTM C150 Specification for Portland Cement

ASTM C260 Specification for Air-Entraining Admixtures for Concrete

ASTM C309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C494 Specification for Chemical Admixtures for Concrete

ASTM A775 Specification for Epoxy-Coated Reinforcing Steel Bars

4. Concrete Reinforcing Steel Institute (CRSI)

CRSI Manual of Standard Practice, Latest Edition

B. Workmanship: The Contractor is responsible for correction of concrete work which does not conform to the specified requirements, including strength, tolerances and finishes. Correct deficient concrete as directed by Architect.

C. Concrete Testing Service: At the Contractor's expense, employ a testing laboratory acceptable to Architect to perform material evaluation tests and to design concrete mixes.

D. Materials and installed work may require testing and retesting, as directed by Architect, at anytime during progress of work. Allow free access to material stockpiles and facilities. Tests, not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

E. Material manufacturers shall be ISO 9001/9002 registered or provide proof of documented quality assurance system. Quality system must be certified by an independent auditing

registrar who is accredited by the American National Standards Institute, Registrar Accreditation Board (ANSI-RAB) or by another internationally recognized body. ISO 9001/9002 certification shall be included with material submittals.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement, coatings on reinforcement, forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, mineral oxide coloring ingredients, chemical floor hardeners, vapor retarders, and others as requested by Architect.

B. Shop Drawings; Reinforcement: No part of structure shall be fabricated or installed unless shop drawings have been reviewed and not required to be submitted by the Architect and Engineer. Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required and openings through concrete structures and construction joints. Show wall reinforcing in elevations, in addition to sections.

C. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.

D. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test as specified. Submit test results for water soluble chloride tests of all concrete mixes, tested at 28 to 45 days of age, if tests of aggregate indicate total chlorides in excess of 0.15% of the weight of cement.

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. Materials include, but are not limited to cement, sand, aggregate, admixtures, reinforcement and coatings on reinforcement. Submit proof of C.R.S.I. plant certification for the producer of epoxy coated reinforcement. Submit each manufacturer's ISO 9001/9002 Registration Certificate.

F. Mock Up: Produce a mock-up not less than 8 feet high and 6 feet wide of architectural concrete showing all reglets, chamfers, form ties, finishes, etc. If accepted by Architect, the test panel will remain as the standard for acceptance of the work. Replace mock-ups until the Architect is satisfied with the results.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest to minimize number of joints and to conform to joint system shown on

drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form", Class I (for exterior surfaces of foundation walls exposed to view).

B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Cylindrical Columns and Supports: Form round-section members with metal, fiberglass reinforced plastic, or paper or fiber tubes. Forms for columns exposed to view shall produce a smooth, uniform surface similar to HDO plywood, free of marks from spirals or seams in formwork. For round columns and piers not exposed to view, construct paper or fiber tubes of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. In all cases, provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation.

D. Form Coatings: Provide 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, such as sealants or damp proofing. Provide such as "Crete-Lease 880 VOC" by Cresset Chemical Company or accepted equal, a non-staining liquid chemical release agent which will not leave any kerosene, oil, or wax residue to interfere with bonding of sealants and damp proofing material.

E. Form Ties: Steel wire snap ties with positive break backs which will leave no metal closer than 1-1/2" from formed surface of concrete, leaving a cone-shaped recess.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A-615, Grade 60, deformed. (Provide low alloy steel deformed bars conforming to ASTM A-706 for all bars that are to be welded).

B. Supports for Reinforcement: Provide supports for reinforcement including 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, unless otherwise acceptable.

C. For slabs-on-grade/and footings use concrete bricks of correct height.

D. 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 1).

2.3 CONCRETE MATERIALS

A. Portland Cement: ANSI-ASTM C 150, Type I/II, unless otherwise acceptable to Architect, without integral air entraining agent. Use one brand of cement throughout project, unless

otherwise acceptable to Architect.

B. Ground Granulated Blast Furnace Slag: ASTM C 989 (Grade 120). Blend of slag and cement shall provide for medium heat of hydration and moderate sulfate resistance. Newcem, by Atlantic Cement Company.

C. Normal Weight Aggregates: Conforming with ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

D. Lightweight Aggregates: Conforming to ASTM C 330.

E. Water: Clean, fresh, potable, free of substances injurious to concrete.

F. Calcium chloride will not be permitted in any concrete. Maximum water-soluble chloride content in concrete, in percent by weight of cement, when tested at 28 to 45 days of age, shall not exceed 0.15 for sidewalks and other concrete exposed to salts in service, or 0.30 for all other concrete.

G. Fine Aggregate for pumped concrete shall conform to ASTM C 33 except a minimum of 15% shall pass the #50 sieve and the Fineness Modulus shall range between 2.3 to 2.6.

H. Admixtures: Each admixture to be compatible with all other required admixtures. Admixtures to be supplied by the same manufacturer, unless acceptable to the Architect.

1. Air-Entraining Admixture: Provide admixture conforming to ASTM C 260. Provide one of the following:

"Daravair or Darex II AEA"	W.R. Grace & Co.
"MB-VR or MB-AE"	Master Builders, Inc.
"AEA-92 and Air Mix 200"	The Euclid Chemical Co.

2. Water-Reducing Admixture: Provide admixture conforming to ASTM C494, Type A, and containing not more than 0.05 percent chloride ions. Provide one of the following:

"WRDA with Hycol"	W.R. Grace & Co.
"Pozzolith 200N or 220N"	Master Builders, Inc.
"Eucon WR 75 or Eucon WR 91"	The Euclid Chemical Co.

3. Mid-Range Water-Reducing Admixture: ASTM C494, Type A and F and containing not more than 0.05 percent chloride ions. Provide one of the following:

"Daracem 55"	W.R. Grace & Co.
"Polyheed or Polyheed 997"	Master Builders, Inc.
"Eucon MR"	The Euclid Chemical Co.

4. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C494, Type F or Type G and containing not more than 0.05 percent chloride ions. Provide one of the following:

"Daracem 100 or Adva Flow"	W.R. Grace & Co.

"Rheobuild 1000"	Master Builders, Inc.
"Eucon 37"	The Euclid Chemical Co.

5. Non-Chloride, Non-Corrosive Accelerating Admixture: The admixture shall conform to ASTM C494, Type C or E, and not contain 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 a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures. Provide one of the following:

"Daraset or Polarset"	W.R. Grace & Co.
"Pozzolith NC 534 or Pozzutec 20"	Master Builders, Inc.
"Accelguard 80"	The Euclid Chemical Co.

6. Water-Reducing, Retarding Admixture: ASTM C494, Type D, and contain not more than 0.05 percent chloride ions. Provide one of the following:

"Daratard 17"	W.R. Grace & Co.
"Polyheed RI or Pozzolith 100-XR"	Master Builders, Inc.
"Eucon Retarder 75"	The Euclid Chemical Co.

7. Distributed Synthetic Fiber Reinforcement: Subject to compliance with requirements, provide one of the following:

"Grace Strux Fiber"	W.R. Grace & Co.

8. 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.

9. Prohibited Admixtures: Calcium chloride thiocyanates or admixture containing more than 0.05 percent chloride ions are not permitted. The effects of admixtures containing chlorides are to be included within the water-soluble chloride limits in this section.

2.4 RELATED MATERIALS

A. Reglets: Provide stainless steel reglets cast into the construction. Provide Heckmann No. 231 "Stay-Put" foam-filled reglets, 26 gage, stainless steel (1/2" x 1-1/2" slot, slope 1-3/4", and 1/4" anchorage flanges).

B. Vapor Barrier/Retarder: Provide a vapor barrier/retarder cover, joints sealed with manufacturer's associated tapes, adhesives or fasteners, over prepared base material for all interior slabs on ground. Plastic materials shall be in accordance with ASTM E 1745-97 Class A (Plastic), ASTM E 154-88 and ACI 302.1R-96. Installation shall be in accordance with ASTM E 1643-98. Materials to have maximum W.V.T.R. (permeance) of 0.04 perms; puncture resistance in accordance with ASTM D 1709; and tensile strength in accordance with ASTM D 882 and D 828. Subject to compliance with requirements, provide on of the following:

"STEGO WRAP"	Stego Industries LLC

"Premoulded Membrane Vapor Seal with Plastic Core"	W.R. Meadows
"ZERO PERM"	Alumiseal Corporation

C. Non-Shrink, Non-Metallic Grout: The non-shrink grout shall be a factory pre-mixed grout 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 the grout when placed at a fluid consistency shall achieve 95% bearing under a 4" x 4" base plate. Subject to compliance with requirements, provide one of the following:

"Masterflow 713 or 928 Grout"	Master Builders, Inc.
"Five Star Grout "	U.S. Grout Corp.
"NS Grout"	The Euclid Chemical Co.

D. High Flow Grout: Where high fluidity and/or increased placing time is required, use high flow grout. The factory pre-mixed grout 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 the grout when placed at a fluid consistency shall achieve 95% bearing under an 18" x 36" base plate. Subject to compliance with requirements, provide one of the following:

"Masterflow 928"	Master Builders, Inc.
"Hi-Flow Grout"	The Euclid Chemical Co.
"Masterflow 816 Cable Grout"	Master Builders, Inc.

E. Liquid Hardener/Densifier: The liquid densifier compound shall be a siliconate based sealer which penetrates concrete surfaces, increases abrasion resistance and provides a low-sheen surface. Subject to compliance with requirements, provide one of the following products, or approved equal:

"Euco Diamond Hard"	The Euclid Chemical Co.
"Chem Hard"	L&M Construction Chemicals, Inc.

F. Non-slip Aggregate Finish: Provide fused aluminum oxide grits, or crushed emery, as abrasive aggregate for non-slip finish with emery aggregate containing not less than 40% aluminum oxide and not less than 25% ferric oxide. Use material that is factory-graded, packaged, rust-proof and non-glazing, and is unaffected by freezing, moisture and cleaning materials.

G. Waterstop: Provide continuous, field spliceable waterstops where indicated on the drawings. Subject to compliance with requirements, provide one of the following:

1. Flexible PVC waterstops shall have continuous wires molded integral to the PVC for mechanical anchorage. Provide "Wirestop", by Paul Murphy Plastics.

2. Preformed Swelling Gasket Waterstop: Continuous, preformed, bar of flexible

hydrophilic material that provides controlled and reversible swelling on contact with water, along with associated sealants, adhesives, and fasteners. The waterstop shall not contain clay materials. Subject to compliance with requirements, provide one of the following or approved equal:

"Duroseal Gasket Waterstop"	BBZ USA, Inc.
"Adeka Ultra Seal MC-2010MP"	Unique Technologies, Inc.

H. Curing Materials:

1. Moisture-retaining cover shall be made of sheet materials for curing concrete, shall be white, and shall conform to ASTM C 171.

2. Waterproof paper: 2-layer laminated paper, with a bituminous inner layer and embedded fiber scrim.

3. Polyethylene Film: New film, not less than 4 mil average thickness, not less than 3 mils thickness at any point.

4. Absorptive Cover: Plastic-coated Burlap cloth made from jute, weighing approximately 10 oz. per sq. yd., complying with AASHTO M 182, Class 2. "Burlene", by Max Katz Bag Co.

5. Liquid membrane for curing concrete shall be compatible with adjacent materials. Provide a liquid membrane curing compound, conforming to U.S. Army Corps of Engineers CRD-C 300, for all exposed concrete. Remove curing compound mechanically from floors to receive terrazzo tile, or adhesive-bonded finishes. "Cure and Seal" products are not permitted.

2.5 BONDING MATERIALS:

A. Bonding Compound – The compound shall be a polyvinyl acetate type. Subject to compliance with requirements, provide one of the following:

"Flex-Con"	The Euclid Chemical Co.
"Daraweld C"	W. R. Grace & Co.
"SBR Latex"	The Euclid Chemical Co.

B. Epoxy Adhesive: ASTM C 881, two (2) components, 100% solids, 100% reactive compound suitable for use on dry or damp surfaces. Subject to compliance with requirements, provide one of the following:

"Sikadur Hi-Mod"	Sika Chemical Corp.
"Euco #452 or #620 Epoxy"	The Euclid Chemical Co.
"Thiopoxy"	W.R. Grace & Co.

C. Underlayment Compound: Free-flowing, self-leveling, pumpable cementitious base compound. Subject to compliance with requirements, provide the following:

"Flo-Top"	The Euclid Chemical Co
"Ardex"	Ardex Co.
"Underlayment 110"	Master Builders

2.6 PROPORTIONING AND DESIGN OF MIXES

A. Preparation of Design Mixes: 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 318-02. Submit mix designs on each class of concrete for review.

1. If previously used mixes are submitted, all materials shall be from the same sources and with the same brand names as the previously utilized mix.

2. If trial batches are used, the mix design shall be prepared by an independent testing laboratory and shall achieve an average compressive strength 1200 psi higher than the specified strength. This over-design shall be increased to 1400 psi when concrete strengths of 5000 psi or more are used.

3. The proposed mix designs shall be accompanied by complete standard deviation analysis or trial mixture test data.

B. The testing facility shall not be the same as used for field quality control testing.

C. Submit each proposed mix design to the Architect for review at least 7 days prior to the pre-concrete conference. Do not begin concrete production until Architect has reviewed and accepted the mix designs.

D. Design mixes to provide normal weight concrete with the strengths and properties indicated on the drawings and in specifications.

E. 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 must be submitted to and accepted by Architect before using in work.

F. Admixtures:

6. Use water-reducing admixture, mid-range water reducer, or high range water-reducing admixture (superplasticizer) in all concrete as required for placement and workability.

7. Use non-corrosive, non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50°F (10°C).

8. Use air-entraining admixture in all concrete exposed to freezing and thawing deicer chemicals. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or-minus 1-1/2 percent within following limits:

a) 6.0 percent for 3/4" maximum size aggregate.

G. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

H. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps slabs and sloping surfaces: Not more than 3".

2. Reinforced foundation systems: Not less than 4" and not more than 6".

3. Concrete containing HRWR admixture (superplasticizer): Not more than 8" unless otherwise approved by the architect. The concrete shall arrive at the job site at a slump of 2" to 3", be verified, then the high-range water-reducing admixture added at site to increase the slump to the approved level.

4. Other Concrete: Not less than 3" or more than 5".

2.7 CONCRETE CLASSES

Class A: Required 28-day compressive strength of all normal weight concrete shearwall footings & walls, foundation braces, grade beams, slabs-on-grade, sidewalks, exposed basement walls, retaining walls, exposed columns and at cast-in-place beams: 4000 psi.

Class B: Required 28-day compressive strength at all other concrete elements: 3000 psi

Class C: Required 28-day compressive strength of all light weight concrete for all supported slabs 4000 psi

2.8 CONCRETE MIXING

A. Job-Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd., or fraction thereof.

B. Provide batch ticket for each batch used in work, indicating project identification, date, class of concrete, mix time, quantity, and weights of all ingredients in each batch, including amount of water introduced.

C. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as herein specified.

1. Delete the references for allowing additional water to be added to the batch for material with insufficient slump. Addition of water to the batch will not be permitted.

2. 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.

3. When air temperature is above 85 degrees F, reduce the mixing and delivery time from 1-1/2 hours to 60 minutes.

PART 3 - EXECUTION

3.1 FORMS

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms complying with ACI 347 to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, 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 of cement paste.

D. Provide watertight joints in formwork for exposed concrete surfaces.

E. 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 easy removal.

F. Provide temporary openings where interior area of formwork is inaccessible for clean out, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

G. 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.

H. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

I. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is at least 1-1/2" inside concrete.

J. 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.

K. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement if required to eliminate mortar leaks and maintain proper alignment.

3.2 PLACING REINFORCEMENT

A. Comply with specified codes and standards, and 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, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement to obtain at least minimum coverage indicated 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.

F. At construction joints, no bar shall terminate within 60 diameters of joint; provide additional reinforcement as shown on drawings.

3.3 JOINTS

A. Construction joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Architect.

B. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings; keyed bulkheads designed for this purpose may be used for slabs.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints.

D. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous barrier in each joint. Make provisions to support and protect exposed waterstops during progress of work. Thoroughly clean and dry concrete surfaces prior to installing waterstops. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions.

E. Isolation Joints in Slabs on Ground: Construct isolation joints in slabs on ground at all points of contact between slabs on ground and vertical surfaces, such as foundation walls and

columns, and elsewhere as indicated.

F. Joint filler and sealant materials are specified in Division 7 of these specifications.

G. All contraction joints in exposed slabs-on-grade shall be made with saw cuts. The "Soff-Cut" saw shall be used to a depth of 1". A conventional saw shall be used as soon as possible without dislodging aggregate and to depth of 25% of slab thickness.

H. Keyed bulkheads designed for this purpose may be used only in approved areas of pedestrian traffic.

3.4 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. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

B. 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.

3.5 PREPARATION OF FORM SURFACES

A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

C. Forms to be thoroughly cleaned of all debris and free of all water, snow, or ice.

D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.6 CONCRETE PLACEMENT

A. Pre-placement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

C. General: Comply with ACI 304, and as herein specified.

D. Area excavated for footings shall be free of water or foreign materials when concrete is placed.

E. Notify Architect 48 hours prior to placing operations so that soil conditions at bottom of excavations, reinforcing and forms may be observed. No concrete shall be placed until such observations have been made and accepted or waived.

F. 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. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.

G. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with recommended practices of ACI 309.

H. 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.

I. 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.

J. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

K. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. No slab finishing operations, screeding, floating, nor troweling shall begin while there is any free water standing on the surface.

L. Maintain reinforcing in proper position during concrete placement operations.

M. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, 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 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F, and not more than 80 degrees F at point of placement. Avoid sudden drop of temperature during curing period.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt and other materials containing antifreeze agents.

N. Hot Weather Placing: When hot weather conditions exist that would 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 80 degrees F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.

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. Wet forms thoroughly before placing concrete.

4. Do not use retarding admixture unless otherwise accepted in mix designs.

5. Use evaporation retarder prior to and during finishing to avoid rapid drying of concrete surfaces while in a plastic state or during curing period.

3.7 FLOOR FLATNESS/LEVELNESS TOLERANCES

A. FF defines the maximum floor curvature allowed over 24 in. Computed on the basis of successive 12 in. (300 mm) elevation differentials, FF is commonly referred to as the "Flatness F-Number".

B. FL defines the relative conformity of the floor surface to a horizontal plane as measured over a 10 ft. (3.05 m) distance commonly referred to as the "Levelness F-Number".

C. 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).

D. 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.

E. All elevated slabs shall achieve the specified FL tolerance after the removal of the forms.

F. All slabs on metal deck shall achieve the specified FL tolerance after the concrete has set.

3.8 FINISH OF FORMED SURFACES

A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or by other construction, unless otherwise indicated; this is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched, fins and other projections exceeding 1/4" in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed to view or that are to be covered

with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system; this is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas, fins or other projections to be completely removed, smoothed and accepted by Architect.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 MONOLITHIC SLAB FINISHES

A. Concrete to be placed with as stiff a consistency as possible to prevent accumulation of free water on surface at any time.

B. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

1. After placing slabs, surface shall achieve an FF 25 and FL 20 tolerance (FL 17 for elevated slabs). Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.

C. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, 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. 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. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture. Surface shall achieve an FF 25 and FL 20 tolerance (FL 17 for elevated slabs).

D. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

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. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance and with a surface leveled to an FF25 and FL 20 tolerance (FL 17 for elevated slabs). Grind smooth surface defects, which would telegraph through applied floor covering system.

2. After curing, lightly work surface with a steel wire brush, or an abrasive stone, and water to expose non-slip aggregate.

E. Liquid Densifier: Apply liquid densifier on exposed interior floors subject to vehicular abrasion and so noted on the drawings. Application shall be made in strict accordance with the directions of the manufacturer and just prior to completion of construction. These areas must be cured with a continuous moist curing method approved by the Architect. The compound shall be applied no sooner than 28 days after slab placement and at a maximum coverage of 200ft2/gallon.

3.10 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures, and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

C. Curing Methods for Interior Slabs-on-grade and Slabs-on-metal-deck: Perform curing of concrete by moist curing and by moisture-retaining cover curing only as herein specified (DO NOT USE CURING COMPOUND). Maintain effective curing for minimum of 7 days.

D. Curing Methods for Exterior Sidewalk Slabs: Perform curing of concrete by moist curing, by moisture-retaining cover curing, curing compound and by combinations thereof as herein specified. Maintain effective curing for minimum of 7 days.

E. Provide moisture curing by following methods.

1. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 6" lap over adjacent absorptive covers.

2. Provide moisture-cover curing as follows: Cover concrete surfaces as soon as final finishing operations are complete (within 2 hours) with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 6" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

4. Do not use membrane curing compounds on interior surfaces and on surfaces which are to be covered with coating material applied directly to concrete such as liquid floor hardener, waterproofing, damp proofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to Architect.

F. Curing Formed Surfaces: Cure formed concrete surfaces, including underside 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.

G. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

3.11 SHORES AND SUPPORTS

A. Comply with ACI 347 for shoring and reshoring in multistory construction, and as herein specified.

B. Extend shoring from ground to roof for structures 4 stories or less, unless otherwise permitted.

C. Extend shoring at least 3 floors under floor or roof being placed for structures over 4 stories. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores. Space shoring in stories below this level in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.

D. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support work without excessive stress or deflection.

E. Keep reshores in place a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

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 degrees F 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, joists, slabs and other structural elements, may not be removed in less than 7 days and then only if reshores are employed. Determine potential compressive strength of inplace concrete by testing field-cured specimens representative of concrete location or members.

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 extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint 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 specified in contract documents. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

D. Grouts: Column base plates, equipment base plates and other locations noted on the drawings shall use the specified non-shrink, non-metallic grout. Where high fluidity and/or increased placing time are required us the specified high flow grout; this grout shall be used for all base plates larger than 10 square feet.

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 as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.15 CONCRETE SURFACE REPAIRS (Only as permitted by Architect separately for each occurrence)

A. Repair of Defective Areas.

1. With prior approval of the Architect, as to method and procedure, all repairs of defective areas shall conform to ACI 301, Chapter 9, except that the specified bonding compound must be used.

2. The specified polymer patching mortar may be used in lieu of the above-mentioned method when color match of the adjacent concrete is not required. Prior approval by the Architect is required.

3. All structural repairs shall be made with prior approval of the Architect, as to method and procedure, using the specified low shrinkage structural repair mortar or epoxy adhesive and/or epoxy mortar. Where epoxy injection procedures must be used, an approved low viscosity epoxy made by the manufacturers previously specified shall be used.

4. Leveling of floors for subsequent finished shall be achieved by use of the specified underlayment material.
5. All exposed floors shall be leveled, where required, with the specified self-leveling repair topping.

6. Repair methods not specified above may be used, subject to acceptance of Architect.

B. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

1. Cut out honeycomb, 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. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

D. Repair of Unformed Surfaces: 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, in addition to smoothness using a template having required slope.

1. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

3. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original

concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

4. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

5. Use epoxy-based mortar for structural repairs where directed by Architect.

6. Repair methods not specified above may be used, subject to acceptance of Architect.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. The Owner will employ a testing laboratory to perform tests and to submit test reports.

B. 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 for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

3. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure for normal weight concrete; one for each set of test specimens.

4. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens made.

5. Compression Test Specimens: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

6. Compressive Strength Tests: ASTM C 39; one set for each 50 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; one specimen tested at 7 days, two specimen tested at 28 days, and one specimen retained in reserve for later testing if required.

C. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

D. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and

curing the in-place concrete.

E. 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 by more than 500 psi.

F. Test results will be reported in writing to Architect and Contractor on same day that tests are made. Reports of compressive strength tests shall contain the project identification, 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.

G. 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 conducted, and any other additional testing as may be required, and extra engineering and architectural services related to evaluating the problem and developing and acceptable solution, when unacceptable concrete is verified.

H. The Contractor shall be responsible for scheduling with the testing laboratory, and shall provide free access for its personnel and labor required in helping to obtain and handle samples of concrete. He shall also provide and electrically heated covered box with automatic control to keep inside temperature between 60 and 80 degrees F, adequate to store the required number of concrete cylinders (12 minimum), to be placed in the box immediately after molding and kept there for 24 to 72 hours until delivery to the laboratory.

I. Flatness and Levelness: The owner will engage a Testing Service to measure the surface profile of the slabs using the procedures in ASTM E-1155, and report the results to the Architect.

3.17 CORRECTIVE WORK

A. Contractor shall bear all costs associated with corrective work resulting from errors or poor workmanship, including all extra engineering and architectural services related to evaluating the problem and developing an acceptable solution.

END OF SECTION 033000

SECTION 033001 – SITE CONCRETE WORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes for the following:

1. Concrete stairs and cheek walls.
2. Seat walls.

B. Related Section

1. Section 312000 Earth Moving

1.2 SUBMITTALS

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

B. Design Mixtures: For each concrete mixture.

C. Shop Drawings: For steel reinforcement and formwork. Material test reports and certificates.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

C. Form 816 - State of Connecticut Department of Transportation "Standard Specification for Road, Bridges, and Incidental Construction" 2004 edition shall be used for materials compliance and execution of the work in this section.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed.
   1. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

A. Concrete shall be Class "C" concrete conforming to Article M.03.01 of the Standard Specifications.

B. Water: potable.

C. Air-Entraining Admixture shall conform to Article M.03.01 of the Standard Specifications.

D. Concrete shall have a minimum compressive strength of 4000 psi.

2.4 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.6 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

3.4 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.6 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-

half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.7 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

3.8 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.9 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

1. Testing Services: Tests shall be performed according to ACI 301.

END OF SECTION 033001

SECTION 034500 - PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Architectural precast concrete units.

1.3 DEFINITION

A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

1.4 SUBMITTALS

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

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings: Detail fabrication of architectural precast concrete units. Indicate, plans, elevations, dimensions, shapes, and cross section. Indicate joints, reveals, and extent and location of each surface finish.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements.

1. Participates in PCI's plant certification program and is designated a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units or participates in APA's "Plant Certification Program for Production of Architectural Precast Concrete Products" and is designated an APA-certified plant.

B. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

C. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses which would cause cracking or damage.

PART 2 - PRODUCTS

2.1 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.2 REINFORCING MATERIALS

A. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 775/A 775M epoxy coated.

B. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, flat sheet, Type 1 bendable coating.

C. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.3 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.

B. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

C. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

D. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixtures: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017 M.

2.4 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Concrete Mixtures: Proportion full-depth mixture by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi minimum.
2. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.5 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly chamfered.

2.6 FABRICATION

A. Cast-in openings larger than 10 inches in any dimension. Do not drill or cut openings or prestressing strand without Architect's approval.

B. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.

1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
3. Place reinforcement to maintain at least 1-1/2-inch minimum coverage. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

C. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.

D. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

E. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.

1. Place backup concrete mixture to ensure bond with face-mixture concrete.

F. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.

1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

G. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

H. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

I. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.7 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

B. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with the following product tolerances:

1. Total Thickness or Flange Thickness: Plus 1/4 inch, minus 1/8 inch.
2. Dimensions of Architectural Features and Rustications: Plus or minus 1/8 inch.

2.8 FINISHES

A. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units as follows:
1. As-Cast Surface Finish: Provide surfaces free of pockets, sand streaks, and honeycombs.
2. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install architectural precast concrete level and plumb.

3.2 REPAIRS

A. Repair architectural precast concrete units if permitted by Architect. The Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

C. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.3 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

END OF SECTION 034500

SECTION 035416 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes hydraulic-cement-based underlayment for use below interior floor coverings.

B. Related Sections include the following:

1. Division 09 Sections for patching and leveling compounds applied with floor coverings.

1.3 SUBMITTALS

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

B. Manufacturer Certificates: Signed by manufacturers of both underlayment and floor covering system certifying that products are compatible.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

B. Product Compatibility: Manufacturers of both underlayment and floor covering system certify in writing that products are compatible.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature and humidity, ventilation, and other conditions affecting underlayment performance.

1. Place hydraulic-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

1.7 COORDINATION

A. Coordinate application of underlayment with requirements of floor covering products, including adhesives, specified in Division 09 Sections, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 HYDRAULIC-CEMENT-BASED UNDERLAYMENTS

A. Underlayment: Hydraulic-cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thicknesses of 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers that may be utilized include, but are not limited to, the following:

a. Ardex.
b. Bonsal, W. R. Company.
c. ChemRex.
d. Dayton Superior Corporation.
e. MAPEI Corporation.

2. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
3. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Water: Potable and at a temperature of not more than 70 deg F.

C. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance.

1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.
1. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035416

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Face brick.
3. Stone trim units.
4. Mortar and grout.
5. Reinforcing steel.
6. Masonry joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.
10. Cavity-wall insulation.

B. Related Sections include the following:

1. Division 07 Section "Bituminous Dampproofing" for dampproofing applied to cavity face of backup wythes of cavity walls.
2. Division 07 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
3. Division 07 Section "Penetration Firestopping" for firestopping at openings in masonry walls.
4. Division 07 Section "Fire-Resistive Joint Systems" for fire-resistive joint systems at heads of masonry walls.
5. Division 07 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.
6. Division 32 Section "Unit Paving" for exterior unit masonry paving.
7. Division 32 Section "Segmental Retaining Walls" for dry-laid, concrete unit retaining walls.

C. Products furnished, but not installed, under this Section include the following:

1. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 05 Section "Structural Steel Framing."

D. Products installed, but not furnished, under this Section include the following:

1. Steel lintels for unit masonry, furnished under Division 05 Section "Metal Fabrications."
2. Manufactured reglets and/or counterflashing in masonry joints for metal flashing, furnished under Division 07 Section "Sheet Metal Flashing and Trim."

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide concrete unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.

B. Determine net-area compressive strength (f'_m) of concrete masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.5 SUBMITTALS

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

B. Shop Drawings: For the following:
   1. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
   2. Special brick shapes: Show sizes, profiles, and locations of special brick shapes required.

C. Samples for Initial Selection: For the following:
   1. Face brick, in the form of straps of five or more bricks.
   2. Colored mortar.

D. Samples for Verification: For each type and color of the following:
   1. Special brick shapes.
   2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
   3. Stone trim.
   4. Weep holes/vents.

E. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

   1. Masonry units.
      a. For exposed brick, include material test report for efflorescence according to ASTM C 67.
      b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

   1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.

2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

G. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

H. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.6 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

C. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

1. Clay Masonry Unit Test: For each type of unit required, per ASTM C 67.
2. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
3. Mortar Test (Property Specification): For each mix required for clay unit masonry, per ASTM C 780.
4. Grout Test (Compressive Strength): For each mix required for concrete unit masonry, per ASTM C 1019.

D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup for typical exterior wall in sizes approximately 64 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.

   a. Include a sealant-filled joint at least 16 inches long.
   b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
   c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).

d. Include veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup.

2. Erect mockups adjacent and parallel to existing surface.
3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
4. Protect accepted mockups from the elements with weather-resistant membrane.
   a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 and the following:
   1. Provisions for Work in Progress:
      a. Ambient Temperature Above 40 deg F: Normal construction practice.
      b. Ambient Temperature Below 40 deg F or Temperature of Units Below 40 deg F: Heat mortar materials to produce mortar temperatures between 40 deg F and 120 deg F at time of mixing. Maintain mortar above freezing until used in masonry. If units have a temperature below 20 deg F, heat to above 20 deg F. Remove visible ice from units.
      c. Ambient Temperature Between 25 deg F and 20 deg F: Heat masonry under construction from both sides. Install wind breaks when wind velocities reach 15 mph.
      d. Ambient Temperature Below 20 deg F: Provide heated enclosure for masonry under construction and maintain temperature above 32 deg F within enclosure.

   2. Protection of Newly Completed Work:
      a. Mean Daily Temperature Above 40 deg F: Normal construction practice.
      b. Mean Daily Temperature Between 40 deg F and 25 deg F: Cover completed masonry with weather resistive membrane to protect from rain or snow for 24 hours after construction.
      c. Mean Daily Temperature Between 25 deg F and 20 deg 40 F: Cover masonry with insulating blankets or equivalent protection for 24 hours after construction.
      d. Mean Daily Temperature Below 20 deg F: Maintain temperature of masonry above 32 deg F for 24 hours after construction.

   3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602 and the following:
   1. Provisions for Work in Progress:
      a. Ambient Temperature Above 100 deg F or 90 deg F with an 8 mph wind: Provide necessary conditions and equipment to produce and maintain mortar having a temperature below 120 deg F. Flush mixer, mortar transport container, and mortar boards with cool water before they come into contact with mortar ingredients or mortar. Maintain mortar consistency by re-tempering with cool water. Use mortar within 2 hours of initial mixing.
      b. Ambient Temperature Above 115 deg F or 105 deg F with an 8 mph wind: Masonry work not permitted.

   2. Protection of Newly Completed Work:

a. Temperature Above 100 deg F or 90 deg F with an 8 mph wind: Fog spray newly constructed masonry until damp, at least three times a day until the masonry is three days old.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.3 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide bullnose units for outside corners, unless otherwise indicated.

B. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
2. Weight Classification: Lightweight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

C. Concrete Building Brick: ASTM C 55.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2500 psi.
2. Weight Classification: Normal weight.

2.4 MASONRY LINTELS

A. General: Provide masonry lintels complying with requirements below.

B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 BRICK

A. General: Provide shapes indicated and as follows:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
3. Provide lip bricks for lintels, unless otherwise indicated.
4. Provide bullnose units for outside corners used in the interior of the building, unless otherwise indicated.

B. Face Brick: ASTM C 216, Grade SW, Type FBA.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4500 psi.
2. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
3. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
4. Application: Use where brick is exposed, unless otherwise indicated.
5. Products:

   a. Redland Brick Inc.; Cushwa Plant, 172 Jamestown Orange

   b. Glen-Gery Brick; Molded Series 56-DD

   c. Watsontown Brick Co.; Pennsylvania Molded Series, Alverton

2.6 STONE STOOLS

A. Slate: Comply with ASTM C 629, Class II.

B. Finish: Honed.

C. Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints at right angles to faces.

2.7 STONE COPING

A. Slate: Comply with ASTM C 629, Class II.

B. Finish: Natural Cleft.

C. Color: Green

D. Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints at right angles to faces.

2.8 MORTAR AND GROUT MATERIALS

A. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

B. Colored Cement Product: Packaged blend made from portland cement and lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Formulate blend as required to match architect's sample.
2. Pigments shall not exceed 10 percent of portland cement by weight.
3. Available Products:

a. Colored Portland Cement-Lime Mix:

1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
2) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
3) Spec Mix Incorporated; PCL Sand Color.

C. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

D. Aggregate for Grout: ASTM C 404.

E. Water: Potable.

2.9 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.

3. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.
4. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
5. Wire Size for Veneer Ties: W2.8 or 0.188-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

D. Masonry Joint Reinforcement for Multiwythe Masonry:

1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod at each wythe of masonry 4 inches or less in width.
2. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

2.10 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
1. Hot-Dip Galvanized after Fabrication, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.
2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.

D. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
2. Tie Section for Steel Frame: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.188-inch- diameter, hot-dip galvanized steel wire.

E. Adjustable Masonry-Veneer Anchors

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

   a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.

2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.

   a. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, 2-3/4 inches wide by 3 inches high; with projecting tabs having slotted holes for inserting vertical legs of wire tie specially formed to fit anchor section.
   b. Fabricate sheet metal anchor sections and other sheet metal parts from 0.097-inch-thick, steel sheet, galvanized after fabrication.
   c. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188-inch- diameter, hot-dip galvanized steel wire.
   d. Available Products:

      1) Dayton Superior Corporation, Dur-O-Wal Division; D/A 213.
      2) Hohmann & Barnard, Inc.; HB-200
      3) Wire-Bond; RJ-711.

3. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 diameter by length required to penetrate steel stud flange with not less than 3 exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.

   a. Available Products:

      1) ITW Buildex; Teks Maxiseal with Climaseal finish.
      2) Textron Inc., Textron Fastening Systems; Elco Dril-Flex with Stalgard finish.

2.11 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide concealed metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual and as follows:
   1. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
   2. Metal Drip Edges: Fabricate from stainless steel. Extend 4 inches into wall with outer edge bent down 90 degrees and hemmed and inside edge turned up 90 degrees a minimum of ¼ inch.

B. Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:

1. Copper-Laminated Flashing: For use with masonry back-up, provide 7-oz./sq. ft. copper sheet with non-asphalt adhesive glass fabric laminated to each copper face. Use only where flashing is fully concealed in masonry.

   a. Available Products:

      1) Advanced Building Products Inc.; Copper Sealtite 2000.
      2) Sandell Construction Solutions; Copper Fabric Flashing NA.
      3) York Manufacturing, Inc.; York Multi-Flash 500.

2. Rubberized-Asphalt Flashing: For use with metal stud back-up, provide composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.

   a. Available Products:

      1) Advanced Building Products Inc.; Peel-N-Seal.
      2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
      3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier-44.
      4) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
      5) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
      6) Hohmann & Barnard, Inc.; Textroflash.
      7) Polyguard Products, Inc.; Polyguard 300.
      8) Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
      9) Williams Products, Inc.; Everlastic MF-40.

C. Solder and Sealants for Sheet Metal Flashings:

   1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.12 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

C. Weep/Vent Products: Use the following, unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

   a. Available Products:

      1) Advanced Building Products Inc.; Mortar Maze weep vent.
      2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
      3) Heckmann Building Products Inc.; No. 85 Cell Vent.
      4) Hohmann & Barnard, Inc.; Quadro-Vent.
      5) Wire-Bond; Cell Vent.

D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

   1. Provide the following configuration:
      a. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.

E. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

   1. Available Products:

      a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
      b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
      c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
      d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.13 CAVITY-WALL INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, closed-cell product extruded with an integral skin.
   1. Thickness: 2-inch.

B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.14 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

   1. Available Manufacturers:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

2.15 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement and lime.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.
1. For concrete masonry and clay masonry below grade, use Type S.
2. For clay masonry above grade, use Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

2.16 SOURCE QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Clay Masonry Unit Test: For each type of unit furnished, per ASTM C 67.

C. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
   1. Verify that foundations are within tolerances specified.
   2. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

   1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

   1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
   2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

3.4 MORTAR BEDDING AND JOINTING

A. Lay concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

   a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.

2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement.

B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
1. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.

3.6 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.
2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Coat cavity face of backup wythe to comply with Division 07 Section "Bituminous Dampproofing."

D. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

a. Reinforcement above is in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.8 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.9 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing and to masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed tie sections in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install

additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

3.10 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:
   1. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick made from clay or shale as follows:
   1. Build in compressible joint fillers where indicated not less than 3/8 inch and recessed to allow for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants," but not less than 3/8 inch.

   1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.11 LINTELS

A. Install steel lintels where indicated or required.

B. Provide masonry lintels where indicated.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe.
3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under building paper or building wrap, lapping at least 4 inches.
4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

E. Install vents in head joints in exterior wythes at 24" o.c.. Use specified weep/vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.13 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.14 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.

E. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

F. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

3.15 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.16 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of structural steel work is shown on drawings, including 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 AISC "Code of Standard Practice" and as otherwise shown on drawings but excludes dunnage, catwalks, and miscellaneous items installed after the erection of the structure.

C. Miscellaneous metal fabrications include dunnage, catwalks, and other items are specified in Section 055110.

D. Shop primer of any steel called to be painted by the Architectural drawings and as specified in Division 9 of the specifications. Galvanizing of all exterior structural steel angles, plates or members supporting masonry, or shown or described in the contract documents is included in the work of this section.

E. Metal decks are specified in Section 053000.

F. Steel joists are specified in Section 052100.

1.3 QUALITY ASSURANCE

Codes and Standards: Comply with provisions of following, except as otherwise indicated. Certain sections in this specification contain requirements that are more restrictive and /or different than contained in the standards listed. In such cases, the requirements of this specification shall control.

A. AISC "Load and Resistance Factor Design Specification for Structural Steel Buildings" (1999)

B. AISC "Load and Resistance Factor Design Specification for Steel Hollow Structural Sections" (2000)

C. AISC "Code of Standard Practice for Steel Buildings and Bridges", March 7, 2000, except as noted. Fabrication shop shall be AISC certified for the type of work being performed.

1. Exception is taken to paragraph 1.8.2. In the first sentence, change the word "adequacy" to "design" so that the sentence reads, "The Structural Engineer of Record shall be responsible for the structural design of the structure in the completed project

2. Glossary Section. Delete the definition for Contract Documents in its entirety. Add the following as the definition for Contract Documents: "Refer to Specification Section 00401 General Conditions, AIA Document A201, Article 1 of the General Provisions in Section 1.1.1 for the definition of Contract Documents"

3. Glossary Section. Delete the definition for Design Drawings in its entirety. Add the following as the definition for Design Drawings: "Contract Documents as defined in Specification Section 00401 General Conditions AIA Document A201, Article 1 of the General Provisions in Section 1.1.1."

4. Exception is taken to section 3.1. In the second paragraph, strike the words "with sufficient dimensions" and "accurately". Delete section (a) in its entirety and add the following: "(a) The size, section, and material grade of all members;". In section (f), delete "3.1.6" and replace with "3.1.5".

5. Exception is taken to section 3.2. Delete the first and second sentence in its entirety and add the following: "The architectural Design Drawings shall be utilized in conjunction with the structural drawings in developing dimensions for shop details and drawings. All requirements for the quantities and sizes of Structural Steel shall be shown or noted in the structural Design Drawings. Architectural, electrical and/or mechanical Design Drawings shall be utilized as a supplement to the structural Design Drawings for the purposes of defining detail configurations and construction information."

6. Article 4.4. Delete the second sentence in its entirety and add the following: Reference Specification Section 01330 for Submittal Procedures.

D. U.S. Army Corps of Engineers:

1. CRD-C621, Specification for Non-Shrink Grout

E. American Society for Testing and Materials (ASTM):

1. ASTM A992-04a Standard Specification for Steel for Structural Shapes for Use in Building Framing.

2. ASTM A36/A 36M-05: Specification for Structural Steel.

3. ASTM A123/A 123M-02: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

4. ASTM A153-05: Standard Specification for Zinc (Hot-Dip Galvanized Coatings) on Iron and Steel Hardware.

5. ASTM A325-04b: Standard Specification for High Strength Bolts for Structural Steel Joints.

6. ASTM A490-04a: Standard Specification for High-Strength Bolts for Structural Steel Joints

7. ASTM A563-04a: Standard Specification for Carbon and Allow Steel Nuts

8. ASTM F436-04: Standard Specification for Hardened Steel Washers

9. ASTM F1852-05 Standard Specification for Twist Off Type Tension Control Structural Bolt/Nut/Washer Assemblies

10. ASTM A500-03a: Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

11. ASTM A572/A 572M-04: Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality.

12. ASTM F1554-04: Standard Specification for Anchor Bolts, Steel 30, 55 and 105 KSI Yield Strength.

F. American Welding Society (AWS):

1. AWS D1.1-00: Structural Welding Code - Steel.

2. AWS D1.4-98: Structural Welding Code – Reinforcing Steel

3. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

4. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.

5. If recertification of welders is required, retesting will be Contractor's responsibility.

G. Federal Specifications (Fed. Spec.)

1. Fed. Spec. TT-P-645: Primer, Paint, Zinc Chromate, Alkyd Type; unless other required by a paint system in Division 9.

H. Steel Structures Painting Council (SSPC):

1. SSPC SP-3: Power Tool Cleaning.

2. SSPC SP-6/NACE 3: Commercial Blast Cleaning.

1.4 SUBMITTALS

A. Shop Certification: Submit a copy of the current AISC Certification of the fabrication shop. The shop shall be certified for the complex building structures in accordance with the requirements of the project.

B. Product Data: Submit producer's or manufacturer's specifications and installation instruction for following products. Include laboratory test reports and other data to shown 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, and certification that nuts are manufactured for specifications of supplied bolt.

3. Anchor bolts (each type).

4. Structural steel primer paint.

5. Shrinkage-resistant grout.

6. Weld electrode: Product literature and certified test reports indicating conformance with the requirements of Part 2.1(I).

C. Shop Drawings: 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.

1. Include details of cuts, connection, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.

2. Provide setting drawings, templates and directions for installation of anchor bolts and other anchorages to be installed by others.

D. Connection Design: Submit shop standards for connections to be used in the preparation of shop drawings.

1. For connections of lateral braced frames, submit computations signed and sealed by a Professional Engineer licensed in the state of Connecticut.

2. For connections at steel trusses, submit computations signed and sealed by a Professional Engineer licensed in the state of Connecticut.

E. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results.

F. Galvanizing: Submit notarized certificate of compliance with all specifications.

G. Certified Report of Survey: As noted under "Quality Control, Contractor's Responsibilities".

1.5 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 not to 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.

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.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Surfaces, General: For fabrication of 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. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

B. Structural Steel Tees and Wide Flange Shapes, ASTM A992 or A572 Grade 50 with special requirements, in conformance with AISC Technical Bulletin 3 dated March, 1997. Base plates, channels, angles, and miscellaneous plates: ASTM A36.

C. Cold-Formed Steel Tubing: ASTM A500, Grade B.

D. Steel Pipe: ASTM A53, Type E or S, Grade B.

E. Anchor Bolts: ASTM F1554, Grade 55, with weldability supplement S-1 and Charpy impact requirements at +40° F Supplement S4. Provide headed type unless otherwise indicated. Ends projecting from concrete shall be color coded. Bolts utilized in exposed locations such as in exterior applications or exposed to moisture shall be stainless steel.

F. Provide hexagonal heads and nuts for all connections.

G. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325.

2. Tension control bolts conforming to ASTM F1852 may be used at Contractor's option.

H. Electrodes for Welding: Comply with AWS Code; E70XX low hydrogen and must be capable of delivering a minimum notch toughness of 20 ft.-lbs. at -20° F (or below) when tested in accordance with the applicable AWS A5 filler metal specification.

I. Structural Steel Primer Paint: As specified in Division 9 of the specifications.

J. Non-Shrink, Non-Metallic Grout: The non-shrink grout shall be a factory pre-mixed grout 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 the grout when placed at a fluid consistency shall achieve 95% bearing under a 4" x 4" base plate. Subject to compliance with requirements, provide one of the following:

"Masterflow 713 or 928 Grout"	Master Builders, Inc.
"Five Star Grout "	U.S. Grout Corp.
"NS Grout"	The Euclid Chemical Co.

K. Special Fasteners: HIT-TZ Threaded Rods with HIT HY 150 / HIT-ICE Injection Adhesive Anchoring System for fastening to solid concrete and concrete filled masonry, HIT-A Threaded Rods and screen tubes with HIT HY 20 Adhesive Anchoring System for fastening to hollow masonry, reinforcing bar dowels with HIT RE 500 Injection Adhesive Anchoring System for fastening into solid concrete or concrete filled masonry, and HDA Undercut Anchors for fastening into solid concrete: Provide as shown on drawings and subject to compliance with requirements of Hilti Corporation, Tulsa, OK, or approved equal. According to applications, anchor rods and dowels shall conform to one of the following: ASTM A36; ASTM A510; ASTM A193 and Grade B7 (Type 2), ASTM F593 (AISI 304 or AISI 316) Condition CW "Stainless"; ASTM A615 or A706, Grade 60 reinforcing dowels. See contract drawings for types and locations. Rods utilized in exposed locations such as in exterior applications or exposed to moisture shall be stainless steel.

2.2 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 AISC Specifications and as indicated on final shop drawings. Provided camber in structural members where indicated.

B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

C. 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.

D. Connections: Weld or bolt shop connections, as indicated.

E. Bolt field connections, except where welded connections or other connections are indicated.

F. 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.

G. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts".

H. Welded Construction: Comply with AWS D1-95 Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

I. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

J. Holes for Other Work: 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.

K. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

L. Galvanizing: All steel or iron specified and/or noted as "galvanized" shall be coated by the hot-dipped process in the molten zinc, with a continuous coating of uniform thickness free from injurious defects, flux or uncoated spots. Average coating shall be not less than 2 oz. per square foot of surface. All items of work noted or specified to be galvanized shall be hot-dipped galvanized after fabrication in compliance with ASTM A123, or A153, as applicable. Where size of assembly is too large for galvanizing, only these assemblies will be galvanized prior to fabrication.

1. All galvanized material 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.

2. To minimize surface imperfections (e.g.: 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.

3. After galvanizing all material must be chromated by dipping material in a 0.2% chromic acid solution. (Omit if surface is to be painted, but provide air cooling to avoid surface contaminants.)

4. Field welding to Galvanized Steel: Prior to field welding connection, Zinc coating at all weld connection areas (faying surfaces) shall be removed by burning with oxygen fuel gas torch or by shot blasting. Damaged or field-welded surfaces exposed to

moisture shall be thoroughly cleaned by wire-brushing and receive two brushed-on coats of cold galvanizing compound.

2.3 SHOP PAINTING

A. General: Shop paint structural steel at locations shown in Architectural drawings and as specified in Division 9 of the specifications.

1. Do not paint surfaces which are to be welded or high-strength bolted with "Slip-Critical" friction-type connections.

2. Do not paint surfaces which are scheduled to receive sprayed-on fireproofing or galvanizing.

3. Apply 2 coats of paint to surfaces which are inaccessible after assembly or erection or as directed per Division 9 of the specifications. Change color of second coat to distinguish it from first.

4. Surface Preparation: After inspection and before shipping, clean steelwork to be shop primer painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:

   a. Typical interior framing: Utilize SSPC SP-3 "Power Tool Cleaning".

   b. Exposed Interior framing: Utilize SSPC SP-6/NACE 3: Commercial Blast Cleaning.

5. Painting: Immediately after surface preparation (unless otherwise noted in Architectural drawings and Division 9 of the specifications), apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.

PART 3 - EXECUTION

3.1 ERECTION

A. Surveys: Employ a registered professional engineer or 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. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

E. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.

F. Refer to Section 3 of these specifications for anchor bolt installation requirements in concrete, and Section 4 masonry installation.

G. Setting Bases and Bearing Plates: 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.

H. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

I. Tighten anchor bolts 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.

J. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow curing.

K. For proprietary grout materials, comply with manufacturer's instructions.

L. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

M. Level and plumb individual members of structure within specified AISC tolerances.

N. 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.

O. Splice members only where indicated and accepted on shop drawings.

P. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

Q. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

R. Do not enlarge unfair holes in members by burring or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

S. 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 not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

T. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

1. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

2.4 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. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations there from.

B. Testing agency may inspect structural steel either at plant before shipment or at the construction site; however, Architect reserves right, at any time before final acceptance, to reject material not complying with specified requirements.

C. Testing and Inspection Requirements:

1. Shop and Field Bolted Connections: Inspect in accordance with AISC Specifications.

2. Shop and Field Welding: Inspect and test during fabrication of structural steel assemblies, as follows:

a) Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record works required and perform to correct deficiencies.

b) Perform visual inspection of all welds.

c) Perform tests of welds as follows. Inspection procedures listed are to be used at testing agency's option.

d) Liquid Penetrant Inspection: ASTM E165.

e) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.

f) Radiographic Inspection: ASTM E94 and ASTM E142; minimum quality level "2-2T".

D. Contractor's Responsibilities:

1. Provide access for testing agency to places where structural steel work is being fabricated, produced, and erected so that required inspection and testing can be accomplished.

2. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated does not comply 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 for corrected work.

3. Survey: Upon completion of finish bolting or welding on any part of the work and prior to start of work by other trades that may be supported, attached, or applied to the structural steel work, a certified report of survey shall be submitted to the Architect for approval. The reports shall be prepared by registered land surveyor or registered civil engineer. The report shall specify that the location of the structural steel is acceptable for plumbness, level and alignment within the specified tolerances.

2.5 CORRECTIVE WORK

A. Contractor shall bear all costs associated with corrective work resulting from errors of poor workmanship, including all extra engineering and architectural services related to evaluating the problem and developing an acceptable solution.

END OF SECTION 051200

SECTION 052100 - STEEL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - Specification sections, apply to work of this section.

1.2 SUMMARY

A. Extent of steel joists and joist girders is shown on drawings, including basic layout and type of joists required.

B. Additional Loads: Joist loadings in addition to standard uniformly distributed loads are shown on the drawings and included in this Specification. Loads from the drawings and specifications are to be utilized in joist designs.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of joist and accessories. Include manufacturer's certification that joists comply with SJI "Specifications".

B. Shop Drawings: Submit detailed drawings showing layout of joist units, special connections, joining and accessories. Include mark, number, type, location and spacing of joists and bridging. Stress increases are not allowed for net wind uplift and forces caused by wind.

C. Provide templates or locations drawings for installation of anchor bolts and metal bearing plates.

1.4 QUALITY ASSURANCE

A. Provide joists fabricated in compliance with the following, and as herein specified.

1. Steel Joist Institute (SJI) "Standard Specifications, Load Tables and Weight Tables" for:
   LH Series Long-span Steel Joists.
   K Series Open Web Steel Joists.
   KCS Series Open Web Steel Joists.

B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with American Welding Society "Structural Welding Code", AWS D1.1.

C. Inspection: Inspect joists and girders in accordance with SJI specifications.

D. Performance Test: If required, conduct performance tests in accordance with procedures described in SJI "Recommended Code of Standard Practice".

E. Quality Assurance: Open web steel joists will be inspected by testing laboratory engaged by the Owner at time of delivery to the site (before erection). The Contractor is to notify the testing laboratory prior to the scheduled delivery. Any fabrication deficiencies will be subject to field or shop repairs.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle steel joists as recommended in SJI "Specifications". Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel: Comply with SJI "Standard Specifications".

B. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular hexagon type, low carbon steel.

C. High-Strength Threaded Fasteners: ASTM A 325 or A 490 heavy hexagon structural bolts with nuts and hardened washers.

D. Steel Prime Paint: Comply with SJI "Specifications".

E. Steel Prime Paint: Manufacturer's standard.

2.2 FABRICATION

A. General: Fabricate steel joists in accordance with SJI “Standard Specification”.

B. Load Diagrams: Load Diagrams for individual joists will be provided upon request.

C. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer's standard and requirements of applicable SJI "Standard Specifications" and load tables.

D. Seats: Provide sloping seats as required on sloping joists to accommodate horizontal supports.

E. Ceiling Extensions: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 1/2" of finished wall surface unless otherwise indicated.

F. Bridging: Provide horizontal and diagonal or diagonal type bridging for joists and joist girders complying with SJI "Standard Specifications". Provide a line of bridging at the first panel point from all supports. Provide additional lines of bridging, if required, to resist 30 pounds per square foot net uplift on the joists. Particular attention is called to the SJI

requirements for bridging to be bolted in place prior to the release of hoisting cable. Lines of horizontal bridging shall contain at least two bays of diagonal bridging, one at each end, with horizontal bridging at end bay connections to walls.

G. Sloping Joists: Provide sloping joists with top chord strength increased as required for additional loads due to slope. Joists shown do not include allowance for increase in chord force due to slope.

H. Provide bridging anchors for ends of bridging lines terminating at walls or beams.

I. End Anchorage: Provide end anchorages including bearing plates, to secure joists to adjacent construction, complying with SJI "Standard Specifications", unless otherwise indicated.

J. Header Units: Provide header units to support tail joists at openings in floor or roof system not framed with steel shapes.

K. Shop Painting: Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint.

1. Apply one shop coat of steel prime paint to joists and accessories, by spray, dipping, or other method to provide a continuous dry paint film thickness of not less than 0.50 millimeters.

PART 3 - EXECUTION

3.1 ERECTION

A. Place and secure steel joists in accordance with SJI "Standard Specifications", final shop drawings, and as herein specified.

B. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.

C. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction according to the current recommendations of the Steel Joist Institute.

D. Bridging: Install permanent bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.

3.2 FASTENING JOISTS

A. Field weld joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used. Coordinate welding sequence and procedure with placing of joists.

B. Secure joists resting on masonry or concrete bearing surfaces by bedding in mortar and anchoring to masonry or concrete construction as specified in SJI "Specifications" for type of steel joist used.

C. Bolt joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used.

1. Provide unfinished threaded fasteners for bolted bracing connections, unless otherwise indicated.

2. Provide high-strength fasteners for bolted connections or welded connections, except where specifically shown.

3. Provide high-strength threaded fasteners for bolted connections of steel joists to steel columns, and at other locations where shown, installed in accordance with AISC "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts".

D. Touch-Up Painting: After joist installation, paint field bolt heads and nuts, and welded areas, abraded or rusty surfaces on joists and steel supporting members. Wire brush surfaces and clean with solvent before painting. Use same type of paint as used for shop painting.

4.1 CORRECTIVE WORK

A. Contractor shall bear all costs associated with corrective work resulting from errors of poor workmanship, including all extra engineering and architectural services related to evaluating the problem and developing an acceptable solution.

END OF SECTION 052100

SECTION 053000 - METAL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 and Division-7 Specification sections apply to work of this section.

1.2 SUMMARY

A. Extent of metal decking is indicated on drawings, including basic layout and type of deck units required, closures and fillers, accessories, fastening of deck, and shear connectors.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes and standards, except as otherwise indicated or specified:

a. AISI NASPEC-2001: "North American Specification for Design of Cold-Formed Steel Structural Members".

b. AWS D1.3-98: "Structural Welding Code - Sheet Steel".

c. ASTM A653/A 653M-05a: "Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process".

d. ASTM A108-03e1: "Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished".

e. SDI "Design Manual for Composite Decks, Form 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.

C. Deck fastening, including pins, screws, and welds securing decking in place are 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. Replace pins or screws not properly installed.

D. Underwriters' Label: Provide metal floor deck units listed in Underwriters' Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific system detailed.

E. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for "Class I" fire rated construction.

1.4 SUBMITTALS

A. Product Data:

1. Submit for each type of decking specified, including dimensions of individual components, profiles, and finishes.

2. Mechanical fasteners: Test reports from a qualified independent testing agency evidencing compliance with requirements based on comprehensive testing.

B. Shop Drawings: Submit detailed drawings showing layout and types of deck panels, anchorage details, and conditions requiring closure panels, pour stops, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories.

C. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

a) Metal Roof Deck Units:
United Steel Deck, Inc.
Vulcraft/Div. Nucor Corp.
Wheeling Corrugating Company

b) Composite Metal Floor Deck Units and Form Decks:
United Steel Deck, Inc.
Vulcraft/Div. Nucor Corp.
Wheeling Corrugating Company

c) Cellular Composite Metal Roof Deck Units:
United Steel Deck, Inc.
Vulcraft/Div. Nucor Corp.
Wheeling Corrugating Company

2.2 MATERIALS

A. Steel for Galvanized Metal Deck Units: ASTM A 653 Structural Quality ; minimum yield strength of 33 ksi for floor deck; grade 80 for roof deck units.

B. Steel for Galvanized Form Deck Units: minimum yield strength of 80 ksi.

C. Miscellaneous Steel Shapes: ASTM A 36.

D. Shear Connectors: Headed concrete anchors, conforming to the AWS requirements of Chapter 7 of the AWS D 1.1 "Structural Welding Code-Steel" (2000), and meeting the requirements for "Type B" studs in Table 7.1. Unless otherwise noted on drawings, provide 3/4" diameter headed studs with an installed height of ¾" less than the total slab thickness denoted in the associated floor construction note shown in the drawings.

E. Sheet Metal Accessories: ASTM A 653, commercial quality, galvanized.

F. Galvanizing: All deck to be galvanized to ASTM A653; G90 for roof deck; G60 for floor deck.

G. Galvanizing Repair Paint (Brush Applied): High zinc-dust content paint for repair of damaged galvanized surfaces complying with Military Specifications MIL-P-21035 (Ships).

H. Flexible Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.

I. For Roof Deck Attachment:

1. Attachment of deck to structural steel: all roof deck to be fastened to structural steel trusses, frames, beams, girders and other structural steel in contact with the roof deck using powder actuated fasteners (PAF) with knurled shank, minimum ½" diameter steel washer, electroplated zinc conforming to ASTM B633, Sc. 1, type III and meeting SDI design requirements and Factory Mutual approval.

2. Fastening of side-laps: Unless otherwise shown in Structural drawings, provide Kwik-Pro Self-drilling (self-tapping), sealing (Kwik-Seal), #12 Screw for side-lap and miscellaneous metal deck attachments as manufactured by Hilti Corp., with organic copolymer corrosion resistant (Kwik-Coat) finish, or approved equal.

J. Electrodes for Welding: Comply with AWS Code.

2.3 FABRICATION

A. General: Form deck units in lengths to span 2 or more supports, with flush, telescoped or nested 2" laps at ends and interlocking or nested side laps, unless otherwise indicated. Minimum end bearing 1-1/2".

B. Roof Deck Units: Provide deck configurations complying with SDI "Roof Deck Specifications", of metal thickness, depth and width as shown.

C. 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.

D. Cellular Roof Deck Units: Fabricate cellular metal roof deck units by welding a perforated or non-perforated lower flat plate to the bottom of typical roof deck units (reference Structural drawings). Place acoustic batts in cells.

E. Metal Cover Plates: Fabricate metal cover plates for end-abutting roof and floor deck units of not less than same thickness as decking. Form to match contour of deck units and approximately 8" wide.

F. Metal Closure Strips: Fabricate metal cell closure strips, for cell raceways and openings between decking and other construction, of not less than 0.478" min. (18 gage) galvanized sheet steel. Form to provide tight-fitting closures at open ends of cells or flutes and sides of decking.

G. Roof Sump Pans: Fabricate from single piece of 0.071" min. (14 gage) galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than 1-1/2" below roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field.

H. Pour Stops: Fabricate metal pour stop strips for forming edges of concrete slabs, of hot rolled plates or angles where shown, and elsewhere of not less than 0.1345" (min. 10 gage) galvanized sheet metal for use with composite deck units and 0.0478" (min. 18 gage) for use with Form Deck.

I. Accessories: Furnish galvanized sheet steel (minimum 18 gage) ridge and valley plates, and flat plates at change of direction in decks as required by field conditions to provide a finished surface for application of roof insulation and roof covering. Plates to be minimum 18 gauge.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine areas and conditions under which metal decking is to be installed and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

3.2 INSTALLATION

A. General: Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein.

B. 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.

C. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.

D. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.

E. Do not place deck units on concrete supporting structure until concrete has cured and is dry.

F. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.

G. Do not use floor deck units for storage or working platforms until permanently secured.

H. Fastening Deck Units:

1. Fasten floor and roof deck units to steel supporting members with approved fasteners at intervals and spacing shown on drawings, but providing not less than two fasteners per unit at each support. Fasten side-laps with approved fasteners at spacing shown on drawings and noted in this section. Locate fasteners with clearance to side of supporting member as recommended by fastener manufacturer.

2. Install fastenings so that decking is clamped tight to supporting steel by fasteners.

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.

4. Keep the interiors of cells that will be used as raceways free of welds having sharp points or edges.

5. Tack weld or use PAF or self-tapping No. 12 or larger machine screws at 48" o.c. for fastening end closures.

6. Fasten floor deck side laps with self-tapping No. 12 or larger machine screws at intervals not exceeding 30" o.c., unless otherwise shown.

7. Mechanically fasten roof deck side laps of adjacent deck units between supports, at intervals not exceeding 12" o.c., unless otherwise shown, using self-tapping No. 12 or larger machine screws.

8. Secure floor deck to supports with mechanical fasteners or welds prior to welding shear connectors.

9. Perimeter Edge Attachment: Fasten perimeter edges of deck units at minimum 36 inches (1 m) intervals or as shown on design drawings using mechanical fasteners or arc puddle welds at specified sidelap spacing for edges of units and specified endspacing for ends of units, but not less than one fastener per flute.

I. Uplift Loading: Install and anchor roof deck units to resist net uplift loading of 40 lbs. per sq. ft. at eave overhang and 25 lbs. per sq. ft. for other roof areas.

J. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through of adjacent to the decking and as shown on project documents.

K. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of ceiling construction, air ducts, diffusers, lighting fixtures, or other similar components. Hot rolled reinforcing frames are required below the deck at all openings in roof deck other than roof drains.

L. Hanger Slots or Clips: Provide UL approved punched hanger slots where floor deck units are to receive hangers for support of ceiling construction, air ducts, diffusers, lighting fixtures or other similar components.

M. Hanger clips designed to clip over male side lap joints of floor deck units may be used instead of hanger slots.

N. Locate slots or clips at not more than 14" o.c. in both directions, not over 9" from walls at ends, and not more than 12" from walls at sides, unless otherwise shown.

O. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units, except where taped joints are required.

P. Roof Sump Pans: Place over openings provided in roof decking and weld to top decking surfaces. Space welds not more than 12" o.c. with at least one weld at each corner. Cut opening in roof sump bottom to accommodate drain size indicated. Provide ridge and valley plates and flat plates at change in direction of deck to provide finished surface for roofing material application. Space fasteners at not more than 12" on center on each piece joined.

Q. 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.

R. Closure Strips: Provide metal closure strips at open uncovered ends and edges of floor and roof decking, and in voids between decking and other construction. Weld into position to provide a complete decking installation.

S. Provide flexible closure strips instead of metal closures, at Contractor's option, wherever their use will ensure complete closure. Install with adhesive in accordance with manufacturer's instructions.

T. Pour Stops: Provide metal pour stop strips at edges of concrete slabs. Weld into position on steel framing or onto deck.

U. 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. Clean and touch-up galvanized surfaces at field welds, abraded areas, rust spots and exposed exterior steel preceding finish painting with two brushed-on coats of galvanizing repair paint applied in accordance with manufacturer's instructions.

3.2 CORRECTIVE WORK

A. Contractor shall bear all costs associated with corrective work resulting from errors or poor workmanship, including all extra engineering and architectural services related to evaluating the problem and developing an acceptable solution.

END OF SECTION 053000

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior non-load-bearing wall framing.
   2. Exterior load-bearing wall framing.
   3. Interior non-load-bearing wall framing used as masonry back-up.
   4. Wall sheathing.

B. Related Sections include the following:

   1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.

   2. Division 07 Section "Self-Adhered Sheet Air Barrier" for protection of wall sheathing.
   3. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
   4. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

   1. Design Loads: As indicated.

   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Exterior and Interior Framing: Horizontal deflection of 1/600 of the wall height.

   3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
   4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 1 inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior and interior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
3. Roof Trusses: Design according to AISI's "Standard for Cold-Formed Steel Framing - Truss Design."

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Miscellaneous structural clips and accessories.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements,

including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

D. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. Allied Studco.
2. AllSteel Products, Inc.
3. Clark Steel Framing.
4. Consolidated Fabricators Corp.; Building Products Division.
5. Craco Metals Manufacturing, LLC.
6. Custom Stud, Inc.
7. Dale/Incor.
8. Design Shapes in Steel.
9. Dietrich Metal Framing; a Worthington Industries Company.
10. Formetal Co. Inc. (The).
11. Innovative Steel Systems.
12. MarinoWare; a division of Ware Industries.
13. Quail Run Building Materials, Inc.
14. SCAFCO Corporation.
15. Southeastern Stud & Components, Inc.
16. Steel Construction Systems.
17. Steeler, Inc.
18. Super Stud Building Products, Inc.
19. United Metal Products, Inc.

2.2 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: ST50H.
2. Coating:
   a. Exterior walls: G90 or equivalent.
   b. Interior walls: G60 or equivalent.

2.3 EXTERIOR WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch.
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.

C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch.
2. Flange Width: 1 inch plus the design gap for 1-story structures.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Gusset plates.
7. Stud kickers, knee braces, and girts.
8. Hole reinforcing plates.
9. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. 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.

B. 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.

C. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

D. Welding Electrodes: Comply with AWS standards.

2.6 WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Type and Thickness: Type X, 5/8 inch thick.
2. Size: 48 by 96 inches, 48 by 120 inches for vertical installation.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

C. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
1. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

I. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: To match stud spacing.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

E. Install horizontal bridging in stud system, spaced as indicated on Shop Drawings. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.

F. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

G. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 EXTERIOR AND INTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single-leg deflection tracks and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of

width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

a. Install solid blocking at centers indicated on Shop Drawings.

2. Bridging: Combination of flat, taut, steel sheet straps, 1-1/2 inch by 0.0329 inch thick minimum and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 SHEATHING INSTALLATION

A. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

B. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

C. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

D. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

E. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.

F. Horizontal Installation: Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

G. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

3.6 FIELD QUALITY CONTROL

A. Field and shop welds will be subject to testing and inspecting.

B. Remove and replace work where test results indicate that it does not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

C. Exterior Sheathing: Protect sheathing by covering exposed exterior surface of sheathing with self-adhered sheet air barrier securely fastened to framing. Apply covering immediately after sheathing is installed.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Steel framing and supports for overhead doors, grilles and accordion folding doors.
2. Steel framing and supports for countertops.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Elevator hoist beams.
6. Steel shapes for supporting elevator door sills.
7. Metal ladders.
8. Metal floor plate and supports.
9. Structural-steel door frames.
10. Miscellaneous steel trim including steel angle corner guards, edgings and floor base.
11. Metal bollards.
12. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Division 04 Section "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Division 05 Section "Structural Steel Framing."
4. Division 05 Section "Metal Stairs."
5. Division 05 Section "Decorative Metal."
6. Division 10 Section "Wire Mesh Partitions."

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: For the following:
1. Paint products.
2. Grout.

B. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. 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.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

C. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

D. Steel Tubing: ASTM A 500, cold-formed steel tubing.

E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches.
2. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B; 0.0677-inch minimum thickness; unfinished.

F. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.
3. Provide stainless-steel fasteners for fastening nickel silver.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

D. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

E. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.
3. Where support rods for accordion folding partitions are indicated, provide 3/8-inch diameter threaded rods with nuts and washers.

2.7 METAL LADDERS

A. General:

1. Comply with ANSI A14.3 unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.

B. Steel Ladders:

1. Space siderails 18 inches apart unless otherwise indicated.
2. Space siderails of elevator pit ladders 12 inches apart.
3. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
4. Rungs: 3/4-inch- diameter steel bars.
5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
6. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch in least dimension.
7. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.

8. Galvanize exterior ladders, including brackets and fasteners.

2.8 STRUCTURAL-STEEL DOOR FRAMES

A. Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with 5/8-by-1-1/2-inch steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than 10 inches o.c. Reinforce frames and drill and tap as necessary to accept finish hardware.

1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.

B. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

C. Prime steel frames with zinc-rich primer.

2.9 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

C. Prime miscellaneous steel trim with zinc-rich primer.

2.10 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

1. Cap bollards with 1/4-inch- thick steel plate.

B. Prime bollards with zinc-rich primer.

2.11 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

2.12 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

2.13 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.14 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.15 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

3.3 INSTALLING METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

B. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
   1. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055110 - METAL STAIRS AND HANDRAILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Preassembled steel stairs with concrete-filled treads.
2. Handrails and railings attached to metal stairs, walls, and elsewhere.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal stairs capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of metal stairs.

1. Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of 100 lbf/sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. in., whichever produces the greater stress.
2. Stair Framing: Capable of withstanding stresses resulting from loads specified above in addition to stresses resulting from railing system loads.
3. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

4. Handrails and Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Filler panels shall be designed to withstand 50 lb/sf applied on an area equal to 1 square foot.
d. Uniform and concentrated loads need not be assumed to act concurrently.

1.4 SUBMITTALS

A. Product Data: For metal stairs and the following:
   1. Paint products.
   2. Grout.

B. Shop Drawings: Show fabrication and installation details for metal stairs. Include plans, elevations, sections, and details of metal stairs and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

   1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. 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.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Arrange for metal stairs specified in this Section to be fabricated and installed by the same firm.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal stairs (including handrails and railing systems) that are similar to those indicated for this Project in material, design, and extent.

C. Fabricator Qualifications: A firm experienced in producing metal stairs 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. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," AWS D1.2, "Structural Welding Code--Aluminum.", and AWS D1.3, "Structural Welding Code--Sheet Steel."

1.6 COORDINATION

A. Coordinate installation of anchorages for metal stairs. 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Extruded Abrasive Nosings:
      a. American Safety Tread
      b. Amstep Products
      c. Armstrong Products, Inc.
      d. Balco/Metalines, Inc.
      e. Safe-T-Metal Co.
      f. Wooster Products Inc.

2.2 FERROUS METALS

A. Metal Surfaces, General: Provide metal free from pitting, seam marks, roller marks, and other imperfections where exposed to view on finished units. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

D. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Uncoated, Cold-Rolled Steel Sheet: Commercial quality, complying with ASTM A 366/A 366M; or structural quality, complying with ASTM A 611, Grade A, unless another grade is required by design loads.

G. Uncoated, Hot-Rolled Steel Sheet: Commercial quality, complying with ASTM A 569/A 569M; or structural quality, complying with ASTM A 570/A 570M, Grade 30, unless another grade is required by design loads.

H. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coating, either commercial quality or structural quality, Grade 33, unless another grade is required for design loads.

I. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

J. Welded-Wire Mesh: Welded steel wire mesh, square pattern, 1-inch by 1-inch, made from 0.120-inch nominal diameter wire complying with ASTM A 510.

2.3 NONFERROUS METALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

B. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

C. Extruded Structural Pipe and Round Tubing: ASTM B 429, Alloy 6063-T6.

1. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.

D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.

2.4 FASTENERS

A. General: Provide the following:

1. Aluminum: Type 304 stainless-steel fasteners.
2. Steel: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Machine Screws: ASME B18.6.3.

D. Lag Bolts: ASME B18.2.1.

E. Plain Washers: Round, carbon steel, ASME B18.22.1.

F. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5 for interior applications.
2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594 for exterior applications.

H. Provide tamper-resistant flat-head machine screws for exposed fasteners, unless otherwise indicated.

2.5 PAINT

A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."

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. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers or cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 ABRASIVE NOSINGS

A. Extruded Units: Aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. ACL Industries, Inc.
   b. American Safety Tread Co., Inc.
   c. Amstep Products.
   d. Armstrong Products, Inc.
   e. Balco Inc.
   f. Granite State Casting Co.
   g. Wooster Products Inc.

2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
3. Nosings: Square-back units, 1-7/8 inches wide, without lip.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.

2.7 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.8 CONCRETE FILL AND REINFORCING MATERIALS

A. 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, unless higher strengths are indicated.

B. Welded Wire Fabric: ASTM A 185, 6 by 6 inches --W1.4 by W1.4, unless otherwise indicated.

2.9 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, handrails, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding, unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.
3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

1. Architectural class, for stair A3.
2. Commercial class, unless otherwise indicated.

C. Shop Assembly: Preassemble stairs 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 reassembly and coordinated installation.

D. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Shear and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.

E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously, unless otherwise indicated.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.10 STEEL-FRAMED STAIRS

A. Stair Framing: Fabricate stringers of structural-steel channels, plates, or tubes, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural-steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.

1. Where stairs are enclosed by gypsum board assemblies, provide hanger rods to support landings from floor construction above. Locate hanger rods within stud space of shaft-wall construction.
2. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

B. Metal Risers, Subtread Pans, and Subplatforms: Form to configurations shown from steel sheet of thickness necessary to support indicated loads, but not less than 0.0677 inch.

1. Steel Sheet: Uncoated cold-rolled steel sheet at stair A3.
2. Steel Sheet: Uncoated hot-rolled steel sheet, unless otherwise indicated.
3. Directly weld metal pans to stringers; locate welds on side of subtreads to be concealed by concrete fill. Do not weld risers to stringers.
4. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
5. Shape metal pans to include nosing integral with riser or as indicated.
6. Attach extruded abrasive nosings to risers. Make nosings full width of tread, with noses flush with riser faces and level with tread surfaces.

2.11 METAL TUBE HANDRAILS AND GUARDRAILS

A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

B. Interconnect members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.

1. At tee and cross intersections, cope ends of intersecting members to fit contour of tube to which end is joined, and weld all around.

C. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

D. Close exposed ends of handrail and railing members with prefabricated end fittings.

E. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.

F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting railings and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.

1. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

G. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

H. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.

I. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

2.12 FINISHES

A. Comply with NAAMM'S "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

C. Galvanizing: Hot-dip galvanize exterior items items to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strips 0.0299 inch thick and heavier.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
3. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed products:
1. Interiors (SSPC Zone 1A): SSPC SP 3, "Power Tool Cleaning."

E. Apply shop primer to prepared surfaces of metal stair components, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Do not apply primer to galvanized surfaces.
2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

F. Aluminum Handrail Finish: Class I, Clear Anodic Finish, AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.

B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonmetallic, nonshrink grout, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING STEEL TUBE RAILINGS AND HANDRAILS

A. Adjust handrails and railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:

1. Anchor posts to steel by welding directly to steel supporting members.
2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

B. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
3. For hollow masonry anchorage, use toggle bolts.
4. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055110

SECTION 057500 - DECORATIVE FORMED METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior sunshades.

B. Related Sections include the following:

   1. Division 05 Section "Metal Fabrications" for non-ornamental metal fabrications.
   2. Division 07 Section "Sheet Metal Flashing and Trim" for items made of formed metal for flashings.
   3. Division 08 Section "Louvers and Vents" for louvers made of formed metal.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Loads: Capable of withstanding the following structural loads without exceeding the allowable design working stress of materials involved, including anchors and connections, and without exhibiting permanent deformation in any components:

   1. Wind Loads on Exterior Items: As indicated on Drawings.

B. Thermal Movements: Provide exterior ornamental formed-metal assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

C. Corrosion Control: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, including finishes.

B. Shop Drawings: Detail fabrication and installation of ornamental formed metal. Include plans, elevations, sections, and details of components and their connections. Show anchorage and accessory items.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Provide templates for anchors and bolts specified for installation in other Sections.

C. Samples for Initial Selection: Manufacturer's sections of units showing the full range of, textures, including mechanical finishes, and patterns available for each type of ornamental formed-metal product indicated.

D. Samples for Verification: For each type of exposed finish required, prepared on 6-inch- square samples of metal of same thickness and material indicated for the Work.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing ornamental formed metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

1. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Anodic Finisher Qualifications: A firm experienced in successfully applying anodic finishes of type indicated and employing competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

C. Source Limitations: Obtain each ornamental formed-metal item through one source from a single manufacturer.

D. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.2, "Structural Welding Code - Aluminum."

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver ornamental formed-metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

B. Store products on elevated platforms in a dry location.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with ornamental formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate installation of anchorages for ornamental formed-metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 SHEET METAL

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.

B. Aluminum Sheet: Flat sheet complying with ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy 5005-H32.

2.2 MISCELLANEOUS MATERIALS

A. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items.

1. Use filler metals that will match the color of metal being joined and will not cause discoloration.

B. Fasteners: Use fasteners fabricated from same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
1. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

C. Isolation Coating: Manufacturer's standard bituminous paint.

2.3 FABRICATION, GENERAL

A. Shop Assembly: Preassemble ornamental formed-metal 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 reassembly and coordinated installation.

B. Coordinate dimensions and attachment methods of ornamental formed-metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned, unless otherwise indicated.

C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends.

D. Increase metal thickness as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.

E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce ornamental formed-metal items as needed to attach and support other construction.

F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install ornamental formed-metal items.

G. Where welding or brazing is indicated, weld or braze joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.

1. Use welding and brazing procedures that will blend with and not cause discoloration of metal being joined.

2.4 PERFORATED METAL SUNSHADE

A. Fabricate sunshades to withstand indicated wind load, without exceeding the allowable design working stress of materials involved, including anchors and connections, and without exhibiting permanent deformation in any components.

B. Provide cut outs for letters using water jet cutting.

C. Fabricate perforated metal of type and thickness indicated below.

1. Aluminum Steel Sheet:

a. Thickness: As required to comply with performance requirements, but no less than 0.125”.
b. Perforations: 3/16” diameter x ¼” staggered (60 degree pattern), 51% open.
c. Finish: Mill

2.5 SUNSHADE GRILLE

A. Fabricate sunshades to withstand indicated wind load, without exceeding the allowable design working stress of materials involved, including anchors and connections, and without exhibiting permanent deformation in any components.

B. Fabricate grille from metal of type and thickness indicated below.

1. Aluminum
    a. Type 6063-T6 alloy and temper.
    b. Finish: Clear anodized.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Apply anodic finishes to formed metal after fabrication.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of ornamental formed metal.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate and place ornamental formed-metal items level and plumb and in alignment with adjacent construction.

B. Use concealed anchorages where possible.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

D. Corrosion Protection: Apply nonmelting/nonmigrating-type bituminous coating or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

3.3 ADJUSTING

A. 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.

3.4 PROTECTION

A. Protect finishes of ornamental formed-metal items from damage during construction period.

END OF SECTION 057500

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Wood blocking and nailers.
3. Wood furring.
4. Wood sleepers.
5. Plywood backing panels.
6. Plywood subfloor.

B. Related Sections include the following:
1. Division 05 Section "Cold Formed Metal Framing."

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA Standard U1, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).
1. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat all rough carpentry, unless otherwise indicated.

2.4 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 19 percent.

B. Joists, Rafters, Studs, and Other Framing: Select Structural grade in the following species:
1. Douglas fir-larch (north); NLGA.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.

B. For items of dimension lumber size, provide Construction or No. 2, 19 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine, No. 2 grade; SPIB.
2. Eastern softwoods, No. 2 Common grade; NeLMA.
3. Northern species, No. 2 Common grade; NLGA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.7 SUBFLOORING

A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exposure 1, Underlayment single-floor panels.

1. Span Rating: Not less than 16 o.c.
2. Nominal Thickness: Not less than 23/32 inch.
3. Edge Detail: Square.
4. Surface Finish: Fully sanded face.

2.8 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. 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.

2.9 METAL FRAMING ANCHORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpine Engineered Products, Inc.
2. Cleveland Steel Specialty Co.
3. Harlen Metal Products, Inc.
4. KC Metals Products, Inc.
5. Simpson Strong-Tie Co., Inc.
6. Southeastern Metals Manufacturing Co., Inc.
7. USP Structural Connectors.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

C. Joist Hangers: U-shaped joist hangers with 2-inch- long seat and 1-1/4-inch- wide nailing flanges at least 85 percent of joist depth.

1. Thickness: 0.062 inch.

2.10 WEATHER-RESISTANT SHEATHING PAPER

A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.

2.11 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

B. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

D. Do not splice structural members between supports, unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

I. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

J. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

3.2 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring horizontally and vertically at 24 inches o.c.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- size furring vertically at 16 inches o.c.

3.4 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single top and bottom plate using members of 2-inch nominal thickness whose widths equal that of studs. Fasten plates to supporting construction, unless otherwise indicated.

1. For interior and exterior walls, provide wood studs spaced 16 inches o.c., unless otherwise indicated.
2. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.

3.5 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
   1. Where framed into wood supporting members by using metal joist hangers.

B. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches from top or bottom.

C. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to 3 joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.

D. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.

   1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- size lumber, double-crossed and nailed at both ends to joists.
   2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.6 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Fiber-cement siding.

B. Related Sections include the following:
   1. Division 06 Section "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
   2. Division 09 Section "Painting" for finishing of fiber-cement siding.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Samples for Initial Selection: For each type of siding indicated.

C. Samples for Verification:

   1. For each panel products, with 1/2 of exposed surface finished; 8 by 10 inches for panels.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 FIBER-CEMENT PANELS

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. CertainTeed Corp.
   b. GAF Materials Corporation.
   c. James Hardie.

B. Pattern: Smooth.

C. Factory Priming: Manufacturer's standard acrylic primer.

2.2 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.

1. For face-fastening siding, provide stainless-steel ringed-shank siding nails.

B. Flashing: Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.

C. Sealants: Comply with requirements in Division 07 Section "Joint Sealants" for sealant installed in exterior finish carpentry.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 SIDING INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Do not install damaged components.
2. Center nails in elongated nailing slots without binding siding to allow for thermal movement.

B. Install fiber-cement panels and related accessories.

1. Install fasteners no more than 24 inches o.c.

2. Provide 1/4" joint between panels and provide sealant over bond-breaker tape applied to back of joint.

3.5 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean exterior finish carpentry on exposed and semi-exposed surfaces.

3.7 PROTECTION

A. Protect installed products from damage during construction.

END OF SECTION 062013

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Flush wood paneling.
   2. Wood cabinets.
   3. Guardrail wood caps
   4. Plastic-laminate countertops and sills.
   5. Solid-surfacing-material countertops.
   6. Closet and utility shelving.
   7. Shop finishing of interior woodwork.

B. Related Sections include the following:
   1. Division 06 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
   2. Division 12 Section "Wood Laboratory Casework" for casework located in science rooms and prep rooms.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated and finishing materials and processes.

   1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

2. Show locations and sizes of cutouts and holes for plumbing fixtures and other items installed in architectural woodwork.

C. Samples for Initial Selection:

1. Shop-applied transparent finishes.
2. Plastic laminates.
3. PVC edge material.
4. Solid-surfacing materials.

D. Samples for Verification:

1. Lumber with or for transparent finish, not less than 5 inches wide by 24 inches long, for each species and cut, finished on 1 side and 1 edge.
2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
3. Thermoset decorative-panels, 8 by 10 inches, for each type, color, pattern, and surface finish, with edge banding on 1 edge.

4. Exposed cabinet hardware and accessories, one unit for each type.

E. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide AWI Quality Certification Program certificates indicating that woodwork, including installation, complies with requirements of grades specified.
2. The Contract Documents may contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.

D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species and Cut for Transparent Finish: Select white maple, plain sliced..

C. Wood Products: Comply with the following:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade MD.
3. Particleboard: ANSI A208.1, Grade M-2.
4. Softwood Plywood: DOC PS 1.

5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

D. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
   a. Nevamar Company, LLC; Decorative Products Div.

F. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ABA Industries.
   b. Avonite, Inc.
   c. E. I. du Pont de Nemours and Company.
   d. Formica Corporation.
   e. LG Chemical, Ltd.
   f. Meganite Inc.; a division of the Pyrochem Group.
   g. Nevamar Company, LLC; Decorative Products Div.
   h. Samsung; Cheil Industries Inc.
   i. Swan Corporation (The).
   j. Transolid, Inc.
   k. Wilsonart International; Div. of Premark International, Inc.

2. Type: Standard type, unless Special Purpose type is indicated.
3. Colors and Patterns: As selected by Architect from manufacturer's full range.

G. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, 6 mm thick, unless otherwise indicated.

H. Tempered Float Glass for Cabinet Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3; with exposed edges seamed before tempering, 6 mm thick.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.

1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
2. Product: Subject to compliance with requirements, provide "Duraflake FR" by Weyerhaeuser.

C. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

1. Product: Subject to compliance with requirements, provide "Medite FR" by SierraPine Ltd.; Medite Div.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."

B. Semiconcealed Hinges: BHMA A156.9, B01521.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 5 inches long, 2-1/2 inches deep, and 5/16 inch in diameter.

E. Catches: Magnetic catches, BHMA A156.9, B03141 or Roller catches, BHMA A156.9, B03071.

F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04101; with shelf brackets, B04112.

G. Shelf Rests: BHMA A156.9, B04011; metal.

H. Drawer Slides: BHMA A156.9, B05091.
   1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
   2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
   3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
   4. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches high and 24 inches wide.
   5. Keyboard Slides: Grade 1HD-100; for computer keyboard shelves.

I. Door Locks: BHMA A156.11, E07121.

J. Drawer Locks: BHMA A156.11, E07041.

K. Sliding Glass Door Hardware: Manufacturers standard extruded aluminum receptor tracks, nominal 7/8-inch high, with extruded aluminum top and bottom shoe for glass. Bottom shoe shall sit on nylon roller carriers.
   1. Provide products from New York Metal Store, or equal.

L. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

M. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

N. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.5 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.

E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

2.6 FLUSH WOOD PANELING

A. Wood Species and Cut: Select white maple, plain sliced.

B. Matching of Adjacent Veneer Leaves: Book match.

C. Veneer Matching within Panel Face: Center-balance match.

D. Panel-Matching Method: Match panels within each separate area by the following method:
1. Sequence-matched, uniform-size sets.

E. Vertical Panel-Matching Method: Continuous match; veneer leaves of upper panels are continuations of veneer leaves of lower panels.

F. Fire-Retardant-Treated Paneling: Provide panels consisting of wood veneer and fire-retardant particleboard or fire-retardant medium-density fiberboard. Panels shall have flame-spread index of 25 or less and smoke-developed index of 450 or less per ASTM E 84.

2.7 WOOD CABINETS FOR TRANSPARENT FINISH

A. AWI Type of Cabinet Construction: Reveal overlay.

B. Wood Species and Cut for Exposed Surfaces: Select white maple, plain sliced.

1. Grain Direction: Vertically for doors and fixed panels.
2. Matching of Veneer Leaves: Book match. No match required for drawer fronts.
3. Vertical Matching of Veneer Leaves: End match.

C. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

2.8 GUARDRAIL WOOD CAPS

A. Grade: Custom.

B. Wood Species and Cut: Select white maple, plain sliced

C. Assemble wood caps in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

2.9 PLASTIC-LAMINATE COUNTERTOPS

A. High-Pressure Decorative Laminate Grade: HGP.

B. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As selected by Architect from manufacturer's full range.

C. Edge Treatment: As indicated.

D. Core Material at Sinks: Particleboard made with exterior glue, medium-density fiberboard made with exterior glue or exterior-grade plywood.

E. Paper Backing: Provide paper backing on underside of countertop substrate.

2.10 SOLID-SURFACING-MATERIAL COUNTERTOPS

A. Grade: Custom.

B. Solid-Surfacing-Material Thickness: 3/4 inch.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:

1. As selected by Architect from manufacturer's full range.

D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

1. Fabricate tops with shop-applied edges of materials and configuration indicated.
2. Fabricate tops with loose backsplashes for field application.

E. Drill holes in countertops for plumbing fittings and soap dispensers.

2.11 CLOSET AND UTILITY SHELVING

A. Shelf Material: 3/4-inch thermoset decorative panel with PVC or polyester edge banding.

B. Cleats: 3/4-inch solid lumber.

2.12 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.

B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

D. Transparent Finish:
1. AWI Finish System: Conversion varnish.
2. Staining: None required.

3. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

G. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening, unless otherwise indicated.

1. Install flush paneling with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.

H. Wood Caps: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary.

I. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.
3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

J. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
3. Secure backsplashes to walls with adhesive.
4. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

K. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

SECTION 070150 - PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Roof tear-off.
2. Partial roof tear-off.
3. Removal of base flashings.
4. Protection of existing roofing system that is not reroofed.

B. Related Sections include the following:

1. Division 01 Section "Summary" for use of the premises and phasing requirements.
2. Division 01 Section "Summary" for restrictions on use of the premises due to Owner or tenant occupancy.
3. Division 01 Section "Photographic Documentation" for photographs taken before reroofing preparation.
4. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for reroofing preparation.
5. Division 01 Section "Cutting and Patching" for cutting and patching procedures for reroofing preparation.
6. Division 01 Section "Allowances" for steel deck replacement.
7. Division 02 Section "Asbestos Abatement" for removal of ACM roof flashing.
8. Division 06 Section "Rough Carpentry" for wood nailers, cants, curbs, and blocking.
9. Division 07 Section "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for roofing membrane, base flashings, roof insulation, and roofing accessories.
10. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
11. Division 07 Section "Roof Specialties."
12. Division 22 Section "Storm Drainage Piping Specialties" for replacement roof drains.
13. Division 23 Sections for HVAC equipment removal and reinstallation.
14. Division 26 Sections for electrical equipment disconnection and reconnection.

C. Unit Prices: Refer to Division 01 Section "Unit Prices" for description of Work in this Section affected by unit prices.

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. Existing Membrane Roofing System for Removal: Built-up asphalt roofing membrane, surfacing, and components and accessories between deck and roofing membrane.

C. Substrate Board: Rigid board or panel products placed over the roof deck that serve as thermal barriers, provide a smooth substrate, or serve as a component of a fire-resistance-rated roofing system.

D. Roof Tear-Off: Removal of existing membrane roofing system from deck.

E. Partial Roof Tear-Off: Removal of a portion of existing membrane roofing system from deck or removal of selected components and accessories from existing membrane roofing system.

F. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.

G. Existing to Remain: Existing items of construction that are not indicated to be removed.

1.5 SUBMITTALS

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

B. Fastener pull-out test report.

C. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.

D. Qualification Data: For Installer including certificate that Installer is approved by warrantor of existing roofing system(s) to remain.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer of new membrane roofing system approved by warrantor of existing roofing system(s) to work on existing roofing.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning membrane roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Reroofing Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner; Architect; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; deck Installer; roofing Installer including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to reroofing preparation, including membrane roofing system manufacturer's written instructions.
3. Review temporary protection requirements for existing roofing system that is to remain, during and after installation.
4. Review roof drainage during each stage of reroofing and review roof drain plugging and plug removal procedures.
5. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
6. Review existing deck removal procedures and Owner notifications.
7. Review procedures to determine condition and acceptance of existing deck for reuse.
8. Review structural loading limitations of deck during reroofing.
9. Review base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect reroofing.
10. Review HVAC shutdown and sealing of air intakes.
11. Review shutdown of fire-suppression, -protection, and -alarm and -detection systems.
12. Review procedures for asbestos removal or unexpected discovery of asbestos-containing materials.
13. Review governing regulations and requirements for insurance and certificates if applicable.
14. Review existing conditions that may require notification of Architect before proceeding.

1.7 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately below reroofing area. Conduct reroofing so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

1. Coordinate work activities daily with Owner so Owner can place protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below the work area if desired.

B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

D. Owner assumes no responsibility for condition of areas to be reroofed.

1. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.

E. The results of an analysis of test cores from existing membrane roofing system are available for Contractor's reference.

F. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering into existing roofing system or building.

G. Hazardous Materials: Present in building to be reroofed. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except according to procedures specified elsewhere in the Contract Documents.
3. Coordinate with hazardous material remediation Contractor to prevent water from entering building or existing roofing system.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during reroofing, by methods and with materials so as not to void existing roofing system warranty. Notify warrantor before proceeding.

1. Notify warrantor of existing roofing system on completion of reroofing, and obtain documentation verifying that existing roofing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 AUXILIARY REROOFING MATERIALS

A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing and new membrane roofing system.

B. Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect existing membrane roofing system that is indicated not to be reroofed.
   1. Limit traffic and material storage to areas of existing roofing membrane that have been protected.
   2. Maintain temporary protection and leave in place until replacement roofing has been completed.

B. Coordinate with Owner to shut down air intake equipment in the vicinity of the Work. Cover air intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

C. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

   1. If roof drains will be temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

E. Verify that rooftop utilities and service piping have been shut off before commencing Work.

3.2 ROOF TEAR-OFF

A. General: Notify Owner each day of extent of roof tear-off proposed.

B. Remove loose aggregate from aggregate-surfaced built-up bituminous roofing with a power broom.

C. Roof Tear-Off: Remove existing roofing membrane and other membrane roofing system components down to the deck.
   1. Bitumen and felts that are firmly bonded to concrete decks are permitted to remain if felts are dry. Remove unadhered bitumen and felts and wet felts.
   2. Remove excess asphalt from steel deck. A maximum of 15 lb/100 sq. ft. of asphalt is permitted to remain on steel decks.
   3. Remove fasteners from deck.

D. Partial Roof Tear-Off: Where indicated, remove existing roofing membrane and other membrane roofing system components down to the deck.
   1. Bitumen and felts that are firmly bonded to concrete decks are permitted to remain if felts are dry. Remove unadhered bitumen and felts and wet felts.

2. Remove excess asphalt from steel deck. A maximum of 15 lb/100 sq. ft. of asphalt is permitted to remain on steel decks.
3. Remove fasteners from deck.

3.3 DECK PREPARATION

A. Inspect deck after tear-off of membrane roofing system.

B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect. Do not proceed with installation until directed by Architect.

C. If deck surface is not suitable for receiving new roofing, or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.

3.4 EXISTING BASE FLASHINGS

A. Remove existing base flashings around parapets, curbs, walls, and penetrations.

1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish.

3.5 FASTENER PULL-OUT TESTING

A. Perform fastener pull-out tests according to SPRI FX-1, and submit test report to Architect before installing new membrane roofing system.

1. Obtain Architect's approval to proceed with specified fastening pattern. Architect may furnish revised fastening pattern commensurate with pull-out test results.

3.6 DISPOSAL

A. Collect and place demolished materials in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

1. Storage or sale of demolished items or materials on-site will not be permitted.

B. Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 070150

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Cold-applied, emulsified-asphalt dampproofing.

B. Related Sections include the following:
   1. Division 07 Section "Modified Bituminous Sheet Air Barriers."

1.3 PERFORMANCE REQUIREMENTS

A. Compatibility: Damproofing must be compatible with modified bituminous air barrier.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.

B. Material Certificates: For each product, signed by manufacturers.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ChemMasters Corp.
2. Degussa Building Systems; Sonneborn Brand Products.
3. Gardner Gibson, Inc.
4. Henry Company.
5. Karnak Corporation.
6. Koppers Inc.
7. Malarkey Roofing Products.
8. Meadows, W. R., Inc.
9. Tamms Industries, Inc.

B. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

C. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

D. VOC Content: 0.25 lb/gal. or less.

2.2 MISCELLANEOUS MATERIALS

A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

B. Patching Compound: Manufacturer's fibered mastic of type recommended by dampproofing manufacturer.

C. Modified Bituminous Sheet: 40-mil- thick, self-adhering sheet consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick, polyethylene film with release liner on adhesive side and formulated for application with primer that complies with VOC limits of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.

1. Proceed with dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
2. Test for surface moisture according to ASTM D 4263.

3.2 PREPARATION

A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.

1. Apply additional coats if recommended by manufacturer or if required to achieve coverages indicated.
2. Allow each coat of dampproofing to cure six hours before applying subsequent coats.
3. Allow 48 hours drying time prior to backfilling.

B. Apply dampproofing to footings and foundation walls where opposite side of wall faces building interior.

1. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches over outside face of footing.
2. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

C. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.

1. Lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
2. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe, and lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.
3. Provide modified bituminous sheet air barrier at columns, expansion joints, and other miscellaneous gaps that cannot be bridged with dampproofing.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. On Concrete Foundations: Apply 2 brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, 1 fibered brush or spray coat at not less than 3 gal./100 sq. ft., or 1 trowel coat at not less than 4 gal./100 sq. ft..

B. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and 1 brush or spray coat at not less than 1 gal./100 sq. ft..

3.5 CLEANING

A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION 071113

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Perimeter insulation under slabs-on-grade.
2. Concealed building insulation.
3. Exposed building insulation.
4. Self-supported, spray-applied cellulosic insulation.

B. Related Sections include the following:

1. Division 04 Section "Unit Masonry" for insulation installed in cavity walls and masonry cells.
2. Division 07 Section "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for insulation specified as part of roofing construction.
3. Division 07 Section "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
4. Division 09 Section "Gypsum Board" for sound attenuation blankets installed in metal-framed partition assemblies.
5. Division 21 Section "Fire-Suppression Systems Insulation."
6. Division 22 Section "Plumbing Insulation."
7. Division 23 Section "HVAC Insulation."

1.3 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 SUBMITTALS

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

B. Samples for Verification: Full-size units for each type of exposed insulation indicated.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 RIGID INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:

1. Available Manufacturers:

a. DiversiFoam Products.
b. Dow Chemical Company.
c. Owens Corning.
d. Pactiv Building Products Division.

2. Type IV, 1.60 lb/cu. ft., unless otherwise indicated.

2.3 BOARD INSULATION

A. Available Manufacturers:

1. Fibrex Insulations Inc.
2. Owens Corning.
3. Thermafiber.

B. Foil-Faced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612; faced on 1 side with foil-scrim or foil-scrim-polyethylene vapor retarder; with maximum flame-spread and smoke-developed indexes of 25 and 5, respectively; and of the following nominal density and thermal resistivity:
1. Nominal density of 8 lb/cu. ft., Type III, thermal resistivity of 4.35 deg F x h x sq. ft./Btu x in. at 75 deg F.
2. Thickness: One inch.
3. Fiber Color: Darkened.

2.4 BATT INSULATION

A. Available Manufacturers:

1. CertainTeed Corporation.
2. Guardian Fiberglass, Inc.
3. Johns Manville.
4. Knauf Fiber Glass.
5. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

C. Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face.

D. Provide glass-fiber blanket insulation is maximum thickness that will fit in cavity, or as indicated,, provide blankets in batt or roll form with the following thermal resistances:
1. 3-5/8 inches thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F.
2. 5-1/2 inches thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F.

2.5 SPRAY INSULATION

A. Self-Supported, Spray-Applied Cellulosic Insulation: ASTM C 1149, Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications), chemically treated for flame-resistance, processing, and handling characteristics.
1. Color: Black/Charcoal.
2. Thickness: As required to achieve an NRC of not less than 0.75 per ASTM C-423.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF UNDER-SLAB INSULATION

A. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Set vapor-retarder-faced units with vapor retarder to warm-in-winter side of construction, unless otherwise indicated.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

C. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

D. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.

1. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

E. Apply self-supported, spray-applied cellulosic insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked.

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 is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072600 - SURFACE APPLIED VAPOR REDUCTION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, materials, tools and equipment as necessary to perform installation of a surface applied moisture mitigation system (vapor retarder) on new and existing concrete slabs free of oil contamination or previously treated with a sealer, as shown on drawings and/or as specified in this section.

B. Repairs and preparation of concrete floors.

C. Related Sections:

1. See section 012000 Contract Considerations.
2. See section 033000 Cast-in-Place Concrete.
3. See section 096400 Wood Flooring.
4. See section 096500 Resilient Flooring.
5. See section 096723 Resinous Flooring.

1.2 REFERENCES

A. ASTM F 1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 1998.

B. ASTM E 1907 – Standard Practices for Determining Moisture-Related Acceptability of Concrete Floors to Receive Moisture-Sensitive Finishes; 1997.

C. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; 1995.

D. ASTM D 4541 B - Pull-Off Strength of Coatings; 1995, Modified.

1.3 SUBMITTALS

A. Product Data:
1. Submit manufacturer's literature and installation instructions for each product.
2. Test data: Submit independent testing laboratory data for product, evidencing:
   a. up to 97% reduction of water vapor transmission (tested as per ASTM E 96-95).
   b. product is insensitive to alkaline environment up to pH 14 (tested as per ASTM D 1308).
3. Submit manufacturers sample warrantee.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Company specializing in manufacturing products specified in this Section with minimum 5 years documented experience.

B. Installer Qualifications:
1. Acceptable to manufacturer with documented experience on at least 3 projects of similar nature in past 5 years and/or training provided by the product manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver and store in a dry, well ventilated area at minimum 50 deg F (10 deg C) and maximum 90 deg F (32 deg C).

B. Deliver materials in manufacturer's unopened containers fully identified with brand, type, grade, class and all other qualifying information. Provide Material Safety Data Sheets for each product.

1.6 SYSTEM REQUIREMENTS

A. Coordinate floor sealing installation with other trades.

B. Provide materials and accessories in timely manner so as not to delay Work.

1.7 PROJECT CONDITIONS

A. Maintain surfaces to be sealed and surrounding air temperature at not less than 50 deg F (10 deg C).

B. Exercise caution when temperatures exceed 90 deg F (32 deg C).

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form, in which manufacturer agrees to repair or replace components of the flooring system, including the finish floor covering, that fail in materials or workmanship due to vapor transmission for five (5) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products For All Locations Indicated Unless Otherwise Specified: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
a. Vaportight Coat SG-2 by Aquafin, Inc.
b. Koester VAP 1 pH by Koester American Corporation.
c. MoistureBloc Universal by Vexcon Chemicals, Inc.

B. Available Products for Resinous Flooring Locations: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. Vaportight Coat SG-3 by Aquafin, Inc.
   b. Koester VAP 1 2000 by Koester American Corporation.
   c. MoistureBloc Emulsion Vapor Reduction System by Vexcon Chemicals, Inc.

2.2 MATERIALS

A. Moisture Vapor Emission Reduction Control System (concrete floor sealer) For All Locations Indicated Unless Otherwise Specified: A 100% solids, solvent free, moisture tolerant, high density, low odor, chemically enhanced epoxy based product which must reduce vapor emissions (MVER) to 3 lbs/24 hrs*1000 SF or less and be compatible with floor finishes and adhesives approved by the manufacturer. Characteristics:

   1. Permeance: (ASTM E-96) <1.0 perm
   2. Alkaline Resistance: (ASTM D-1308) up to pH 14

B. Moisture Vapor Emission Reduction Control System (concrete floor sealer) For Resinous Flooring Locations: A 100% solids, solvent free, moisture tolerant, high density, low odor, chemically enhanced epoxy based product which must reduce vapor emissions (MVER) to 3 lbs/24 hrs*1000 SF or less and be compatible with floor finishes and adhesives approved by the manufacturer. Characteristics:

   1. Permeance: (ASTM E-96) <0.5 perm
   2. Alkaline Resistance: (ASTM D-1308) up to pH 14

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all construction substrates and conditions under which concrete floor sealer material is to be installed. Do not proceed with the concrete floor sealer installation until unsatisfactory conditions are corrected.

B. Assure that surfaces to be treated do not contain any kind of sealer or organic compounds.

C. Anhydrous Calcium Chloride Testing as per ASTM F-1869:
   1. Before installation of concrete floor sealer: use tests carried out by Architect/Engineer during study phase, and confirm by testing through installer or independent laboratory prior to installation of concrete floor sealer.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive concrete floor sealer.

B. Substrate preparation:

1. Remove existing floor coverings, coatings and adhesives down to bare concrete, curing compounds, efflorescence, dust, grease, laitance, etc. with steel shot blasting, abrasive (sand) blasting or grinding using a diamond cup blade. Acid etching is not allowed.

2. Assure that all slabs have surface profile ICRI CSP 3 - 5 (ICRI, Des Plaines, IL, Guideline No. 03732.) for mechanical bond (i.e. medium grit sandpaper). Smooth surfaces are not acceptable, they must be shot blasted.

3. Burn off reinforcing fibers and collect and vacuum remains.

4. Repair defective areas such as honeycombs, cracks or other defects with a suitable repairing or manufacturer recommended mortar.

5. Treat saw cut and expansion joints as per manufacturer's application guideline.

6. Install cementitious underlayment, leveling mortars, flash patching, on top of surface applied concrete floor sealer.

7. Carefully rinse or pre-dampen several times all the surfaces to be treated with clean water, leave no standing water.

3.3 INSTALLATION

A. Mix concrete floor sealer material in proportions recommended by manufacturer.

B. Apply concrete floor sealer material in quantities as per manufacturer's specifications and recommendations.

   1. Apply in one coat at specified rate.

   2. Apply using non-shed synthetic roller or notched squeegee to the still moist substrate, and carefully scrub it into the pores with a long handled scrub brush. Follow with a non-shed synthetic roller to achieve a uniform coverage.

C. Where specified install leveling course as per manufacturer's specifications and recommendations.

D. Where specified install floor covering as per manufacturer's specifications and recommendations.

3.4 ACCEPTANCE

A. Remove left over materials and any foreign material resulting from the work from the site.

B. Clean adjacent surfaces and materials.

END OF SECTION 072600

SECTION 072713 - MODIFIED BITUMINOUS SHEET AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes self-adhering, vapor-retarding, modified bituminous sheet air barriers.

B. Related Sections include the following:
1. Division 04 Section "Unit Masonry" for embedded flashings.
2. Division 05 Section "Cold-Formed Metal Framing" for wall sheathing.
3. Division 07 Section "Bituminous Damproofing."
4. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal flashings.
5. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.

1.3 DEFINITIONS

A. ABAA: Air Barrier Association of America.

B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Compatibility: Air barrier must be compatible with bituminous damproofing.

1.5 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life.

C. Store rolls according to manufacturer's written instructions.

D. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 SELF-ADHERING SHEET AIR BARRIER

A. Modified Bituminous Sheet: 40-mil- thick, self-adhering sheet consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick, polyethylene film with release liner on adhesive side and formulated for application with primer that complies with VOC limits of authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Carlisle Coatings & Waterproofing; CCW-705.
   b. Grace, W. R. & Co.; Perm-A-Barrier.
   c. Henry Company; Blueskin SA.
   d. Meadows, W. R., Inc.; SealTight Air-Shield.
   e. NEI; AC AirSeal.
   f. Rubber Polymer Corporation; Rub-R-Wall SA.
   g. Tremco, Incorporated; ExoAir 110

2. Physical and Performance Properties:

a. Membrane Air Permeance: Not to exceed 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
b. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
c. Ultimate Elongation: 200 percent minimum; ASTM D 412, Die C, modified.
d. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
e. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
f. Puncture Resistance: 40 lbf minimum; ASTM E 154.
g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

2.2 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid primer recommended for substrate by manufacturer of air barrier material.

C. Counterflashing Strip: Modified bituminous 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, crosslaminated polyethylene film with release liner backing.

D. Modified Bituminous Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

E. Termination Mastic: Cold fluid-applied elastomeric liquid; trowel grade.

F. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

G. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

H. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft. density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

I. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- thick, smooth-surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.

J. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Division 07 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

D. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

E. Bridge and cover discontinuous deck-to-wall and deck-to-deck joints with overlapping modified bituminous strips.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 INSTALLATION

A. Install modified bituminous sheets according to air barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous air barrier sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

B. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install modified bituminous strips centered over vertical inside corners. Install 3/4-inch fillets of termination mastic on horizontal inside corners.

C. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.

D. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.

E. Apply and firmly adhere modified bituminous sheets horizontally over area to receive air barrier sheets. Accurately align sheets and maintain a uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure airtight installation.

1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
2. Roll sheets firmly to enhance adhesion to substrate.

F. Apply continuous modified bituminous sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.

G. Seal top of through-wall flashings to air barrier sheet with an additional 6-inch- wide, strip.

H. Seal exposed edges of sheets at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

I. Install air barrier sheets and auxiliary materials to form a seal with adjacent construction and to maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.

J. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings using accessory materials and according to manufacturer's tested assembly.

K. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip so that a minimum of 3 inches of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.

L. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

M. At end or each working day, seal top edge of membrane to substrate with termination mastic.

N. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

O. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air barrier sheet extending 6 inches beyond repaired areas in all directions.

P. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

Q. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.4 FIELD QUALITY CONTROL

A. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air barrier system has been provided.
3. Site conditions for application temperature and dryness of substrates have been maintained.
4. Maximum exposure time of materials to UV deterioration has not been exceeded.
5. Surfaces have been primed.
6. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
7. Termination mastic has been applied on cut edges.
8. Air barrier has been firmly adhered to substrate.
9. Compatible materials have been used.
10. Transitions at changes in direction and structural support at gaps have been provided.
11. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
12. All penetrations have been sealed.

3.5 CLEANING AND PROTECTION

A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed to these conditions for more than 30 days.
2. Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.

B. Clean spills, stains, and soiling from adjacent construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 072713

SECTION 074243 - COMPOSITE WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes metal-faced composite wall panels.

B. Related Sections:

1. Division 05 Section "Cold-Formed Metal Framing" for cold-formed metal framing supporting metal-faced composite wall panels.
2. Division 07 Section "Sheet Metal Flashing and Trim" for field-formed flashings and other sheet metal work not part of metal-faced composite wall panel assemblies.
3. Division 07 Section “Thermal Insulation” for rigid insulation associated with composite wall panels.

1.3 DEFINITION

A. Metal-Faced Composite Wall Panel Assembly: Metal-faced composite wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight wall system.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Metal-faced composite wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Design metal-faced composite wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Water Penetration Under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft.

D. Structural Performance: Provide metal-faced composite wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:
   a. Uniform pressure as indicated on Drawings.

2. Deflection Limits: Metal-faced composite wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/180 of the span.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): Minus 20 to plus 180 deg F ambient; 180 deg F material surfaces.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal-faced composite wall panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal-faced composite wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work.

C. Samples for Initial Selection: For each type of metal-faced composite wall panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.
2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
2. Accessories: 12-inch- long Samples for each type of accessory.
3. Exposed Gaskets: 12 inches long.
4. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of metal-faced composite wall panels adjacent to joint sealants.

E. Delegated-Design Submittal: For metal-faced composite wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Maintenance Data: For metal wall panels to include in maintenance manuals.

G. Warranties: Samples of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Source Limitations: Obtain each type of metal-faced composite wall panel from single source from single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal-faced composite wall panels, and other manufactured items so as not to be damaged or deformed. Package metal-faced composite wall panels for protection during transportation and handling.

B. Unload, store, and erect metal-faced composite wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Store metal-faced composite wall panels vertically, covered with suitable weathertight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 120 deg F.

D. Retain strippable protective covering on metal-faced composite wall panel for period of panel installation.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal-faced composite wall panels to be performed according to manufacturer's written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal-faced composite wall panel fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Coordinate metal-faced composite wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal-faced composite wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal-faced composite wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

A. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

1. Surface: Smooth, flat finish.
2. Exposed Coil-Coated Finishes:
a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

B. Panel Sealants:

1. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal-faced

composite wall panels and remain weathertight; and as recommended in writing by panel manufacturer.

2.2 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

B. Subgirts: Manufacturer's standard C- or Z-shaped sections 0.064-inch nominal thickness.

C. Zee Clips: 0.079-inch nominal thickness.

D. Base or Sill Angles or Channels: 0.079-inch nominal thickness.

E. Hat-Shaped, Rigid Furring Channels:

1. Nominal Thickness: As required to meet performance requirements.
2. Depth: 7/8 inch.

F. Cold-Rolled Furring Channels: Minimum 1/2-inch- wide flange.

1. Nominal Thickness: As required to meet performance requirements.
2. Depth: 3/4 inch.
3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch.
4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

G. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.3 MISCELLANEOUS MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and finish indicated.

B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal-faced composite wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.4 METAL-FACED COMPOSITE WALL PANELS

A. General: Provide factory-formed and -assembled, metal-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic

core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.

1. Fire-Retardant Core: Noncombustible, 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 Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.

2. Basis-of-Design Product: Subject to compliance with requirements, provide Subject to compliance with requirements, provide CENTRIA Architectural Systems; Formabond Wall System.or a comparable product by one of the following:
    a. Alcan Composites USA Inc.
    b. Alcoa Inc.; Reynobond.
    c. ALPOLIC, Division of Mitsubishi Chemical America, Inc.
    d. Feiteng Brand ACP

B. Aluminum-Faced Composite Wall Panels: Formed with minimum 0.020-inch- thick, coil-coated aluminum sheet facings.

1. Panel Thickness: 0.236 inch.
2. Core: Standard.
3. Exterior Finish: 3-coat fluoropolymer.

    a. Color: As selected by Architect from CENTRIA Architectural Systems full range, including Micas and Metalics, or custom colors from a comparable manufacturer.

C. Attachment System Components: Formed from extruded aluminum.

1. Include manufacturer's standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips, and, anchor channels.

2.5 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal-faced composite wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal-faced composite wall panels unless otherwise indicated.

B. Flashing and Trim: Formed from 0.018-inch- minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal-faced composite wall panels.

2.6 FABRICATION

A. General: Fabricate and finish metal-faced composite wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal-faced composite wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Metal-Faced Composite Wall Panels: Factory form panels in a continuous process with no glues or adhesives between dissimilar materials. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.

1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
2. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.
3. Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to back of panels with structural silicone sealant or bond tape.
4. Dimensional Tolerances:

   a. Length: Plus 0.375 inch.
   b. Width: Plus 0.188 inch.
   c. Thickness: Plus or minus 0.008 inch.
   d. Panel Bow: 0.8 percent maximum of panel length or width.
   e. Squareness: 0.2 inch maximum.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal-faced composite wall panel manufacturer.

   a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal-faced composite wall panel manufacturer for application, but not less than thickness of metal being secured.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal-faced composite wall panel supports, and other conditions affecting performance of the Work.

1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal-faced composite wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal-faced composite wall panel manufacturer.

B. Examine roughing-in for components and systems penetrating metal-faced composite wall panels to verify actual locations of penetrations relative to seam locations of panels before panel installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal-faced composite wall panel manufacturer's written instructions.

3.3 METAL-FACED COMPOSITE WALL PANEL INSTALLATION

A. General: Install metal-faced composite wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor panels and other

components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal-faced composite wall panels.
2. Flash and seal metal-faced composite wall panels at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.
3. Install flashing and trim as metal-faced composite wall panel work proceeds.
4. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
5. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners:

1. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal-faced composite wall panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal-faced composite wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer.

1. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

E. Attachment System Installation, General: Install attachment system required to support metal-faced composite wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
2. Do not begin installation until weather barrier and flashings that will be concealed by composite panels are installed.

F. Rainscreen-Principle Installation: Provide manufacturer's standard pressure-equalized, rainscreen-principle system with vertical channel that provides support and complete secondary drainage system, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach wall panels by engaging horizontal support pins into notches in vertical channels and into flanges of wall panels. Leave horizontal and vertical joints with open reveal.

1. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
2. Do not apply sealants to joints unless otherwise indicated on Drawings.

3.4 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal-faced composite wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal-faced composite wall panel units within installed tolerance of 1/4 inch in 20 feet, nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal-faced composite wall panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal-faced composite wall panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.

B. After metal-faced composite wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal-faced composite wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074243

SECTION 075323 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Adhered membrane roofing system.
2. Roof insulation.

B. Related Sections include the following:
1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
3. Division 07 Section "Manufactured Roof Expansion Joints."
4. Division 07 Section "Joint Sealants."
5. Division 07 Section "Preparation for Re-Roofing" for removal of existing roofing.
6. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," before multiplication by a safety factor.

C. Factored Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," after multiplication by a safety factor.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: Class 1C-60.
2. Hail Resistance: MH.

1.5 SUBMITTALS

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

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.

C. Samples for Verification: For the following products:

1. 12-by-12-inch square of sheet roofing, of color specified, including T-shaped side and end lap seam.
2. 12-by-12-inch square of roof insulation.
3. 12-by-12-inch square of walkway pads or rolls.
4. Insulation fasteners of each type, length, and finish.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

G. Maintenance Data: For roofing system to include in maintenance manuals.

H. Warranties: Special warranties specified in this Section.

I. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

J. Roof Acceptance Form: Submit Form 2688, "Contractor's Application for Acceptance of Roof" (blank form can be found at the end of this section) and provide a "RoofNav Assembly No" for each roof system. The FM Global public domain tool; www.RoofNav.com can be utilized for this purpose.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has FMG approval for membrane roofing system identical to that used for this Project.

C. Source Limitations: Obtain components for membrane roofing system approved by roofing membrane manufacturer.

D. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Exterior Fire-Test Exposure: Class B; ASTM E 108, for application and roof slopes indicated.

E. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner; Architect; Owner's insurer if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck Installer; and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Special warranty includes roofing membrane, base flashings, roofing accessories, roof insulation, fasteners, and walkway products and other components of membrane roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 EPDM ROOFING MEMBRANE

A. EPDM Roofing Membrane: ASTM D 4637, Type II, scrim or fabric internally reinforced uniform, flexible sheet made from EPDM, and as follows:

1. Available Manufacturers:

   a. Carlisle SynTec Incorporated.
   b. Firestone Building Products Company.
   c. GenFlex Roofing Systems.
   d. Johns Manville International, Inc.

2. Thickness: 60 mils, nominal.
3. Exposed Face Color: Black.

2.3 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive.

D. Seaming Material: Manufacturer's standard synthetic-rubber polymer primer and 3-inch- wide minimum, butyl splice tape with release film.

E. Lap Sealant: Manufacturer's standard single-component sealant.

F. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

G. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

H. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

I. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.4 ROOF INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.

1. Available Manufacturers:
   a. Carlisle SynTec Incorporated.
   b. Celotex Corporation.
   c. Firestone Building Products Company.
   d. GAF Materials Corp.
   e. GenFlex Roofing Systems.
   f. Johns Manville International, Inc.

C. R-Value: Provide 3-inch insulation with LTTR R-value of 18.5.

D. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/2 inch per 12 inches, unless otherwise indicated.

E. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

2.6 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Mechanically Fastened Insulation: Where underside of deck is not exposed, install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.

3.4 ADHERED ROOFING MEMBRANE INSTALLATION

A. Where underside of deck is exposed to view, install insulation with adhesive.

B. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

E. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

G. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

H. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

I. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

J. Install roofing membrane and auxiliary materials to tie in to existing roofing.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

B. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates and repair or reinstall membrane roofing system to a condition

free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

END OF SECTION 075323

APPLICATION FOR ACCEPTANCE OF ROOFING

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 Approval Guide Listing: ☐ CD-ROM ☐ Paper Issued Date:		
Approved Combination and Assembly (Chapter 3):		
Page Number:	Construction Number:	

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 ☐ Fibre Reinforced Plastic (FRP) ☐ Other:		
☐ Built Up Roofing (BUR)			
☐ Modified Bitumen			
☐ Single Ply:	☐ Adhered	☐ Fastened	☐ Ballasted
☐ Spray Applied			
☐ Other:			

BASE PLY:

(Please include Trade Name, Type, Width)

☐ None	
Trade Name:	Width: ☐ 36 In. ☐ 1 meter (39 In.)
☐ Fastened	☐ Adhered
☐ Attached per Factory Mutual Research Approval Guide **OR**	☐ Per Factory Mutual Research Operating Standard 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

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.)

☐ Factory Mutual Research Approved Manufacturer	☐ Per Factory Mutual Research Operating Standard 1-49
☐ Other:	Comments:

DRAINAGE:

For new construction: Has roof drainage been designed by a Qualified Engineer per FM Research Operating Standard 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 Research Operating Standard 1-54? ☐ Yes ☐ No (Attach details)

Signature of Property Owner: _____

Title: _____ Date: _____

Signature of Installing Contractor: _____

Title: _____ Date: _____

APPLICATION FOR ACCEPTANCE OF ROOFING

FACTORY MUTUAL 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

Reviewed By: _____

Date: _____

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Manufactured Products:
   a. Manufactured reglets and counterflashing.

2. Formed Products:

   a. Formed roof drainage sheet metal fabrications.
   b. Formed low-slope roof sheet metal fabrications.
   c. Formed wall sheet metal fabrications.

B. Related Sections:

1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "EPDM Roofing" for installing sheet metal flashing and trim integral with membrane roofing.
3. Division 07 Section "Composite Wall Panels" for sheet metal flashing and trim integral with metal wall panels.
4. Division 07 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
5. Division 07 Section "Roof Specialties" for manufactured roof-edge flashings.
6. Division 07 Section "Expansion Control" for manufactured sheet metal expansion-joint covers.

1.3 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:

1. Wind Zone 1: For velocity pressures of 10 to 20 lbf/sq. ft.: 40-lbf/sq. ft. perimeter uplift force, 60-lbf/sq. ft. corner uplift force, and 20-lbf/sq. ft. outward force.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F , material surfaces.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.

C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Accessories and Miscellaneous Materials: Full-size Sample.

E. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

F. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

B. Special Warranty on Material and Workmanship: Installer agrees to repair or replace sheet metal flashing and trim that has failed due to material defect or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
1. Surface: Smooth, flat.

2. Exposed Coil-Coated Finishes:
   a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   b. Mica Fluoropolymer: AAMA 620. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   c. Metallic Fluoropolymer: AAMA 620. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   d. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.

3. Color: Match Architect's samples.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.

1. Finish: 2D (dull, cold rolled).
2. Surface: Smooth, flat.

D. Lead-Coated Copper Sheet: ASTM B101.

1. Weight: 17 oz/sf.

2.2 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

    a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
    b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Lead Coated Copper Sheet: Copper, hardware bronze or Series 300 stainless steel.
3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Solder:

1. For Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
2. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cheney Flashing Company.
    b. Fry Reglet Corporation.
    c. Heckmann Building Products Inc.
    d. Hickman, W. P. Company.
    e. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
    f. Keystone Flashing Company, Inc.
    g. National Sheet Metal Systems, Inc.
    h. Sandell Manufacturing Company, Inc.

2. Material: Aluminum, 0.024 inch thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

5. Finish: Manufacturer's standard siliconized polyester and color.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

I. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:
   1. Aluminum: 0.032 inch thick.
      a. Finish: Fluoropolymer.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Edge Flashing and Fascia Cap: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections.

   1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc; Anchor-Tite Fascia or comparable product:
   2. Fabricate from the following materials:
      a. Aluminum Fascia: 0.040 inch thick.
         1) Finish: Fluoropolymer.
      b. Extruded Aluminum Fascia Clip: 6063-T6 aluminum.

B. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections.

   1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc; Perma-Tite Copingt or comparable product:
   2. Fabricate from the following materials:
      a. Aluminum Fascia: 0.040 inch thick.
         1) Finish: Fluoropolymer.

C. Roofing: Custom fabricate sheet metal roofing to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions (panel width and seam height), geometry, metal thickness, and other characteristics of installation indicated. Fabricate sheet metal roofing and accessories at the shop to greatest extent possible.

   1. Flat-Seam Roofing: Form flat-seam panels from metal sheets 20 by 28 inches with 1/2-inch notched and folded edges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

   1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Install underlayment as indicated on Drawings.

B. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing, roofing, and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing, roofing, and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing, roofing, and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 12 feet with no joints allowed within 24 inches of corner or

intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder aluminum sheet.
2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
3. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
4. Copper Soldering: Tin edges of uncoated copper sheets using solder for copper.

F. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

1. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as

indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 24-inch centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.

1. Interlock bottom edges of coping with anchor clips space 36" o.c. maximum.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of anchor and washer at 36-inch centers.

3.6 WALL FLASHING INSTALLATION

A. Reglets: Installation of reglets is specified in Division 04 Section "Unit Masonry."

3.7 CUSTOM-FABRICATED SHEET METAL ROOFING INSTALLATION

A. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks, considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant. Fold back sheet metal to form a hem on concealed side of exposed edges unless otherwise indicated.

1. Install cleats to hold sheet metal panels in position. Attach each cleat with two fasteners to prevent rotation.
2. Fasten cleats not more than 12 inches o.c. Bend tabs over fastener head.
3. Provide expansion-type cleats and clips for roof panels that exceed 30 feet in length.

B. Seal joints as shown and as required for watertight construction. For roofing with 3:12 slopes or less, use cleats at transverse seams.

C. Flat-Seam Roofing: Attach flat-seam metal panels to substrate with cleats, starting at eave and working upward toward ridge. After panels are in place, mallet seams and solder.

1. Attach roofing panels with cleats spaced not more than 24 inches o.c.. Lock and solder panels to base flashing.
2. Attach edge flashing to face of roof edge with continuous cleat fastened to roof substrate at 12 inches o.c. Lock panels to edge flashing and solder.

3.8 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing, roofing, and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.9 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Roof hatches.

1.3 SUBMITTALS

A. Product Data: For each type of roof accessory indicated.

B. Shop Drawings: Show fabrication and installation details for roof accessories.

1.4 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated.

B. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and mill finish.

2.3 ROOF HATCHES

A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated double-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.

1. Manufacturers:

   a. Babcock-Davis; a Cierra Products Inc. Company.
   b. Bilco Company (The).
   c. Bristolite Skylights.
   d. Custom Curb, Inc.
   e. Dur-Red Products.
   f. Hi Pro International, Inc.
   g. J. L. Industries, Inc.
   h. Metallic Products Corporation.
   i. Milcor Inc.; a Gibraltar Company.
   j. Nystrom, Inc.
   k. O'Keeffe's Inc.
   l. Precision Ladders, LLC.
   m. Roof Products & Systems Corporation.
   n. ThyCurb; Div of Thybar Corporation.
   o. Wasco Products, Inc.
   p. Western Canwell.

2. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
3. Type and Size: Single-leaf lid, 30 by 36 inches.
4. Curb and Lid Material: Aluminum sheet, 0.090 inch.
   a. Finish: Mill.

5. Insulation: Manufacturers standard board.
6. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
7. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
8. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
9. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.

10. Ladder Safety Post: Manufacturer's standard ladder safety post. Post to lock in place on full extension. Provide release mechanism to return post to closed position.

11. Safety Railing System: Manufacturer's standard complete system including rails, clamps, fasteners, safety barrier at railing opening, and all accessories required for a complete installation.

    a. Test Load: Concentrated load of 200 lbf applied in any direction.
    b. Height: 42 inches above finished roof deck.

c. Pipe or Tube: 1-1/4-inch ID galvanized pipe or 1-5/8-inch OD galvanized tube.
d. Flat Bar: 2-inch- high by 3/8-inch- thick galvanized steel.
e. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
f. Pipe Ends and Tops: Covered or plugged with weather-resistant material.
g. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.
h. Fabricate joints that will be exposed to weather in a watertight manner.
i. Close exposed ends of handrail and railing members with prefabricated end fittings.
j. Fasteners: Manufacturer's standard.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Roof Hatch Installation:

1. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware.
2. Attach safety railing system to roof hatch curb.
3. Attach ladder safety post according to manufacturer's written instructions.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

D. Seal joints with sealant as required by manufacturer of roof accessories.

END OF SECTION 077200

SECTION 078100 - SPRAYED FIRE-RESISTIVE MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Concealed SFRM.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Show extent of sprayed fire-resistive material for each construction and fire-resistance rating, applicable fire-resistive design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction, and minimum thicknesses.

C. Compatibility and adhesion test reports.

D. Product test reports.

E. Research/evaluation reports.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer, approved by manufacturer to install manufacturer's products. 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. Sprayed Fire-Resistive Materials Testing: By a qualified testing and inspecting agency engaged by Contractor or manufacturer to test for compliance with specified requirements for performance and test methods.

   1. Sprayed fire-resistive materials are randomly selected for testing from bags bearing the applicable classification marking of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Testing is performed on specimens of sprayed fire-resistive materials that comply with laboratory testing requirements specified in Part 2 and are otherwise identical to installed fire-resistive materials, including application of accelerant, sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.
   3. Testing is performed on specimens whose application the independent testing and inspecting agency witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.

C. Compatibility and Adhesion Testing: Engage a qualified testing and inspecting agency to prepare compatibility and adhesion test reports.

1. Test for bond per ASTM E 736 and requirements in UL's "Fire Resistance Directory" for coating materials. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
2. Verify that manufacturer, through its own laboratory testing or field experience, has not found primers or coatings to be incompatible with sprayed fire-resistive material.

D. Fire-Test-Response Characteristics: Where indicated, provide products identical to those tested for fire resistance per ASTM E 119 by a testing agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Provide 1-hour resistance rating. All ratings to comply with designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
2. Identify products with appropriate markings of applicable testing and inspecting agency.

E. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperature is 40 deg F or lower unless temporary protection and heat is provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilate building spaces during and after application of sprayed fire-resistive material. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

C. Sequence and coordinate application of sprayed fire-resistive materials with related work.

1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
4. Do not apply fire-resistive material to metal floor deck substrates until concrete topping has been completed.
5. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
6. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
7. 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.

PART 2 - PRODUCTS

2.1 CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

A. General: For concealed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated for material composition and physical properties representative of installed products.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Cementitious Sprayed Fire-Resistive Material:

a. Carboline Co., Fireproofing Products Div.; Pyrolite 15.
b. Carboline Co., Fireproofing Products Div.; Pyrolite 15 High Yield.
c. Grace, W. R. & Co.--Conn., Construction Products Div.; Monokote Type MK-6s.
d. Grace, W. R. & Co.--Conn., Construction Products Div.; Monokote Type MK-6/HY.
e. Isolatek International Corp., Cafco Products; Cafco 300.
f. Southwest Vermiculite Co., Inc.; 5EF.
g. Southwest Vermiculite Co., Inc.; 5GP.

C. Material Composition: As follows:

1. Cementitious sprayed fire-resistive material consisting of factory-mixed, dry formulation of gypsum or portland cement binders and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

D. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:

1. Dry Density: 15 lb/cu. ft. for average and individual densities regardless of density indicated in referenced fire-resistance design, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
2. Thickness: Provide minimum average thickness required for fire-resistance design indicated according to the following criteria, but not less than 0.375 inch, per ASTM E 605:

a. Where the referenced fire-resistance design lists a thickness of 1 inch or greater, the minimum allowable individual thickness of sprayed fire-resistive material is the design thickness minus 0.25 inch.
b. Where the referenced fire-resistance design lists a thickness of less than 1 inch but more than 0.375 inch, the minimum allowable individual thickness of sprayed fire-resistive material is the greater of 0.375 inch or 75 percent of the design thickness.
c. No reduction in average thickness is permitted for those fire-resistance designs whose fire-resistance ratings were established at densities of less than 15 lb/cu. ft..

3. Bond Strength: 150 lbf/sq. ft. minimum per ASTM E 736 under the following conditions:

   a. Field test sprayed fire-resistive material that is applied to flanges of wide-flange, structural-steel members on surfaces matching those that will exist for remainder of steel receiving fire-resistive material.
   b. Minimum thickness of sprayed fire-resistive material tested in laboratory shall be 0.75 inch.

4. Compressive Strength: 5.21 lbf/sq. in. as determined in the laboratory per ASTM E 761. Minimum thickness of sprayed fire-resistive material tested shall be 0.75 inch and minimum dry density shall be as specified, but not less than 15 lb/cu. ft..
5. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
6. Deflection: No cracking, spalling, or delamination per ASTM E 759.
7. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
8. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistive material is 0.75 inch, maximum dry density is 15 lb/cu. ft., test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.
9. 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 Index: 10 or less.
   b. Smoke-Developed Index: 0.

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-resistance designs indicated.

B. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of sprayed fire-resistive material.

C. Topcoat: Type recommended in writing by manufacturer of each sprayed fire-resistive material for application over concealed sprayed fire-resistive materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work. A substrate is in satisfactory condition if it complies with the following:

1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
2. 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 materials with substrates under conditions of normal use or fire exposure.
3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.

B. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of oil, rolling compounds, and other substances capable of interfering with bond.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.

B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, loose mill scale, and incompatible primers, paints, and encapsulants.

C. Prime substrates where recommended in writing by sprayed fire-resistive material manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive sprayed fire-resistive material.

D. 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.

3.3 INSTALLATION, GENERAL

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Apply sprayed fire-resistive material that is identical to products tested as specified in Part 1 "Quality Assurance" Article and substantiated by test reports, with respect to rate of application,

accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.

E. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by sprayed fire-resistive material manufacturer, install body of fire-resistive covering in a single course.

F. 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 sprayed fire-resistive material manufacturer.

H. Where sealers are used, apply products that are tinted to differentiate them from sprayed fire-resistive material over which they are applied.

I. Where non-fire rated members attach to rated members, extend fire-resistive material a minimum of 12 inches on to non-rated member from the point of connection.

3.4 INSTALLATION, CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

A. Apply concealed sprayed fire-resistive material in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition, but apply in greater thicknesses and densities if specified in Part 2 "Concealed Sprayed Fire-Resistive Materials" Article.

B. Apply water overspray to concealed sprayed-fiber fire-resistive material as required to obtain designated fire-resistance rating.

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 Services: Testing and inspecting of completed applications of sprayed fire-resistive material shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of sprayed fire-resistive material for the next area until test results for previously completed applications of sprayed fire-resistive material show compliance with requirements. Tested values must equal or exceed values indicated and required for approved fire-resistance design.

1. 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.

2. Density Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method."
3. Bond Strength for Structural Framing Members: For each floor, cohesion and adhesion from one sample of size indicated for determining thickness of each type of construction and structural framing member, per ASTM E 736.
5. If testing finds applications of sprayed fire-resistive material are 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 sprayed fire-resistive material where test results indicate that it does not comply with specified requirements for cohesion and adhesion, for density, or for both.

D. Apply additional sprayed 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.

3.7 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. Protect sprayed 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 time of Substantial Completion.

C. Coordinate application of sprayed fire-resistive material with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect sprayed fire-resistive material and patch any damaged or removed areas.

D. Repair or replace work that has not been successfully protected.

END OF SECTION 078100

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

B. Related Sections include the following:

1. Division 07 Section "Fire-Resistive Joint Systems."
2. Division 21 Sections specifying fire-suppression piping penetrations.
3. Division 22 and 23 Sections specifying duct and piping penetrations.
4. Division 26, 27, and 28 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:

1. F-Rated Systems: Provide through-penetration firestop systems with minimum F-ratings of 1 hour, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with minimum T-ratings, as well as F-ratings, of 1 hour but not less than that equaling or exceeding fire-resistance rating of constructions penetrated, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

   a. Penetrations through horizontal assemblies located outside wall cavities.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.4 SUBMITTALS

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

B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

C. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.

B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and

follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.

2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:

   a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
   b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:

      1) UL in its "Fire Resistance Directory."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated that are produced by one of the following manufacturers:

1. A/D Fire Protection Systems Inc.
2. Grace, W. R. & Co. - Conn.
3. Hilti, Inc.
4. Johns Manville.
5. Nelson Firestop Products.
6. NUCO Inc.
7. RectorSeal Corporation (The).
8. Specified Technologies Inc.
9. 3M; Fire Protection Products Division.
10. Tremco; Sealant/Weatherproofing Division.
11. USG Corporation.

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

2.3 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Through-penetration firestop system designation of applicable testing and inspecting agency.
3. Through-penetration firestop system manufacturer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner may engage a qualified, independent inspecting agency to inspect through-penetration firestops.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.7 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Firestop Systems with No Penetrating Items:

1. Available UL-Classified Systems: C-AJ-0001-0999.

2. Available UL-Classified Systems: W-L-0001-0999.

C. Firestop Systems for Metallic Pipes, Conduit, or Tubing:

1. Available UL-Classified Systems: C-AJ-1001-1999.
2. Available UL-Classified Systems: W-L-1001-1999.

D. Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing:

1. Available UL-Classified Systems: C-AJ-2001-2999.
2. Available UL-Classified Systems: W-L-1001-1999.

E. Firestop Systems for Electrical Cables:

1. Available UL-Classified Systems: C-AJ-3001-3999.
2. Available UL-Classified Systems: W-L-1001-1999.

F. Firestop Systems for Cable Trays:

1. Available UL-Classified Systems: W-L-4001-4999.

G. Firestop Systems for Insulated Pipes:

1. Available UL-Classified Systems: C-AJ-5001-5999.
2. Available UL-Classified Systems: W-L-5001-5999.

H. Firestop Systems for Miscellaneous Electrical Penetrants:

1. Available UL-Classified Systems: C-AJ-6001-6999.
2. Available UL-Classified Systems: W-L-6001-6999.

I. Firestop Systems for Miscellaneous Mechanical Penetrants:

1. Available UL-Classified Systems: C-AJ-7001-7999.
2. Available UL-Classified Systems: W-L-7001-7999.

J. Firestop Systems for Groupings of Penetrants:

1. Available UL-Classified Systems: C-AJ-8001-8999.
2. Available UL-Classified Systems: W-L-5001-5999.

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes fire-resistive joint systems for the following:
   1. Head-of-wall joints.
   2. Wall-to-wall joints.
   3. Perimeter fire-resistive joint systems consisting of floor-to-wall joints between perimeter edge of fire-resistance-rated floor assemblies and exterior curtain walls.

B. Related Sections include the following:
   1. Division 07 Section "Penetration Firestopping" for systems installed in openings in walls and floors with and without penetrating items.
   2. Division 07 Section "Joint Sealants" for non-fire-resistive joint sealants.
   3. Division 07 Section "Thermal Insulation" for board insulation associated with floor-to-wall joints at exterior curtainwalls.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.

B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, indicated as determined by UL 2079.

C. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated below and those indicated in the Fire-Resistive Joint System Schedule at the end of Part 3, as determined by NFPA 285 and UL 2079.

   1. UL-Listed, Perimeter Fire-Containment Systems: Integrity ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.
   2. OPL-Listed, Perimeter Fire-Barrier Systems: F-ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.

D. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

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

B. Shop Drawings: For each fire-resistive joint system, show each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

D. Research/Evaluation Reports: For each type of fire-resistive joint system.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, OPL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:

   a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
   b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer,

date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, fire-resistive joint systems that may be incorporated into the Work include, but are not limited to, those systems indicated in the Fire-Resistive Joint System Schedule at the end of Part 3.

B. Products: Subject to compliance with requirements, provide one of the fire-resistive joint systems indicated for each application in the Fire-Resistive Joint System Schedule at the end of Part 3.

2.2 FIRE-RESISTIVE JOINT SYSTEMS

A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

B. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.

B. Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspections are completed and fire-resistive joint systems comply with requirements.

3.5 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.6 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Designation System for Joints in or between Fire-Resistance-Rated Constructions: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHBN.

B. Designation System for Joints at the Intersection of Fire-Resistance-Rated Floor or Floor/Ceiling Assembly and an Exterior Curtain-Wall Assembly: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHDG or OPL's "Directory of Listed Building Products, Materials, & Assemblies" as perimeter fire-barrier systems:

C. Head-of-Wall Fire-Resistive Joint Systems:

1. Available UL-Classified Systems: HW-D-0000-1999.
2. Assembly Rating: Equal to the rating of the wall.

3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II – 50% percent compression or extension.

D. Wall-to-Wall Fire-Resistive Joint Systems:

1. Available UL-Classified Systems: WW-D-0000-0999.
2. Assembly Rating: Equal to the rating of the wall.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class II - 25 percent compression or extension.

E. Perimeter Fire-Resistive Joint Systems:

1. Available UL-Classified Perimeter Fire-Containment Systems: CW-D-0000-0999.

   a. Integrity Rating: 1 hour.
   b. Insulation Rating: 1 hour.
   c. Linear Opening Width: As indicated.
   d. Movement Capabilities: Class II - 25 percent compression or extension.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes sealants for the following applications, including those specified by reference to this Section:

B. This Section includes sealants for the following applications:

1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
   a. Joints between different materials.
   b. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:
   a. Joints between different materials.
   b. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
   a. Perimeter joints of exterior openings where indicated.
   b. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
   c. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
   d. Other joints as indicated.

C. Related Sections include the following:
1. Division 7 Section "Through-Penetration Firestop Systems" for fire-resistant building joint-sealant systems.
2. Division 7 Section "Fire-Resistive Joint Systems" for fire-resistant building joint-sealant systems.
3. Division 8 Section "Glazing" for glazing sealants.
4. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.
3. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified in the sealant schedules at the end of Part 3.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

2.4 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bicellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:

   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

E. Install sealants by proven techniques to comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

    a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.6 ELASTOMERIC JOINT-SEALANT SCHEDULE

A. Single-Component Silicone Sealant: For miscellaneous joints between exterior materials provide:

1. Products:

   a. Dow Corning Corporation; 790.
   b. GE Silicones; SilPruf SCS2000.
   c. Pecora Corporation; 864.
   d. Polymeric Systems Inc.; PSI-641.
   e. Sonneborn, Division of ChemRex Inc.; Omniseal.
   e. Tremco; Spectrem 3.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 50.
4. Use Related to Exposure: NT (nontraffic).
5. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.

B. Latex Sealant : For miscellaneous joints between interior materials provide:

1. Products:
   a. Bostik Findley; Chem-Calk 600.
   b. Pecora Corporation; AC-20+.
   c. Tremco; Tremflex 834.

2. Type and Grade: P and NF.
3. Use Related to Exposure: NT (nontraffic).

C. Multicomponent Pourable Urethane Sealant: For joints in horizontal traffic surfaces provide:

1. Products:
   a. SL 2; Sonneborn Building Products Div., ChemRex Inc.
   b. THC-900; Tremco.
   c. THC-901; Tremco.

2. Type and Grade: M (multicomponent) and P (pourable).
3. Class: 25.

D. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant: Interior joints between plumbing fixtures or kitchen equipment and adjoining walls and floors.

1. Available Products:

a. Pecora Corporation; 898.
b. Tremco; Tremsil 600 White.

2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).

E. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:

1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
2. Available Products:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

END OF SECTION 079200

SECTION 079500 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Architectural joint systems for building interiors.
2. Architectural joint systems for building exteriors.

B. Related Sections include the following:
1. Division 04 Section "Unit Masonry" for masonry wall joint systems.
2. Division 07 Section "Fire-Resistive Joint Systems" for liquid-applied joint sealants in fire-resistive building joints.
3. Division 07 Section "Joint Sealants" for liquid-applied joint sealants.

1.3 DEFINITIONS

A. Maximum Joint Width: Widest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.

B. Minimum Joint Width: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.

C. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage (plus or minus) of nominal value of joint width.

D. Nominal Joint Width: The width of the linear opening specified in practice and in which the joint system is installed.

1.4 SUBMITTALS

A. Shop Drawings: Provide the following for each joint system specified:

1. Placement Drawings: Include line diagrams showing plans, elevations, sections, details, splices, blockout requirement, entire route of each joint system, and attachments to other work. Where joint systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

2. Architectural Joint System Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

   a. Manufacturer and model number for each joint system.
   b. Joint system location cross-referenced to Drawings.
   c. Nominal joint width.
   d. Movement capability.
   e. Classification as thermal or seismic.
   f. Materials, colors, and finishes.
   g. Product options.

B. Samples for Initial Selection: For each type of joint system indicated.

   1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.

C. Samples for Verification: For each type of architectural joint system indicated.

   1. Full width by 6 inches long, for each system required.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for current products.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain interior architectural joint systems through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated. Refer to Division 01 Section "Product Requirements."

   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

C. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)" and ICC A117.1.

1.6 COORDINATION

A. Coordinate installation of exterior wall and soffit joint systems with roof expansion assemblies to ensure that wall transitions are watertight. Roof expansion assemblies are specified in Division 07.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
2. Mill Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

B. Elastomeric Seals: Preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Compression Seals: ASTM E 1612; preformed rectangular elastomeric extrusions having internal baffle system and designed to function under compression.

D. Strip Seals: ASTM E 1783; preformed elastomeric membrane or tubular extrusions having an internal baffle system and secured in or over a joint by a metal locking rail.

E. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.

F. Moisture Barrier: Flexible elastomeric material, Santoprene.

G. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.2 ARCHITECTURAL JOINT SYSTEMS, GENERAL

A. General: Provide architectural joint systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where joint changes direction or abuts other materials.
2. Include factory-fabricated closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous joint systems.

B. Design architectural joint systems for the following size and movement characteristics:

1. Nominal Joint Width: As indicated on Drawings.
2. Movement Capability: Plus or minus 50 percent.
3. Type of Movement: Seismic.

2.3 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING INTERIORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Architectural Art Mfg., Inc.
2. Balco, Inc.
3. Construction Specialties, Inc.
4. JointMaster/InPro Corporation.
5. Michael Rizza Company, LLC.
6. MM Systems Corporation.
7. Nystrom, Inc.
8. Watson Bowman Acme Corp.

B. Floor-to-Floor Joint Systems:

1. Basis-of-Design Product: MM Systems; LASB-NBR Series.
2. Type: Pan.

a. Exposed Metal: Aluminum.

1) Finish: Manufacturer's standard finish.

3. Cover-Plate Design: Provide recessed center plate to accommodate finish flooring.

4. Attachment Method: Mechanical anchors.
5. Moisture Barrier: Manufacturer's standard.

C. Floor-to-Wall Joint Systems:

1. Basis-of-Design Product: MM Systems; LASBE-NBR Series.
2. Type: Pan.

a. Exposed Metal: Aluminum.

1) Finish: Manufacturer's standard finish.

3. Cover-Plate Design: Provide recessed center plate to accommodate finish flooring.

4. Attachment Method: Mechanical anchors.
5. Moisture Barrier: Manufacturer's standard.

D. Wall-to-Wall Joint Systems:

1. Type: Flat Seal.

a. Seal Material: Santoprene.

1) Color: As selected by Architect from manufacturer's full range.

E. Wall-to-Ceiling Joint Systems:

1. Type: Flat seal.

a. Seal Material: Santoprene.

1) Color: White.

F. Ceiling-to-Ceiling Joint Systems:

1. Type: Flat seal.

a. Seal Material: Santoprene.

1) Color: White.

2.4 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING EXTERIORS

A. Architectural Joint Systems for Exterior Walls and Soffits:

1. Type: Preformed silicone bonded to cellular foam backer support sytem.

a. Foam Material: Polyurethane.

1) Color: As selected by Architect from manufacturer's full range.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and blockouts where architectural joint systems will be installed for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to architectural joint system manufacturer's written instructions.

B. Repair concrete slabs and blockouts using manufacturer's recommended repair grout of compressive strength adequate for anticipated structural loadings.

C. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

D. Cast-In Frames: Coordinate and furnish frames to be cast into concrete. Where cast-in frames are located in existing construction, remove existing slab construction as necessary to allow for new frame block-out.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing architectural joint assemblies and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install joint systems.

1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper joint installation and performance.
3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
4. Locate in continuous contact with adjacent surfaces.
5. Repair or grout blockout as required for continuous frame support and to bring frame to proper level. Shimming is not allowed.
6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.

C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Foam Seals: Install with adhesive recommended by manufacturer.

E. Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over joints. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 079500

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Custom hollow metal doors and frames.

B. Related Sections:

   1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
   2. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
   3. Division 09 Sections "Painting" for field painting hollow metal doors and frames.
   4. Division 26 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.

C. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

C. 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.

D. Smoke-Control Door Assemblies: Comply with UL 1784.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Ceco Door Products.
   2. Curries Company.
   3. Fleming Door Products Ltd.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. 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 hollow metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

H. Glazing: Comply with requirements in Division 08 Section "Glazing."

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 CUSTOM HOLLOW METAL DOORS

A. General: Provide doors not less than 1-3/4 inches thick, of seamless hollow construction unless otherwise indicated. Construct doors with smooth surfaces without visible joints or seams on exposed faces. Comply with ANSI/NAAMM-HMMA 861.

B. Exterior Door Face Sheets: Fabricated from metallic-coated steel sheet, minimum 0.053 inch thick.

C. Interior Door Face Sheets: Fabricated from cold-rolled steel sheet, minimum 0.042 inch thick.

D. Core Construction: Provide thermal-resistance-rated cores for exterior doors.

1. Steel-Stiffened Core: 0.026-inch- thick, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart, spot welded to face sheets a maximum of 5 inches o.c. Spaces filled between stiffeners with glass- or mineral-fiber insulation.

a. Fire Door Core: As required to provide fire-protection indicated.
b. Thermal-Rated (Insulated) Doors: For all exterior doors, provide with thermal-resistance value (R-value) of not less than 4.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

E. Vertical Edges for Single-Acting Doors: Beveled 1/8 inch in 2 inches.

F. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.

G. Top and Bottom Channels: Closed with continuous channels, minimum 0.053 inch thick, of same material as face sheets and spot welded to both face sheets.

H. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 861 with reinforcing plates from same material as door face sheets.

2.4 CUSTOM HOLLOW METAL FRAMES

A. General: Fabricate frames of construction indicated. Close contact edges of corner joints tight with faces mitered and stops butted or mitered. Continuously weld faces and soffits and finish faces smooth. Comply with ANSI/NAAMM-HMMA 861.

1. Door Frames for Openings 48 Inches Wide or Less: Fabricated from 0.053-inch- thick steel sheet.
2. Door Frames for Openings More Than 48 Inches Wide: Fabricated from 0.067-inch-thick steel sheet.

3. Sidelight and Transom Frames: Fabricated from same thickness material as adjacent door frame.
4. Borrowed-Light Frames: Fabricated from 0.053-inch- thick steel sheet.

B. Exterior Frames: Formed from metallic-coated steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 861 with reinforcing plates from same material as frame.

E. Head Reinforcement: Provide minimum 0.093-inch- thick, steel channel or angle stiffener for opening widths more than 48 inches.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.9 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/NAAMM-HMMA 861.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.
3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Two anchors per jamb up to 60 inches high.
2) Three anchors per jamb from 60 to 90 inches high.
3) Four anchors per jamb from 90 to 120 inches high.
4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches high.
2) Four anchors per jamb from 60 to 90 inches high.
3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

c. Compression Type: Not less than two anchors in each jamb.
d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/NAAMM-HMMA 861.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.

3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with HMMA 840.

1. 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. At fire-protection-rated openings, install frames according to NFPA 80.
   b. Where frames are fabricated in sections because of 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.
   c. Install frames with removable glazing stops located on secure side of opening.
   d. Install door silencers in frames before grouting.
   e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
4. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame 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. Provide adjustable wedged or bolted anchorage to frame jamb members.
8. Installation Tolerances: Adjust hollow metal 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.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections:

1. Division 08 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate doors to be factory finished and finish requirements.
4. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:

1. 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.
2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
   a. Finish veneer-faced door samples with same materials proposed for factory-finished doors.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

E. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors from single manufacturer.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

1.5 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 rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Graham; an Assa Abloy Group company.
4. Marshfield Door Systems, Inc.
5. Mohawk Flush Doors, Inc.; a Masonite company.
6. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf.
b. Screw Withdrawal, Edge: 400 lbf.

B. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

C. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:

a. 5-inch top-rail blocking.
b. 5-inch bottom-rail blocking.
c. 5-by-12-inch lock blocks
d. 5-inch midrail blocking, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: WDMA Premium with Grade A faces.

2. Performance Level: Extra Heavy Duty.
3. Species: Select white maple.
4. Cut: Plain sliced (flat sliced).
5. Match between Veneer Leaves on Door Faces: Balance match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Exposed Vertical Edges: Same species as faces or a compatible species.
8. Core: Structural composite lumber.
9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Unless otherwise indicated, locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Transparent Finish:
1. Finish: WDMA TR-6, UV Cured Polyurethane.
2. Staining: None required.
3. Effect: Open-grain finish.
4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Access doors and frames for walls and ceilings.

B. Related Sections include the following:
1. Division 04 Section "Unit Masonry" for anchoring and grouting access door frames set in masonry construction.
2. Division 07 Section "Roof Accessories" for roof hatches.
3. Division 23 Section "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.3 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.

B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for vertical access doors and frames.
2. ASTM E 119 for horizontal access doors and frames.

1.5 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

C. Steel Sheet: electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

D. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acudor Products, Inc.
2. Babcock-Davis; A Cierra Products Co.
3. Bar-Co, Inc. Div.; Alfab, Inc.
4. Cendrex Inc.
5. Dur-Red Products.
6. Elmdor/Stoneman; Div. of Acorn Engineering Co.
7. Jensen Industries.
8. J. L. Industries, Inc.
9. Karp Associates, Inc.
10. Larsen's Manufacturing Company.
11. MIFAB, Inc.
12. Milcor Inc.
13. Nystrom, Inc.
14. Williams Bros. Corporation of America (The).

B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces.
2. Door: Minimum 0.060-inch- thick sheet metal, set flush with exposed face flange of frame.
3. Frame: Minimum 0.060-inch- thick sheet metal with 1-inch- wide, surface-mounted trim.
4. Hinges: Continuous piano.
5. Latch: Cam latch operated by screwdriver with interior release.

C. Fire-Rated, Insulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch.
5. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
6. Hinges: Continuous piano.
7. Automatic Closer: Spring type.
8. Latch: Self-latching device operated by ring turn with interior release.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Exposed Flanges: Nominal 1 inch wide around perimeter of frame.
2. Provide mounting holes in frames for attachment of units to metal or wood framing.
3. Provide mounting holes in frame for attachment of masonry anchors.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors square and flush with adjacent finish surfaces.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following types of electric-motor-operated overhead coiling doors:
   1. Insulated service doors.
   2. Fire-rated service doors.

B. Related Sections include the following:

   1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.
   2. Division 08 Section "Door Hardware" for lock cylinders and keying.
   3. Division 26 Sections for electrical service and connections for powered operators and accessories.

1.3 DEFINITIONS

A. Operation Cycle: One cycle of a door is complete when it is moved from the closed position to the fully open position and returned to the closed position.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide overhead coiling doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:

   1. Wind Load: Uniform pressure (velocity pressure) of 35 lbf/sq. ft., acting inward and outward.

1.5 SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling doors through one source from a single manufacturer.

1. Obtain operators and controls from overhead coiling door manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100.

D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

PART 2 - PRODUCTS

2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling door curtain of interlocking slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch and as required to meet requirements.

2. Aluminum Door Curtain Slats: ASTM B 209 or ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

a. Aluminum Extrusion Thickness: Not less than 0.051 inch.
b. Flat profile slats.

3. Insulation: Fill slat with manufacturer's standard rigid cellular polystyrene or polyurethane-foam-type thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within metal slat faces.
4. Inside Curtain Slat Face: To match material of outside metal curtain slat .

B. Endlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Bottom Bar for Service Doors: Consisting of 2 angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; galvanized, stainless-steel, or aluminum extrusions to suit type of curtain slats.

1. Astragal: Provide a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene; for placement between angles or fitted to shape, as a cushion bumper for interior door.

D. Curtain Jamb Guides for Service Doors: Fabricate curtain jamb guides of steel angles or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Build up units with not less than 3/16-inch- thick galvanized steel sections complying with ASTM A 36/A 36M and ASTM A 123/A 123M. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.2 HOODS AND ACCESSORIES

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized steel sheet with G90 zinc coating, complying with ASTM A 653/A 653M.
2. Aluminum: 0.040-inch- thick aluminum sheet complying with ASTM B 209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.
3. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
4. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

B. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets fitted to bottom and top of exterior doors, unless otherwise indicated. At door head, use 1/8-inch- thick, replaceable, continuous sheet secured to inside of hood.

1. Provide motor-operated doors with combination bottom weatherseal and sensor edge.
2. In addition, provide replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene at door jambs for a weathertight installation.

C. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Provide cylinders standard with manufacturer and keyed to building keying system.
2. Keys: Provide Three for each cylinder.

D. If door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.

E. Automatic-Closing Device for Fire-Rated Doors: Equip each fire-rated door with an automatic-closing device that is inoperative during normal door operations and that has a governor unit complying with NFPA 80 and an easily tested and reset release mechanism designed to be activated by the following:
   1. Manufacturer's standard UL-labeled smoke detector and door-holder-release devices.
   2. Building fire-detection and -alarm systems and manufacturer's standard door-holder-release devices.

2.3 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to door curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Provide spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast-steel barrel plugs to secure ends of springs to barrel and shaft.

D. Fabricate torsion rod for counterbalance shaft of cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Provide mounting brackets of manufacturer's standard design, either cast iron or cold-rolled steel plate.

2.4 ELECTRIC DOOR OPERATORS

A. General: Provide electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycle requirements specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

B. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging chain and sprocket operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

C. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

D. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, ac or dc.

E. Door-Operator Type: Provide wall-, hood-, or bracket-mounted, jackshaft-type door operator unit consisting of electric motor, enclosed gear-head-reduction drive, and chain and sprocket secondary drive.

F. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors complying with NEMA MG 1; with overload protection; sized to start, accelerate, and operate door in either direction from any position, at not less than 2/3 fps and not more than 1 fps, without exceeding nameplate ratings or service factor.

1. Type: Single phase, medium-induction type.
2. Service Factor: According to NEMA MG 1, unless otherwise indicated.
3. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.
4. Provide open dripproof-type motor, and controller with NEMA ICS 6, Type 1 enclosure.

G. Remote-Control Station: Provide momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."

1. Provide interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel. For fire-rated doors, activation delays closing.

1. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

a. Self-Monitoring Type: Four-wire configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.

I. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

2.5 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ACME Rolling Doors.
b. Alpine Overhead Doors, Inc.

c. AlumaTek, Inc.
d. C.H.I. Overhead Doors.
e. City-Gates.
f. Cookson Company.
g. Cornell Iron Works, Inc.
h. Dynamic Closures Corp.
i. Lawrence Roll-Up Doors, Inc.
j. Mahon Door Corporation.
k. McKeon Rolling Steel Door Company, Inc.
l. Metro Door.
m. Overhead Door Corporation.
n. QMI Security Solutions.
o. Raynor.
p. Southwestern Steel Rolling Door Co.
q. Wayne-Dalton Corp.
r. Windsor Door.

B. Operation Cycles: Not less than 20,000.

1. Include tamperproof cycle counter.

C. Curtain R-Value: 4.5 deg F x h x sq. ft./Btu.

D. Door Curtain Material: Aluminum.

E. Door Curtain Slats: Flat profile slats of 3-1/4-inch center-to-center height.
1. Insulated-Slat Interior Facing: Metal.

F. Curtain Jamb Guides: Galvanized steel and/or aluminum with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.

G. Hood: Match curtain material and finish.

1. Shape: As shown on Drawings.
2. Mounting: As shown on Drawings.

H. Locking Devices: Equip door with locking device assembly.

1. Locking Device Assembly: Cremone type, both jamb sides locking bars, operable from inside with thumb turn, outside with cylinder.

I. Electric Door Operator:
1. Motor Exposure: Exterior, wet, and humid.
2. Emergency Manual Operation: Chain type.
3. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar.

a. Sensor Edge Bulb Color: As selected by Architect from manufacturer's full range.

4. Remote-Control Station: Interior.

J. Door Finish:

1. Aluminum Finish: Clear anodized.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.6 FIRE-SHUTTER DOOR ASSEMBLY

A. Fire-Rated Service Door: Overhead fire-rated coiling door formed with curtain of interlocking metal slats.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ACME Rolling Doors.
b. Alpine Overhead Doors, Inc.
c. AlumaTek, Inc.
d. C.H.I. Overhead Doors.
e. City-Gates.
f. Cookson Company.
g. Cornell Iron Works, Inc.
h. Lawrence Roll-Up Doors, Inc.
i. Mahon Door Corporation.
j. McKeon Rolling Steel Door Company, Inc.
k. Overhead Door Corporation.
l. Raynor.
m. Southwestern Steel Rolling Door Co.
n. Wayne-Dalton Corp.
o. Windsor Door.

B. Operation Cycles: Not less than 20,000.

1. Include tamperproof cycle counter.

C. Fire Rating: 1 hour with smoke control in accordance with UL 1784.

D. Door Curtain Material: Galvanized steel.

E. Door Curtain Slats: Manufacturers standard.

F. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

G. Hood: Galvanized steel.
1. Mounting: Between jambs.

H. Electric Door Operator:
1. Motor Exposure: Interior.
2. Obstruction Detection Device: Automatic electric sensor edge on bottom bar.

a. Sensor Edge Bulb Color: As selected by Architect from manufacturer's full range.

3. Remote-Control Station: Interior.
4. Other Equipment: Audible and visual signals, integral uninterruptible power source.
5. Operation: Fire door shall become operational upon the activation of the fire alarm or smoke detection system. Once door has closed, it can be reset by clearing the alarm system and pushing the "up" control station. Mechanical resetting is not required. Motor operator shall allow for the testing of the fire doors without mechanical resetting by using the Test Key Station provided. During a power failure, the door will remain open and operate normally for 3 days using an integral uninterruptible power source.

I. Door Finish:

1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.9 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install coiling doors and operating equipment complete with necessary hardware, jamb and head molding strips, anchors, inserts, hangers, and equipment supports.

3.2 ADJUSTING

A. Lubricate bearings and sliding parts; adjust doors to operate easily, free of warp, twist, or distortion and with weathertight fit around entire perimeter.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 083323

SECTION 083326 - OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Open-curtain overhead coiling grilles.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.

1.3 PERFORMANCE REQUIREMENTS

A. Operation Cycles: Provide overhead coiling grille components and operators capable of operating for not less than number of cycles indicated for each grille. One operation cycle is complete when a grille is opened from the closed position to the fully open position and returned to the closed position.

1.4 SUBMITTALS

A. Product Data: For each type and size of overhead coiling grille and accessory. Include the following:

1. Construction details, material descriptions, dimensions of individual components, profiles for curtain components, and finishes.
2. Rated capacities, operating characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Open-Curtain Grille: 18-inch- square assembly with full-size components consisting of rods, spacers, and links as required to illustrate each assembly.

D. Maintenance Data: For overhead coiling grilles to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling grilles from single source from single manufacturer.

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

A. Open-Curtain Grilles: Fabricate metal grille curtain as an open network of horizontal rods, spaced at regular intervals, that are interconnected with vertical links, which are formed and spaced as indicated and are free to rotate on the rods.

1. Aluminum Grille Curtain: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Endlocks: Continuous end links, chains, or other devices at ends of rods; locking and retaining grille curtain in guides against excessive pressures, maintaining grille curtain alignment, and preventing lateral movement.

C. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, finished to match grille.

1. Astragal: Equip each grille bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

D. Grille Curtain Jamb Guides: Manufacturer's standard shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.

2.2 HOODS AND ACCESSORIES

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any

portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Aluminum: 0.040-inch- thick aluminum sheet complying with ASTM B 209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.

B. Mounting Frame: Manufacturer's standard mounting frame designed to support grille; factory fabricated from ASTM A 36/A 36M structural-steel tubes or shapes, hot-dip galvanized per ASTM A 123/A 123M; to be built into wall construction; and complete with anchors, connections, and fasteners.

C. Push/Pull Handles: Equip each push-up-operated or emergency-operated grille with lifting handles on each side of grille, finished to match grille.

1. Provide pull-down straps or pole hooks for grilles more than 84 inches high.

2.3 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

2.4 COUNTERBALANCING MECHANISM

A. General: Counterbalance grilles by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of parts and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.5 MANUAL GRILLE OPERATORS

A. Equip grille with manufacturer's recommended manual grille operator unless another type of grille operator is indicated.

B. Push-up Grille Operation: Design counterbalance mechanism so required lift or pull for grille operation does not exceed 25 lbf.

2.6 OPEN-CURTAIN GRILLE ASSEMBLY

A. Open-Curtain Grille: Overhead coiling grille with a curtain having a network of horizontal rods that interconnect with vertical links.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ACME Rolling Doors.
b. Alpine Overhead Doors, Inc.
c. AlumaTek, Inc.
d. City-Gates.
e. Cookson Company.
f. Cornell Iron Works, Inc.
g. Dynaflair Corporation.
h. Dynamic Closures Corp.
i. Lawrence Roll-Up Doors, Inc.
j. Mahon Door Corporation.
k. McKeon Rolling Steel Door Company, Inc.
l. Metro Door.
m. Overhead Door Corporation.
n. Raynor.
o. Windsor Door.

B. Operation Cycles: Not less than 50,000.

1. Include tamperproof cycle counter.

C. Grille Curtain Material: Aluminum.

1. Space rods at approximately 2 inches o.c.
2. Space links approximately 6 inches apart in a straight in-line pattern.
3. Spacers: Metal tubes matching curtain material.

D. Curtain Jamb Guides: Aluminum with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.

E. Hood: Aluminum.

1. Shape: Square.
2. Mounting: As shown on Drawings.

F. Locking Devices: Equip grille with slide bolt for padlock.

G. Manual Grille Operator: Push-up operation.

H. Grille Finish:

1. Aluminum Finish: Clear anodized.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling grilles, hoods, and operators at the mounting locations indicated for each grille.

C. Accessibility: Install overhead coiling grilles, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that grilles operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling grilles.

END OF SECTION 083326

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exterior and interior storefront framing.
2. Storefront framing for window walls.
3. Exterior and interior manual-swing entrance doors and door-frame units.

B. Related Sections:

1. Division 08 Section "Glazed Aluminum Curtain Walls" for curtain-wall systems that mechanically retain glazing on four sides.
2. Division 08 Section "Structural Glass Curtain Walls" for curtain-wall systems that retain glazing with structural sealant.
3. Division 08 Section "Door Hardware" for door hardware installed in storefront systems.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

   a. Deflection exceeding specified limits.
   b. Thermal stresses transferring to building structure.
   c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.

d. Noise or vibration created by wind and by thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.
g. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.

2. Seismic Loads: As indicated on Drawings.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.

G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

H. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

I. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 71 when tested according to AAMA 1503.

J. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.50 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

E. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

F. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of aluminum-framed systems.
2. Include design calculations.

G. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

H. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project from an engineer licensed to practice in Connecticut.

D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

E. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

F. Source Limitations: Obtain Aluminum Windows, Aluminum Entrances (Division 8), and Glazed Aluminum Curtain Walls (Division 8) through one source from a single manufacturer.

G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water leakage through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. EFCO Corporation.
2. Kawneer North America; an Alcoa company.
3. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   1. Glazing System: Retained mechanically with gaskets on four sides.
   2. Glazing Plane: Front.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.
   3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from stainless steel.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

   1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

   2. Door Design: Wide stile; 5-inch nominal width.

a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

B. Entrance Door Hardware: As specified in Division 08 Section "Door Hardware."

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.

2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.4 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

END OF SECTION 084113

SECTION 084426 - STRUCTURAL GLASS CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following types of structural-sealant-glazed curtain walls with aluminum framing systems:

1. Field-glazed two-sided systems.

2. Conventionally glazed aluminum curtain walls.

B. Related Sections include the following:
1. Division 07 Section "Fire-Resistive Joint Systems" for perimeter fire-containment systems (safing insulation) field installed with structural-sealant-glazed curtain-wall systems.
2. Division 07 Section "Joint Sealants" for installation of joint sealants installed with structural-sealant-glazed curtain-wall systems and for sealants to the extent not specified in this Section.
3. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for entrance and storefront systems installed with structural-sealant-glazed curtain-wall systems.
4. Division 08 Section "Aluminum Windows" for window systems installed with curtain-wall systems.
5. Division 08 Section "Glazing" for insulating-glass requirements.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide structural-sealant-glazed curtain-wall systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
4. Dimensional tolerances of building frame and other adjacent construction.
5. Failure includes the following:

   a. Deflection exceeding specified limits.

b. Thermal stresses transferred to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
d. Glazing-to-glazing contact.
e. Noise or vibration created by wind and thermal and structural movements.
f. Loosening or weakening of fasteners, attachments, and other components.
g. Sealant failure.

B. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by curtain-wall systems without failing adhesively or cohesively. Provide sealant that fails cohesively before sealant releases from substrate when tested for adhesive compatibility with each substrate and joint condition required.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

C. Structural-Sealant Joints: Designed to produce tensile or shear stress in structural-sealant joints of less than 20 psi.

D. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Seismic Loads: As indicated on Drawings.

E. Structural-Test Performance: Provide structural-sealant-glazed curtain-wall systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Duration: As required by design wind velocity but not less than 10 seconds.

F. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, limited to 2 times the length of cantilevered member, divided by 175.

G. Story Drift: Provide structural-sealant-glazed curtain-wall systems that accommodate design displacement of adjacent stories indicated.

1. Design Displacement: 3/4 inch.

H. Thermal Movements: Provide structural-sealant-glazed curtain-wall systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

I. Air Infiltration: Provide structural-sealant-glazed curtain-wall systems with maximum air leakage of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft.

J. Water Penetration Under Static Pressure: Provide structural-sealant-glazed curtain-wall systems that do not evidence water penetration when tested according to ASTM E 331 at a minimum differential static pressure of 20 percent of positive design wind load, but not less than 15 lbf/sq. ft.

K. Condensation Resistance: Provide structural-sealant-glazed curtain-wall systems with condensation-resistance factor (CRF) of not less than 65 when tested according to AAMA 1503.

L. Average Thermal Conductance: Provide structural-sealant-glazed curtain-wall systems with average U-factor of not more than 0.55 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

B. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of structural-sealant-glazed curtain-wall systems.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Preconstruction Sealant Test Reports: Compatibility and adhesion test reports from sealant manufacturer indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants; include sealant manufacturer's interpretation of test results for sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for structural-sealant-glazed curtain-wall systems.

H. Preconstruction Testing Program: Developed specifically for Project.

I. Preconstruction Test Reports: For structural-sealant-glazed curtain-wall systems.

J. Quality-Control Program: Developed specifically for Project.

K. Quality-Control Program Reports: Documenting quality-control procedures and verifying results for structural-sealant-glazed curtain-wall systems.

L. Field quality-control test and inspection reports.

M. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Capable of assuming engineering responsibility and preforming work of this Section and who is acceptable to manufacturer.

1. Engineering Responsibility: Preparation of data for structural-sealant-glazed curtain-wall systems including the following:

a. Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.
b. Quality-control program development and reporting complying with ASTM C 1401 recommendations including, but not limited to, system material qualification procedures, preconstruction sealant-testing program, and procedures and intervals for system fabrication and installation reviews and checks.

B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are

indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

C. Source Limitations: Obtain Aluminum Windows (Division 8), Aluminum Entrances (Division 8), and Glazed Aluminum Curtain Walls (Division 8) through one source from a single manufacturer.

D. Preconstruction Sealant Testing: Perform sealant manufacturer's standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants and each condition required by curtain-wall systems.

1. Test a minimum of five samples of each metal, glazing, and other material.
2. Prepare samples using techniques and primers required for installed systems.
3. Perform tests under environmental conditions that duplicate those under which systems will be installed.
4. For materials that fail tests, determine corrective measures required to prepare each material to ensure compatibility with and adhesion of sealants, including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

E. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."

F. Structural-Sealant Glazing: Comply with recommendations in ASTM C 1401, "Guide for Structural Sealant Glazing."

G. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to structural-sealant-glazed curtain-wall systems including, but not limited to, the following:
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review required testing, inspecting, and certifying procedures.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for structural-sealant-glazed curtain-wall systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating structural-sealant-glazed

curtain-wall systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of structural-sealant-glazed curtain-wall systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Adhesive or cohesive sealant failures.
e. Water leakage.
f. Failure of operating components to function normally.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. EFCO Corporation.
2. Kawneer.
3. Vistawall Architectural Products.
4. Wausau Window and Wall Systems.

2.2 FRAMING SYSTEMS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.

4. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 611.
3. Hot-Rolled Sheet and Strip: ASTM A 570/A 570M.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads.
4. Finish exposed portions to match framing system.
5. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.

E. Anchors: Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

G. Framing Gaskets: As recommended by manufacturer for joint type.

H. Framing Sealants: As recommended by manufacturer for joint type.

2.3 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types compatible with sealants and suitable for joint movement and system performance requirements.

C. Glazing Sealants: As recommended by manufacturer for joint type and as follows:

1. Structural Sealant: ASTM C 1184, neutral-curing silicone formulation compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant, and approved by structural-sealant manufacturer for use in curtain-wall systems indicated.

   a. Color: As selected by Architect from manufacturer's full range of colors.
   b. Type: Single component.
   c. Minimum Tensile Strength: 50 psi.
   d. Modulus of Elasticity: As required by structural-sealant-glazed curtain-wall system design to meet performance requirements.

2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; neutral-curing silicone formulation compatible with structural sealant and other system components with which it comes in contact; and recommended by structural- and weatherseal-sealant and curtain-wall manufacturers for this use.

   a. Joint Movement Capability: Accommodates a 50 percent increase or decrease in joint width at time of application when measured according to ASTM C 719.
   b. Color: Matching structural sealant.

2.4 OPERABLE UNITS

A. Venting Windows: As specified in Division 08 Section "Aluminum Windows."

B. Doors: As specified in Division 08 Section "Aluminum-Framed Entrances and Storefronts."

2.5 ACCESSORY MATERIALS

A. Perimeter Fire-Containment Systems (Safing Insulation): Specified in Division 07 Section "Fire-Resistive Joint Systems."

B. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

C. Aluminum Closure: Where indicated, provide aluminum closure pieces from 0.032-inch aluminum finished to match curtain wall.

2.6 FABRICATION

A. Form aluminum shapes before finishing.

B. Fabricate components that, when assembled, have the following characteristics:

   1. Sharp profiles, straight and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Internal guttering systems or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
6. Structural-sealant joints that do not carry gravity loads of glazing.
7. Provisions for field replacement of glazing from exterior. Include accommodations for using temporary support device (dutchman) to retain glazing in place while sealant cures.

C. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

2.8 SOURCE QUALITY CONTROL

A. Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, system material qualification procedures, sealant testing, and system fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.

2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified Division 08 Section "Glazing." Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

G. Install weatherseal sealant according to Division 07 Section "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

H. Install perimeter fire-containment systems (safing insulation) as specified in Division 07 Section "Fire-Resistive Joint Systems."

I. Erection Tolerances: Install structural-sealant-glazed curtain-wall systems to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:

   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or greater, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C 1401.

a. Destructive test method, Method A, Hand Pull Tab (Destructive) in ASTM C 1401, Appendix X2 shall be used.

1) A minimum of four areas on each building face shall be tested.
2) Repair installation areas damaged by testing.

2. Structural-Sealant Glazing Inspection: After installation of curtain-wall systems are complete, structural-sealant glazing shall be inspected and evaluated according to ASTM C 1401 recommendations.
3. Water Spray Test: After the installation of minimum area of 75 feet by 2 story structural-sealant-glazed curtain-wall system has been completed but before installation of interior finishes has begun, a 2-bay area of system designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

D. 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 084426

SECTION 084523 - FIBERGLASS-SANDWICH-PANEL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes assemblies incorporating fiberglass sandwich panels and aluminum frame systems as follows:

1. Wall assemblies.
2. Skylight assemblies.

B. Related Sections include the following:

1. Division 05 Section "Structural Steel Framing" for steel framing that supports skin-system assemblies.
2. Division 07 Section "Thermal Insulation" for insulation materials field installed with assemblies.
3. Division 07 Section "Sheet Metal Flashing and Trim" for metal flashings installed at perimeters of assemblies.
4. Division 07 Section "Joint Sealants" for sealants installed at perimeters of assemblies.
5. Division 08 Section "Unit Skylights" for standard, factory-assembled skylight units.

1.3 PERFORMANCE REQUIREMENTS

A. Provide assemblies, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Movements of supporting structure.
4. Dimensional tolerances of building frame and other adjacent construction.

B. Failure includes the following:

1. Deflection exceeding specified limits.
2. Water leakage.
3. Thermal stresses transferred to building structure.
4. Noise or vibration created by wind and thermal and structural movements.
5. Loosening or weakening of fasteners, attachments, and other components.

6. Delamination of fiberglass-sandwich-panel faces from panel cores.

C. Structural Loads:

1. Wind Loads: As indicated by structural design data on Drawings.
2. Snow Loads: As indicated by structural design data on Drawings.
3. Concentrated Live Loads on Overhead Assemblies: 300 lbf applied to assemblies at locations that will produce greatest stress or deflection.
4. Load Combinations: Calculate according to requirements of applicable code indicated on Drawings.

D. Deflection of Assemblies:

1. Vertical Assemblies: Limited to 1/60 of clear span for each assembly component.
2. Overhead Assemblies: Limited to 1/60 of clear span for each assembly component.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 PERFORMANCE TESTING

A. Provide assemblies that comply with test-performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard assemblies by a qualified independent testing agency.

B. Structural-Performance Test: ASTM E 330.

1. Performance at Design Load: When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. Performance at Maximum Test Load: When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main supporting members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity but not less than 10 seconds.

C. Air-Infiltration Test: ASTM E 283.

1. Minimum Static-Air-Pressure Difference: 1.57 lbf/sq. ft.
2. Maximum Air Leakage: 0.06 cfm/sq. ft.

D. Test for Water Penetration under Static Pressure: ASTM E 331.

1. Minimum Static-Air-Pressure Difference: 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft.
2. Water Leakage: None.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for assemblies.

B. Shop Drawings: For assemblies. Include plans, elevations, sections, details, and attachments to other work.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation and licensed in the state of Connecticut.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for assemblies.

E. Preconstruction Test Reports: For assemblies.

F. Maintenance Data: For assemblies to include in maintenance manuals.

G. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Entity capable of assuming engineering responsibility, including preparation of Shop Drawings, and performing work of this Section and who is acceptable to manufacturer.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 699 for testing indicated.

C. Product Options: Information on Drawings and in Specifications establishes requirements for assemblies' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including testing conducted by an independent testing agency and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Fire-Test-Response Characteristics: Where fire-test-response characteristics are indicated for assemblies and components, provide products identical to those tested per test method indicated by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

E. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

F. NFRC Certification: Provide fiberglass sandwich panels that are certified for U-factors indicated according to NFRC 100 and listed in its "National Fenestration Council Incorporated - Certified Products Directory."

1.7 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Deterioration of metals and other materials beyond normal weathering.
c. Water leakage.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Fiberglass-Sandwich-Panel Warranty: Manufacturer's standard form in which manufacturer agrees to replace panels that exhibit defects in materials or workmanship.

1. Defects include, but are not limited to, the following:

a. Fiberbloom.
b. Delamination of coating, if any, from exterior face sheet.
c. Discoloration of exterior face sheet of more than 8.0 units Delta E when measured according ASTM D 2244.
d. Delamination of panel face sheets from panel cores.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design for assemblies is based on Kalwall Corporation. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Major Industries, Inc.
2. Skywall Translucent Systems; Vistawall Group (The).
3. Structures Unlimited, Inc.

2.2 ALUMINUM FRAME SYSTEMS

A. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.

B. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.

1. Construction: One-piece extruded-aluminum components.

C. Exposed Flashing and Closures: Manufacturer's standard aluminum components not less than 0.060 inch thick.

D. Frame-System Gaskets: Manufacturer's standard.

E. Frame-System Sealants: As recommended in writing by manufacturer.

F. Anchors, Fasteners, and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding; compatible with adjacent materials.

1. At closures, retaining caps, or battens, use ASTM A 193/A 193M, 300 series stainless-steel screws.
2. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.

G. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

H. Anchor Bolts: ASTM A 307, Grade A, hot-dip zinc coating, ASTM A 153/A 153M, Class C.

I. Frame System Fabrication:

1. Fabricate components before finishing.
2. Fabricate components that, when assembled, have the following characteristics:

a. Profiles that are sharp, straight, and free of defects or deformations.
b. Accurately fitted joints with ends coped or mitered.
c. Internal guttering systems or other means to drain water passing joints, condensation occurring within components, and moisture migrating within the assembly to exterior.

3. Fabricate sill closures with weep holes and for installation as continuous component.
4. Reinforce components as required to receive fastener threads.

5. Weld components in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

2.3 FIBERGLASS SANDWICH PANELS

A. Panel Construction: Assembly of uniformly colored, translucent, thermoset, fiberglass-reinforced-polymer face sheets bonded to both sides of a grid core and complying with requirements applicable to panel materials in ICBO ES AC04, "Sandwich Panels."

1. Face-Sheet, Self-Ignition Temperature: 650 deg F or more per ASTM D 1929.
2. Face-Sheet Burning Extent: 1 inch or less per ASTM D 635.
3. Face-Sheet, Smoke-Developed Index: 450 or less per ASTM E 84.
4. Interior Face-Sheet, Flame-Spread Index: Not more than 75 per ASTM E 84.

B. Panel Thickness: 2-3/4 inches.

C. Panel U-Factor: Not more than 0.23, measured in Btu/sq. ft. x h x deg F according to NFRC 100 or ASTM C 1363 using procedures described in ASTM C 1199 and ASTM E 1423.

D. Panel Strength Characteristics:
1. Panel Support Strength: Capable of supporting, without failure, a 300-lbf concentrated load when applied to a 3-inch- diameter disk according to ASTM E 661.

E. Grid Core: Thermally broken, mechanically interlocked extruded-aluminum I-beams, with a minimum flange width of 7/16 inch.
1. Grid Pattern: Inline rectangle, nominal 12 by 24 inches.

F. Exterior Face Sheet:
1. Color: Crystal.
2. Color Stability: Not more than 3.0 units Delta E when measured according to ASTM D 2244 after outdoor weathering in southern Florida according to procedures in ASTM D 1435 with panels mounted facing south.
   a. Exposure Period: 60 months.

3. Erosion Protection: Manufacturer's standard.

G. Interior Face Sheet:
1. Color: White.

H. Fiberglass-Sandwich-Panel Adhesive: ASTM D 2559.

1. Compatible with facing and core materials.
2. Tensile and shear bond strength of aged adhesive ensures permanent adhesion of facings to cores, as evidenced by testing according to ASTM C 297 and ASTM D 1002 after accelerated aging procedures that comply with aging requirements for adhesives with high resistance to moisture in ICBO ES AC05, "Sandwich Panel Adhesives."

I. Panel Fabrication: Factory assemble and seal panels.

1. Laminate face sheets to grid core under a controlled process using heat and pressure to produce straight adhesive bonding lines that cover width of core members and that have sharp edges.

   a. White spots indicating lack of bond at intersections of grid-core members are limited in number to 4 for every 40 sq. ft. of panel and limited in diameter to 3/64 inch.

2. Fabricate with grid pattern that is symmetrical about centerlines of each panel.
3. Fabricate panel to allow condensation within panel to escape.
4. Reinforce panel corners.

2.4 ACCESSORY MATERIALS

A. Insulating Materials: Specified in Division 07 Section "Thermal Insulation."

B. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.5 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish: Manufacturers standard mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

6. Weld aluminum components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight, unless otherwise indicated.

B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with bituminous paint or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.

C. Install continuous aluminum sill closure with weatherproof expansion joints and locked and sealed or welded corners. Locate weep holes at rafters.

D. Install components to drain water passing joints, condensation occurring within aluminum members and panels, and moisture migrating within assembly to exterior.

E. Install components plumb and true in alignment with established lines and elevations.

F. Install insulation materials as specified in Division 07 Section "Thermal Insulation."

G. Erection Tolerances: Install assemblies to comply with the following maximum tolerances:

1. Alignment: Limit offset from true alignment to 1/32 inch where surfaces abut in line, edge to edge, at corners, or where a reveal or protruding element separates aligned surfaces by less than 3 inches; otherwise, limit offset to 1/8 inch.
2. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 084523

SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of aluminum-framed windows:
   1. Fixed windows.
   2. Projected windows.
   3. Combination windows.

B. Related Sections include the following:

   1. Division 8 Section "Aluminum Framed Entrances" for aluminum doors and frames.
   2. Division 8 Section "Glazing" for glazing requirements for aluminum windows, including those specified to be factory glazed.
   3. Division 8 Section "Glazed Aluminum Curtain Walls."

1.3 DEFINITIONS

A. HC: Heavy Commercial.

B. Performance grade number, included as part of the AAMA/NWWDA product designation code, is actual design pressure in pounds force per square foot used to determine structural test pressure and water test pressure.

C. Structural test pressure, for uniform load structural test, is equivalent to 150 percent of design pressure.

D. Minimum test size is smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of test size indicated below:

1. Minimum size required by AAMA/NWWDA 101/I.S.2.

B. Structural Loads:

1. Wind Loads: As indicated on Drawings.

2. Seismic Loads: As indicated on Drawings.

C. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/NWWDA 101/I.S.2, Air Infiltration Test.

1. Maximum Rate for Fixed Window Units: 0.06 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft. .
2. Maximum Rate for Operating Window Units: 0.1 cfm/sq. ft. of operable sash joint at an inward test pressure of 6.24 lbf/sq. ft.

D. Water Resistance: No water leakage as defined in AAMA/NWWDA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/NWWDA 101/I.S.2, Water Resistance Test.

1. Test Pressure: 15 percent of positive design pressure, but not less than 2.86 lbf/sq. ft. or more than 12 lbf/sq. ft.

E. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 42 or greater.

F. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.

1. U-Value: .60 Btu/sq. ft. x h x deg F.

G. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F ambient; 180 deg F material surfaces.

H. Projected Windows: Comply with AAMA/NWWDA 101/I.S.2 for the following tests:

1. Torsion Test.
2. Horizontal Concentrated Load Test on Latch Rail.
3. Vertical Concentrated Load Test on Latch Rail.
4. Torsion Load Test on Intermediate Frame Rails.

5. Vertical Concentrated Load Test on Intermediate Frame Rails.
6. Balance Arm Load Test.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other Work, operational clearances, and the following:

1. Mullion details, including reinforcement and stiffeners.
2. Joinery details.
3. Expansion provisions.
4. Flashing and drainage details.
5. Weather-stripping details.
6. Thermal-break details.
7. Glazing details.

C. Samples for Verification: For aluminum window components required, prepared on Samples of size indicated below.

1. Main Framing Member: 12-inch- long, full-size sections of extrusions with factory-applied color finish.
2. Hardware: Full-size units with factory-applied finish.
3. Weather Stripping: 12-inch- long sections.
4. Architect reserves the right to require additional samples that show fabrication techniques, workmanship, and design of hardware and accessories.

D. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each type, grade, and size of aluminum window. Test results based on use of down-sized test units will not be accepted.

E. Maintenance Data: For operable window sash, operating hardware, weather stripping, and finishes to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain Aluminum Windows, Aluminum Entrances (Division 8), and Glazed Aluminum Curtain Walls (Division 8) through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Fenestration Standard: Comply with AAMA/NWWDA 101/I.S.2, "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors," for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Provide AAMA certified aluminum windows with an attached label.

F. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Failure to meet performance requirements.
2. Structural failures including excessive deflection.
3. Water leakage, air infiltration, or condensation.
4. Faulty operation of movable sash and hardware.
5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
6. Insulting glass failure.

B. Warranty Period: Five years from date of Substantial Completion.

C. Warranty Period for Metal Finishes: Ten years from date of Substantial Completion.

D. Warranty Period for Glass: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Aluminum windows as shown on drawings and specified herein are based on EFCO Corporation, Shadowline Thermal AP-HC45 Series, and EFCO Corporation 2900 Thermal AP-AW50 Series.

1. Subject to compliance with requirements, provide named EFCO Corporation windows, or standard products of the other named manufacturers having the same visual profile with only minor dimensional differences.

a. EFCO Corporation.
b. Kawneer Company, Inc.
c. Moduline.
d. Wausau/Winco Manufacturing Co.

2.2 MATERIALS, GENERAL

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.062-inch thickness at any location for the main frame and sash members.

B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components. Cadmium-plated steel fasteners are not permitted.

1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated. Cadmium-plated steel anchors, clips, and accessories are not permitted.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated. Cadmium-plated steel reinforcing members are not permitted.

E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when aluminum window is closed.

1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/NWWDA 101/I.S.2.

F. Replaceable Weather Seals: Comply with AAMA 701/702.

G. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.3 GLAZING

A. Glass and Glazing Materials: Refer to Division 8 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.

2.4 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and sized to accommodate sash or ventilator weight and dimensions. Cadmium-plated hardware is not permitted. Do not use aluminum in frictional contact with other metals. Where exposed, provide aluminum or nonmagnetic stainless steel.

B. Gear-Type Rotary Operators: Comply with AAMA 901 when tested according to ASTM E 405, Method A.

1. Operation Function: All ventilators move simultaneously and securely close at both jambs without using additional manually controlled locking devices.

C. Four- or Six-Bar Friction Hinges: Comply with AAMA 904.

1. Locking mechanism and handles for manual operation.
2. Friction Shoes: Provide friction shoes of nylon or other nonabrasive, nonstaining, noncorrosive, durable material.

D. Limit Devices: Provide limit devices designed to restrict sash or ventilator opening.

1. Safety Devices: Limit clear opening to 6 inches for ventilation; with custodial key release.

2.5 INSECT SCREENS

A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Locate screens on inside of window and provide for each operable exterior sash or ventilator.

1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," Monumental M-32 class.
2. Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," for minimum standards of appearance, fabrication, attachment of screen fabric, hardware, and accessories unless more stringent requirements are indicated.

B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints, concealed fasteners and removable PVC spline/anchor concealing edge of frame.

1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
2. Finish: Match aluminum window members.

C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.

1. Wire-Fabric Finish: Charcoal gray.

2.6 FABRICATION

A. General: Fabricate aluminum windows, in sizes indicated, that comply with requirements and that meet or exceed AAMA/NWWDA 101/I.S.2 performance requirements for the following window type and performance class. Include a complete system for assembling components and anchoring windows.
1. Fixed Windows: HC.
2. Projected Windows: HC.

B. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.

C. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.

1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
2. Provide hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.

D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.

E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

F. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.

G. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

H. Subframes: Provide thermally broken subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.125-inch- thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.

I. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/NWWDA 101/I.S.2.

J. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

2.7 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; operational clearances; and other conditions affecting performance of work.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.

2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components; Drawings; and Shop Drawings.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/NWWDA 101/I.S.2.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

B. Remove and replace windows where test results indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING

A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

3.5 PROTECTION AND CLEANING

A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 085113

SECTION 086200 - UNIT SKYLIGHTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Unit skylights mounted on site-built curbs.

B. Related Sections:

   1. Division 06 Section "Rough Carpentry" for wood framing and blocking at unit skylights.
   2. Division 07 Section "Sheet Metal Flashing and Trim" for flashing at unit skylights.
   3. Division 08 Section "Fiberglass-Sandwich-Panel Assemblies" for skylights glazed with translucent insulating panels.

1.3 PERFORMANCE REQUIREMENTS

A. Test Performance Criteria: Provide unit skylights capable of complying with performance requirements indicated, based on testing manufacturer's unit skylights that are representative of those specified.

   1. Structural Performance: Provide unit skylights, including glazing and anchorage, capable of withstanding the effects of the following design loads:

      a. Positive Pressure or Inward Load: As indicated.
      b. Negative Pressure or Uplift Load: As indicated.

   2. Air Infiltration: Provide unit skylights with maximum air leakage through assembly of 0.3 cfm/sq. ft. when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.
   3. Water Penetration: Provide unit skylights that do not evidence water penetration through assembly when tested according to ASTM E 331 at a zero static-air-pressure difference across unit.

1.4 SUBMITTALS

A. Product Data: For each type of unit skylight indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for unit skylights.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type and size of unit skylight.

C. Maintenance Data: For unit skylights to include in maintenance manuals.

D. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating unit skylights that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

B. Source Limitations: Obtain unit skylights from single source from single manufacturer.

C. Surface-Burning Characteristics of Plastic Glazing: Provide plastic glazing sheets identical to those tested for fire-exposure behavior per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Self-Ignition Temperature: 650 deg F or more for plastic sheets in thickness indicated when tested per ASTM D 1929.
2. Smoke-Production Characteristics: Comply with either requirement below:

   a. Smoke-Developed Index: 450 or less when tested per ASTM E 84 on plastic sheets in manner indicated for use.

3. Burning Characteristics: Tested per ASTM D 635.

   a. Acrylic Glazing: Class CC2, burning rate of 2-1/2 inches per minute or less for nominal thickness of 0.060 inch or thickness indicated for use.

D. Unit Skylight Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

1.6 COORDINATION

A. Coordinate unit skylight flashing requirements with roofing system.

B. Coordinate sizes and locations of site-built curbs with actual unit skylights provided.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Uncontrolled water leakage.
   b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   c. Yellowing of acrylic glazing.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide "Skydome Unit" by Wasco Products, Inc. or comparable product by one of the following:

1. Acralight International Skylights
2. Bristolite Skylights.
3. Dur-Red Products.
4. Exarc Skylights, Inc.
5. Fiore Skylights, Inc.
6. Fox Lite, Inc.; Skymaster Skylights.
7. GE Polymer Shapes; General Electric Company.
8. Glazed Structures Inc.
9. Hi Pro International, Inc.
10. Lane-Aire Manufacturing Corp.
11. Plasteco, Inc.
12. Plastic Engineering Company of Tulsa, Inc.
13. Skyline Sky-Lites, LLC.
14. Solar Industries, Inc.
15. Sunglo Skylight Products.
16. VELUX America.

2.2 MATERIALS

A. Aluminum Components:

1. Sheets: ASTM B 209, alloy and temper to suit forming operations and finish requirements but with not less than the strength and durability of alclad Alloy 3005-H25.
2. Extruded Shapes: ASTM B 221, alloy and temper to suit structural and finish requirements but with not less than the strength and durability of Alloy 6063-T52.

B. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened.

2.3 GLAZING

A. Acrylic Glazing: ASTM D 4802, thermoformable, monolithic sheet, category as standard with manufacturer, Finish 1 (smooth or polished), Type UVF (formulated with UV absorber).

1. Double-Glazing Profile: Dome, 25 percent rise.

a. Thicknesses: Not less than thicknesses required to exceed performance requirements.
b. Outer Glazing Color: Colorless, transparent.
c. Inner Glazing Color: Colorless, transparent.

B. Glazing Gaskets: Manufacturer's standard.

2.4 INSTALLATION MATERIALS

A. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic, nominally free of sulfur and containing no asbestos fibers, formulated for 15-mil dry film thickness per coating.

B. Joint Sealants: As specified in Division 07 Section "Joint Sealants."

C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

D. Roofing Cement: ASTM D 4586, asbestos free, designed for trowel application or other adhesive compatible with roofing system.

2.5 UNIT SKYLIGHTS

A. General: Provide factory-assembled unit skylights that include glazing, extruded-aluminum glazing retainers, gaskets, and inner frames and that are capable of withstanding performance requirements indicated.

B. Site-Built Curb: As indicated.

C. Unit Shape and Size: As indicated.

D. Condensation Control: Fabricate unit skylights with integral internal gutters and nonclogging weeps to collect and drain condensation to the exterior.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Mill Finish: Manufacturer's standard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with unit skylight installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate installation of unit skylight with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.

B. Comply with recommendations in AAMA 1607 and with manufacturer's written instructions for installing unit skylights.

C. Install unit skylights level, plumb, and true to line, without distortion.

D. Anchor unit skylights securely to supporting substrates.

E. Where metal surfaces of unit skylights will contact incompatible metal or corrosive substrates, including preservative-treated wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation recommended in writing by unit skylight manufacturer.

F. Set unit skylight flanges in thick bed of roofing cement to form a seal unless otherwise indicated.

G. Where cap flashing is indicated, install to produce waterproof overlap with roofing or roof flashing. Seal with thick bead of mastic sealant except where overlap is indicated to be left open for ventilation.

3.3 CLEANING

A. Clean exposed unit skylight surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes.

B. Remove excess sealants, glazing materials, dirt, and other substances.

C. Remove and replace glazing that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect unit skylight surfaces from contact with contaminating substances resulting from construction operations.

END OF SECTION 086200

SECTION 08 71 00 – DOOR HARDWARE

PART I – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. The work in this section includes furnishing all items of finish hardware as hereinafter specified or obviously necessary for all swinging, sliding, folding and other doors. Except items, which are specifically excluded from this section of the specification or of unique hardware, specified in the same sections as the doors and frames on which they are installed.

B. RELATED DOCUMENTS

1. Related documents, drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 specification sections apply to this section.

C. RELATED SECTIONS

1. 08 11 00 – Metal Doors and Frames
2. 08 14 00 – Wood Doors
3. 08 41 00 – Entrances and Storefronts

1.02 REFERENCES

A. STANDARDS

1. ANSI A156.1 – Butts and Hinges
2. ANSI A156.2 – Bored Locks and Latches
3. ANSI A156.3 – Exit Devices
4. ANSI A156.4 – Door Controls – Door Closers
5. ANSI A156.5 – Auxiliary Locks and Associated Products
6. ANSI A156.6 – Architectural Door Trim
7. ANSI A156.7 – Template Hinge Dimensions
8. ANSI A156.8 – Door Controls – Overhead Holders
9. ANSI A156.13 – Mortise Locks and Latches
10. ANSI A156.15 – Closer Holder Release Devices
11. ANSI A156.16 – Auxiliary Hardware
12. ANSI A156.18 – Material and Finishes
13. ANSI A156.19 – Power Assist and Low Energy Power Operated Doors
14. NFPA 80 – Fire Doors and Windows
15. UL10C – Positive Pressure Fire Tests of Door Assemblies
16. AIA A201 1997 – General Conditions of the Contract

B. CODES

1. NFPA 101 – Life Safety Code

2. IBC 2003 – International Building Code with CT State 2005 Building Code
3. ANSI A117.1 – Accessible and Usable Buildings and Facilities
4. ADA – Americans with Disabilities Act

1.03 SUBMITTALS

A. GENERAL REQUIREMENTS

1. Submit copies of finish hardware schedule in accordance with Division 1, General Requirements.

B. SCHEDULES AND PRODUCT DATA

1. Schedules to be in vertical format, listing each door opening, and organized into "hardware sets" indicating complete designations of every item required for each door opening to function as intended. Hardware schedule shall be submitted within two (2) weeks from date the purchase order is received by the finish hardware supplier. Furnish four (4) copies of revised schedules after approval for field and file use. Note any special mounting instructions or requirements with the hardware schedule. Schedules to include the following information:

   a. Location of each hardware set cross-referenced to indications on drawings, both on floor plans and in door and frame schedule.
   b. Handing and degree of swing of each door.
   c. Door and frame sizes and materials.
   d. Keying information.
   e. Type, style, function, size, and finish of each hardware item.
   f. Elevation drawings and operational descriptions for all electronic openings.
   g. Name and manufacturer of each hardware item.
   h. Fastenings and other pertinent information.
   i. Explanation of all abbreviations, symbols and codes contained in schedule
   j. Mounting locations for hardware when varies from standard.

2. Submit catalog cuts and/or product data sheets for all scheduled finish hardware.

3. Submit separate detailed keying schedule for approval indicating clearly how the owner's final instructions on keying of locks has been fulfilled.

C. SAMPLES

1. Upon request, samples of each type of hardware in finish indicated shall be submitted. Samples are to remain undamaged and in working condition through submittal and review process. Items will be returned to the supplier or incorporated into the work within limitations of keying coordination requirements.

D. TEMPLATES

1. Furnish a complete list and suitable templates, together with finish hardware schedule to contractor, for distribution to necessary trades supplying materials to be prepped for finish hardware.

E. ELECTRONIC HARDWARE SYSTEMS

1. Provide complete wiring diagrams prepared by an authorized factory employee for each opening requiring electronic hardware, except openings where only magnetic hold-open devices are specified. Provide a copy with each hardware schedule submitted after approval.

2. Provide complete operational descriptions of electronic components listed by opening in the hardware submittals. Operational descriptions to detail how each electrical component functions within the opening incorporating all conditions of ingress and egress. Provide a copy with each hardware schedule submitted for approval.

3. Provide elevation drawings of electronic hardware and systems identifying locations of the system components with respect to their placement in the door opening. Provide a copy with each hardware schedule submitted for approval.

4. Prior to installation of electronic hardware, arrange conference between supplier, installers and related trades to review materials, procedures and coordinating related work.

5. The electrical products contained within this specification represent a complete engineered system. If alternate electrical products are submitted, it is the responsibility of the distributor to bear the cost of providing a complete and working system including re-engineering of electrical diagrams and system layout, as well as power supplies, power transfers and all required electrical components. Coordinate with electrical engineer and electrician to ensure that line voltage and low voltage wiring is coordinated to provide a complete and working system.

6. For each item of electrified hardware specified, provide standardized molex plug connectors to accommodate up to twelve (12) wires. Molex plug connectors shall plug directly into through-door wiring harnesses, frame wiring harnesses, electric locking devices and power supplies.

F. OPERATIONS AND MAINTENANCE MANUALS

1. Upon completion of construction and building turnover, furnish two (2) complete maintenance manuals to the owner. Manuals to include the following items:

   a. Approved hardware schedule, catalog cuts and keying schedule.
   b. Hardware installation and adjustment instructions.
   c. Manufacturer's written warranty information.
   d. Wiring diagrams, elevation drawings and operational descriptions for all electronic openings.

1.04 QUALITY ASSURANCE

A. SUBSTITUTIONS

1. All substitution requests must be submitted before bidding and within the procedures and time frame as outlined in Division 1, General Requirements. Approval of products is at the discretion of the architect and his hardware consultant.

B. SUPPLIER QUALIFICATIONS

1. A recognized architectural door hardware supplier who has maintained an office and has been furnishing hardware in the project's vicinity for a period of at least two (2) years.

2. Hardware supplier shall have office and warehouse facilities to accommodate this project.

3. Hardware supplier shall have in his employment at lease one (1) Architectural Hardware Consultant (AHC) who is available at reasonable times during business hours for consultation about the project's hardware and requirements to the owner, architect and contractor.

4. Hardware supplier must be an authorized factory distributor of all products specified herein.

1.05 FIRE-RATED OPENINGS

1. Provide door hardware for fire-rated openings that comply with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed by Underwriter's Laboratories (UL) or Warnock Hersey (WH) for use on types and sizes of doors indicated.

2. Project requires door assemblies and components that are compliant with positive pressure and S-label requirements. Specifications must be cross-referenced and coordinated with door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies.

   a. Hardware required for fire doors shall be listed with Underwriters Laboratories for ratings specified.

   b. Certification(s) of compliance shall be made available upon request by the Authority Having Jurisdiction.

1.06 DELIVERY, STORAGE AND HANDLING

A. MARKING AND PACKAGING

1. Properly package and mark items according to the approved hardware schedule, complete with necessary screws and accessories, instructions and installation templates for spotting mortising tools. Contractor shall check deliveries against accepted list and provide receipt for them, after which he is responsible for storage and care. Any shortage or damaged good shall be made without cost to the owner.

2. Packaging of door hardware is the responsibility of the supplier. As hardware supplier receives material from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set and door numbers to match the approved hardware schedule. Two or more identical sets may be packed in same container.

B. DELIVERY

1. The supplier shall deliver all hardware to the project site; direct factory shipments are not allowed unless agreed upon beforehand. Hardware supplier shall coordinate delivery times and schedules with the contractor. Inventory door hardware jointly with representatives of hardware supplier and hardware installer/contractor until each is satisfied that count is correct.

2. No keys, other than construction master keys and/or temporary keys are to be packed in boxes with the locks.

3. At time of hardware delivery, door openings supplier in conjunction with the contractor shall check in all hardware and set up a hardware storage room.

C. STORAGE

1. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of work will not be delayed by hardware losses both before and after installation.

1.07 WARRANTY

A. All items, except as noted below, shall be warranted in writing by the manufacturer against failure due to defective materials and workmanship for a minimum period of one (1) year commencing on the date of final completion and acceptance. In the event of product failure, promptly repair or replace item with no additional cost to the owner.

1. Cylindrical locksets – Heavy Duty: Five (5) years
2. Mortise locksets: Five (5) years
3. Exit Devices: Five (5) years
4. Door closers: Ten (10) years
5. Securitron (and approved equals) electrified hardware: Unlimited Lifetime

PART II – PRODUCTS

2.01 MANUFACTURERS

A. Only manufacturers as listed below shall be accepted. Obtain each type of finish hardware (hinges, latch and locksets, exit devices, door closers, etc.) from a single manufacturer.

2.02 MATERIALS

A. SCREWS AND FASTENERS

1. All required screws shall be supplied as necessary for securing finish hardware in the appropriate manner. Thru-bolts shall be supplied for exit devices and door closers where required by code and the appropriate blocking or reinforcing is not present in the door to preclude their use.

B. HANGING DEVICES

1. HINGES

   a. Hinges shall conform to ANSI A156.1 and have the number of knuckles as specified, oil-impregnated bearings as specified with NRP (non-removable pin) feature, at all exterior reverse bevel doors. Unless otherwise scheduled, supply one (1) hinge for every 30" of door height. Hinges shall be a minimum of 4 1/2" high and 4" wide; heavy weight hinges (.180) shall be supplied at all doors where specified.

      1) Specified Manufacturer: McKinney
      2) Approved Substitutes: Hager, Stanley

2. ELECTRIC HINGES

   a. Electric hinges shall be provided with molex standardized plug connectors to accommodate up to twelve (12) wires. Plug connectors shall plug directly into molex through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number of concealed wires to accommodate electric function of specified hardware. Provide a mortar guard for each electric hinge specified.

      1) Specified Manufacturer: McKinney QC Series
      2) Approved Substitutes: NONE

3. CONTINUOUS GEARED HINGES

   a. All hinges to be non-handed and completely reversible. Hinge line to be available in concealed flush mount with or without inset, full surface and half surface types as specified in the hardware sets. All hinges to be made of extruded 6060 T6 aluminum alloy with polyacetal thrust bearings, anodized after cutouts are made for bearings. All concealed hinges to be fire-rated for 20, 45 and 90 minutes when incorporated into proper door and frame labeled installations, without necessitating the use of fusible-link pins. All concealed hinges to be available in standard, heavy, and extra heavy duty weights; all full surface and half surface hinges in standard and heavy duty weights as specified in the hardware sets. All hinges to be factory cut for door size.

      1) Specified Manufacturers: McKinney
      2) Approved Substitutes: Pemko, Select

4. ELECTRIC CONTINUOS GEARED HINGES

   a. Electric geared continuous hinges shall be provided with molex standardized plug connectors to accommodate up to twelve (12) wires. Plug connectors shall plug directly into molex through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number of concealed wires to accommodate electric function of specified hardware.

      1) Specified Manufacturer: McKinney SER Series
      2) Approved Substitutes: Pemko

C. FLUSH BOLTS AND ACCESSORIES

1. All manual and automatic flush bolts to be furnished as specified.

   a. Specified Manufacturer: McKinney
   b. Approved Substitutes: Rockwood, Trimco

D. CYLINDERS AND KEYING

1. CYLINDERS

   a. Where specified, high security cylinders shall be supplied. Provide Patented High security keys able to operate both the appropriate conventional and high security cylinder within the same master key system while the keys for the conventional cylinders will not operate the high security cylinders. The high security cylinder can be easily re-configured by the Owner to void existing keys without disturbing the pinning of the master key system. If the master key system is compromised by the loss of a top-level master key, the system can be changed through a simple realignment of the barrel/plug components. The existing keys are then voided from operating the cylinder. Stamp all change keys with keyset symbol (VKC), but do not stamp with key section or bitting number.

      1) Specified Manufacturer: Sargent Signature
      2) Approved Substitutes: Corbin Russwin Pyramid PS, Schlage Everest Primus

2. KEYING

   a. All locks and cylinders shall be removable core type and shall be furnished with temporary brass construction cores for use during the construction phase of the project. These temporary cores remain the property of the lock manufacturer and must be returned upon installation of the permanent cores. For each temporary core not returned, the general contractor shall be billed 25.00 per core not returned. The factory shall key all permanent cores. Furnish the following key amounts:
      1) Three (3) change keys per lock
      2) Six (6) grand master keys
      3) Six (6) master keys per master level
      4) Ten (10) construction master keys
      5) Two (2) permanent control keys
      6) Two (2) construction control keys

   b. Master keys and all high-security or restricted keyway blanks shall be sealed in tamper-proof packaged boxes when shipped from the factory. The boxes shall be shrink wrapped and imprinted to ensure the integrity of the packaging.

3. KEY CABINET

   a. Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers,

and standard metal cabinet. Key control cabinet shall expansion capacity of 150% of the number of locks required for the project.

1) Specified Manufacturer: Telkee
2) Approved Substitutes: Lund

4. KEY CONTROL SOFTWARE

a. A comprehensive key management software package shall be supplied. Software package shall include free one year technical support and free upgrades to software as it becomes available. Software shall have customized query, reporting and search capability and shall allow for tracking of all issued keys. Display of key-holder photographs and signatures shall be allowed.

1) Specified Manufacturers: Corbin Russwin
2) Approved Substitutes: Sargent, Schlage

E. LOCKING DEVICES

1. MORTISE LOCKSETS

a. All locksets shall be ANSI 156.13 Series 1000, Grade 1 Certified. All functions shall be manufactured in a single sized case formed from 12 gauge steel minimum. The lockset shall have a field-adjustable, beveled armored front, with a .125" minimum thickness and shall be reversible without opening the lock body. The lockset shall be 2 3/4" backset with a one-piece 3/4" anti-friction stainless steel latchbolt. The deadbolt shall be a full 1" throw made of stainless steel and have 2 hardened steel roller inserts. All strikes shall be non-handed with a curved lip. To insure proper alignment, all trim, shall be thru-bolted and fully interchangeable between rose and escutcheon designs.

1) Specified Manufacturer: Corbin Russwin ML2000 Series
2) Approved Substitutes: Sargent 8200 Series, Schlage L9000 Series

2. CYLINDRICAL LOCKSETS – HEAVY DUTY

a. All locksets shall be ANSI 156.2 Series 4000, Grade 1 Certified. Furnish with standard 2 3/4" backset. Lock housing shall be fabricated of steel zinc dichromate and stainless steel. Latchbolt shall be brass or stainless steel with a minimum 1/2" throw. Locks shall be non-handed and fully field reversible.

1) Specified Manufacturer: Corbin Russwin CL3300 Series
2) Approved Substitutes: Sargent 10 Series, Schlage ND Series

3. ELECTRIFIED LOCKSETS

a. Mechanical features of locksets shall conform to standards as specified above. Locksets shall be fail-secure unless otherwise specified. Where specified electrified locksets shall be provided with a switch to monitor inside or outside lever handle or signal remote location.

1) Specified Manufacturers: Corbin Russwin
2) Approved Substitutes: Sargent, Schlage

4. LOCKSET STRIKES

a. Strikes shall be non-handed and available with curved lip, full lip or ASA type strikes as required. Provide strikes with lip-length required to accommodate jamb and/or trim detail and projection.

F. EXIT DEVICES

1. CONVENTIONAL DEVICES – PUSH RAIL

a. All exit devices shall be ANSI A156.3, Grade 1 Certified and shall be listed by Underwriters Laboratories and bear the UL label for life safety in full compliance with NFPA 80 and NFPA 101. Mounting rails shall be formed from a solid single piece of stainless steel, brass or bronze no less than 0.072" thick. Push rails shall be constructed of 0.062" thick material. Painted or anodized aluminum shall not be considered heavy duty and is not acceptable. Lever trim shall be available in finishes and designs to match that of the specified locksets.

1) Specified Manufacturer: Corbin Russwin ED5000 Series
2) Approved Substitutes: Sargent 80 Series, Von Duprin 98 Series

2. ELECTRIFIED DEVICES

a. Electrified exit devices shall conform to all traditional exit device standards as specified above. All power requirements for exit devices used must utilize a continuous circuit electric hinge for clean design and no visible means of interrupting power to device.

b. Options for delayed egress exit devices to be specified in the hardware sets. Devices to conform to NFPA 101 - Special Locking Arrangements for delayed egress. Nuisance delay to be available as standard for either zero (0) or two (2) seconds. Internal latchbolt monitoring, and a standard 10-second delay for "Authorized Entry" to be standard features on every device. Delayed egress feature to be available throughout all styles and sizes of exit devices including: Panic and Fire rated Rim, Wide and Narrow Stile, Mortise, Surface Vertical Rod, and Concealed Vertical Rod.

c. All exit devices, both fire labeled and non-labeled devices, requiring electric dogging shall be held in the "dogged" or retracted position. All exit devices with electric latch retraction shall provide for a remote means of unlocking for momentary or maintained periods of time.

d. Exit devices with electrified trim shall be fail-secure unless otherwise specified.

e. Where specified exit devices shall be provided with a switch to monitor push rail or signal remote location and latchbolt monitoring.

1) Specified Manufacturers: Corbin Russwin

2) Approved Substitutes: Sargent, Von Duprin

G. DOOR CLOSERS

1. SURFACE MOUNTED CLOSERS – HEAVY DUTY

a. All door closers shall be ANSI 156.4, Grade 1 Certified. All closers shall have aluminum alloy bodies, forged steel arms, and separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to provide up to 50% increase in spring power. Closers shall be furnished with parallel arms mounting on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

1) Specified Manufacturer: Corbin Russwin DC8000 Series
2) Approved Substitutes: Norton 7500 Series, Sargent 351 Series, LCN 4041 Series

H. DOOR TRIM AND PROTECTIVE PLATES

1. Kick plates shall be .050 gauges and two (2) inches less full width of door, or as specified. Push plates, pull plates, door pulls and miscellaneous door trim shall be as shown in the hardware schedule.

a. Specified Manufacturer: McKinney
b. Approved Substitutes: Rockwood, Trimco

I. DOOR STOPS AND HOLDERS

1. WALL MOUNTED DOOR STOPS

a. Where a door is indicated on the plans to strike flush against a wall, wall bumpers shall be provided. Provide convex or concave design as indicated.

1) Specified Manufacturers: McKinney
2) Approved Substitutes: Rockwood, Trimco

2. OVERHEAD STOPS/HOLDERS

a. Where specified, overhead stops/holders as shown in the hardware sets are to be provided. Track, slide, arm and jamb bracket shall be constructed of extruded bronze and shock absorber spring shall be of heavy tempered steel. Overhead stops shall be of non-handed design.

1) Specified Manufacturers: Rixson
2) Approved Substitutes: Sargent, ABH

3. MAGNETIC HOLD-OPENS

a. Magnetic door holders shall meet or exceed ANSI A156.15 and be UL listed 228 for Door Closer and Holders, with or without integral smoke detectors. Holding force shall

be 25 to 40 pounds and shall be fail-safe. Pushpin release that eliminates residual magnetism shall be standard. Provide magnetic hold-opens with triple-voltage coil that can receive 12 VDC, 24 VAC/DC, or 120VAC; or coordinate required voltage with electrical.

1) Specified Manufacturers: Rixson
2) Approved Substitutes: HES, Sargent

J. GASKETING AND THRESHOLDS

1. Provide continuous weatherseal on exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. Provide intumescent seals as required to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

2. Provide threshold units not less than 4" wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames. All threshold units shall comply with the Americans with Disabilities Act (ADA).

   a. Specified Manufacturers: Pemko
   b. Approved Substitutes: McKinney, Reese, Zero

K. SILENCERS

1. Furnish rubber door silencers all hollow metal frames; two (2) per pair and three (3) per single door frame.

L. ELECTRONIC PRODUCTS AND ACCESSORIES

1. INTEGRATED KEYPAD/PROXIMITY CARD PRODUCTS

   a. Provide access control products in type and functions as specified in the hardware groups with nonvolatile memory. Provide keypad operated products with a minimum of 100 user codes or 2,000 user codes as specified. Where specified provide keypad/proximity and proximity only products with a minimum of 2,000 user codes and the ability to audit the last 2,000 transactions. In addition to user codes, provide a Master Code as standard, the Master Code assigns emergency, supervisory, and user codes. Provide the ability to print the last fifteen entries via infrared printer.

   b. Wall mounted products shall be supplied for all openings as specified. Each unit shall use HID based proximity cards or fobs and/or a keypad and have the capabilities to integrate into facilities with existing HID based technology. Units shall have a main relay capable of switching up to 2 amps and a separate auxiliary 2 amp relay to signal alarm shunt, propped or forced door in conjunction with a door status switch or other means on door monitoring.

   c. Provide SofLink Plus Software, capable of working with Microsoft Windows operating systems (98/2000/XP to include all subsets), required to program time zone periods,

blocked holidays, automatic unlock with or without first entry, and listing 2,000 event transaction history – unlock, egress activation, entry into programming mode, date, time, user number, and door number.

d. Where specified, locksets and exit devices shall have the option to be remotely controlled via hand-held radio frequency (RF) transmitter, allowing lock/unlock capabilities from up to 75 feet away from the lock. Units shall have LEDs to indicate status – unlocked and programming mode.

1) Specified Manufacturers: Corbin Russwin Access 800
2) Approved Substitutes: Sargent Profile Series

2. POWER SUPPLIES

a. Power supplies shall furnish regulated 24VDC and shall be UL class 2 listed. LED's shall monitor zone status (voltage/no voltage) and slide switches shall be provided to connect or disconnect the load from power; 1, 4 or 8 separate output circuit breakers shall be provided to divide the load. Power supplies shall have the internal capability of charging optional 24VDC sealed lead acid batteries in addition to operating the DC load. Power supplies shall be supplied complete requiring only 120VAC to the fused input and shall be supplied in an enclosure. Power supplies shall be provided with emergency release terminals that allow the release of all devices upon activation of the fire alarm system.

1) Specified Manufacturer: Corbin Russwin, Securitron BPS
2) Approved Substitutes: Folger Adams

2.03 FINISHES

A. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 or traditional U.S. finishes shown by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

PART III – EXECUTION

3.01 EXAMINATION

A. Contractor shall ensure that the building is secured and free from weather elements prior to installing interior door hardware. Examine hardware before installation to ensure it is free of defects.

3.02 INSTALLATION

A. Mount hardware units at heights indicated in the following applicable publications, except as specifically indicated or required to comply with the governing regulations.

1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute (DHI.)

2. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."

B. All hardware shall be applied and installed in accordance with best trade practice by an experienced hardware installer. Care shall be exercised not to mar or damage adjacent work.

C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

D. Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.03 FIELD QUALITY CONTROL

A. The Contractor shall comply with AIA A201 1997 section 3.3.1 which reads as follows: "The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the contract Documents give other specific instructions concerning these matters."

B. Prior to the installation of hardware, manufacturer's representatives for locksets, closers, and exit devices shall arrange and hold a jobsite meeting to instruct the installing contractor's personnel on the proper installation of their respective products. A letter of compliance, indicating when this meeting is held and who is in attendance, shall be sent to the Architect and Owner.

C. The hardware supplier shall do a final inspection prior to building completion to ensure that all hardware was correctly installed and is in proper working order.

D. The manufacturer's representative shall do a final inspection prior to building completion to ensure that all hardware was correctly installed and is in proper working order.

3.04 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore to proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Instruct owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes and usage of any electronic devices.

3.05 PROTECTION

A. Contractor shall protect all hardware, as it is stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

3.06 HARDWARE SCHEDULE

A. The following schedule is furnished for whatever assistance it may afford the Contractor; do not consider it as entirely inclusive. Should any particular door or item be omitted in any scheduled hardware heading, provide door or item with hardware same as required for similar purposes. Hardware supplier is responsible for handing and sizing all products as listed in the hardware heading. Quantities listed are for each pair of doors, or for each single door.

B. Manufacturer's Abbreviations:

1. CR Corbin Russwin
2. MC McKinney
3. PE Pemko
4. RX Rixson
5. SN Securitron

3.07 HARDWARE SETS

SET #1

1	Continuous Hinge	MCK-12HD	CLEAR	MC
1	Electric Continuous Hinge	MCK-12HD SER12	CLEAR	MC
1	Removable Mullion	710 KM CT6R M57	600	CR
1	Exit Device	ED5200 x TH950 CT6R M52	630	CR
1	Electrified Exit Device	ED5200 x TH959 CT6R M52 M94	630	CR
4	Cylinder Core	8027 CKC2	630	CR
2	Surface Closer (Stop)	DC8210 A11	689	CR
1	Weatherseal & Astragal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
1	Threshold	2005 AV		PE
1	Controller	781N-120		CR
1	Card Reader	FURNISHED BY SECURITY CONTRACTOR		

Card reader releases electrified exit device allowing access.
Door relocks upon closing.
Door fails secure.
Immediate exiting is available at all times by depressing pushbar on either exit device.

SET #2

2	Continuous Hinge	MCK-12HD	CLEAR	MC
1	Removable Mullion	710 KM CT6R M57	600	CR
1	Exit Device	ED5200 x TH950 CT6R M52	630	CR

1	Exit Device	ED5200 x TH959 CT6R M52	630	CR
4	Cylinder Core	8027 CKC2	630	CR
2	Surface Closer (Stop)	DC8210 A11	689	CR
1	Weatherseal & Astragal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
1	Threshold	2005 AV		PE

SET #3

1	Continuous Hinge	MCK-12HD	CLEAR	MC
1	Exit Device	ED5200 x TH959 CT6R M52	630	CR
2	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer (Stop)	DC8210 A11	689	CR
1	Weatherseal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
1	Threshold	2005 AV		PE

SET #4

1	Continuous Hinge	MCK-12HD	CLEAR	MC
1	Electric Continuous Hinge	MCK-12HD SER12	CLEAR	MC
1	Removable Mullion	710 KM CT6R M57	600	CR
1	Exit Device	ED5200 x TH950 CT6R M52	630	CR
1	Electrified Exit Device	ED5200 x TH959 CT6R M52 M94	630	CR
4	Cylinder Core	8027 CKC2	630	CR
2	Surface Closer (Stop)	DC8210 A11	689	CR
1	Controller	781N-120		CR
1	Card Reader	FURNISHED BY SECURITY CONTRACTOR		

Card reader releases electrified exit device allowing access.
Door relocks upon closing.
Door fails secure.
Immediate exiting is available at all times by depressing pushbar on either exit device.

SET #5

2	Continuous Hinge	MCK-12HD	CLEAR	MC
1	Removable Mullion	710 KM CT6R M57	600	CR
1	Exit Device	ED5200 x TH950 CT6R M52	630	CR
1	Exit Device	ED5200 x TH959 CT6R M52	630	CR
4	Cylinder Core	8027 CKC2	630	CR
2	Surface Closer (Stop)	DC8210 A11	689	CR

SET #6

2	Continuous Hinge	MCK-12HD	CLEAR	MC
2	Push Bar	ED5000DB	630	CR
2	Pull Plate	TH950	630	CR
2	Surface Closer (Stop)	DC8210 A11	689	CR

SET #6A

1	Continuous Hinge	MCK-12HD	CLEAR	MC
1	Push Bar	ED5000DB	630	CR

1	Pull Plate	TH950	630	CR
1	Surface Closer (Stop)	DC8210 A11	689	CR

SET #7

1	Door Cord	TSB-C		SN
1	Removable Mullion	710 KM CT6R M57	600	CR
1	Exit Device	ED5200 x TH950 CT6R M52	630	CR
1	Electrified Exit Device	ED5200 x TH959 CT6R M52 M94	630	CR
4	Cylinder Core	8027 CKC2	630	CR
1	Controller	781N-120		CR
1	Card Reader	FURNISHED BY SECURITY CONTRACTOR		
1	Balance of Hardware	REUSE EXISTING		

Card reader releases electrified exit device allowing access.
Door relocks upon closing.
Door fails secure.
Immediate exiting is available at all times by depressing pushbar on either exit device.

SET #8

1	Electric Continuous Hinge	MCK-12HD SER12	CLEAR	MC
1	Electrified Lockset	ML20905 PSA CT6R	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer(Stop/HO)	DC8210 A12	689	CR
1	Armor Plate	KP50 34" X 2" LDW	32D	MC
1	Perimeter Gasket	S88 C		PE
1	Raindrip	346 C		PE
1	Threshold	2005 AV		PE
1	Power Supply	BPS-24-1		SN
1	Backup Battery	B-24-5		SN
1	Card Reader	FURNISHED BY SECURITY CONTRACTOR		

Card reader releases electrified lockset allowing access.
Door relocks upon closing.
Door fails secure.
Immediate exiting is available at all times by turning inside lever.

SET #9

1	Electric Continuous Hinge	MCK-12HD SER12	CLEAR	MC
1	Electrified Lockset	ML20905 PSA CT6R	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer (Stop)	DC8210 A11	689	CR
1	Kickplate	KP50 8" X 2" LDW	32D	MC
1	Perimeter Gasket	S88 C		PE
1	Raindrip	346 C		PE
1	Threshold	2005 AV		PE
1	Power Supply	BPS-24-1		SN
1	Backup Battery	B-24-5		SN
1	Card Reader	FURNISHED BY SECURITY CONTRACTOR		

SET #10

2	Continuous Hinge	MCK-12HD	CLEAR	MC
1	Removable Mullion	710 KM CT6R M57	600	CR
2	Exit Device	ED5200 M52	630	CR
2	Cylinder Core	8027 CKC2	630	CR
2	Surface Closer (Stop)	DC8210 A11	689	CR
2	Kickplate	KP50 8" X 2" LDW	32D	MC
1	Mullion Gasket	5110		PE
1	Perimeter Gasket	S88 C		PE
2	Raindrip	346 C		PE
1	Threshold	2005 AV		PE

SET #11

1	Continuous Hinge	MCK-12HD	CLEAR	MC
1	Electric Continuous Hinge	MCK-12HD SER12	CLEAR	MC
2	Flush Bolt	FB01M-12	26D	MC
1	Electrified Lockset	ML20905 DSA CT6R SS078	626	CR
1	Cylinder Core	8027 CKC2	630	CR
2	Surface Closer (Stop)	DC8210 A11	689	CR
1	Dust Proof Strike	DPS3 LFP	26D	MC
1	Perimeter Gasket	S88 C		PE
1	Astragal	357 SP		PE
1	Raindrip	346 C		PE
1	Threshold	2005 AV		PE
1	Power Supply	BPS-24-1		SN
1	Backup Battery	B-24-5		SN
1	Card Reader	FURNISHED BY SECURITY CONTRACTOR		

Card reader releases electrified lockset allowing access.
Door relocks upon closing.
Door fails secure.
Immediate exiting is available at all times by turning inside lever.

SET #12

1	Continuous Hinge	MCK-12HD	CLEAR	MC
1	Exit Device	ED5200 x TH959 CT6R M52	630	CR
2	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer (Stop)	DC8210 A11	689	CR
1	Kickplate	KP50 8" X 2" LDW	32D	MC
1	Perimeter Gasket	S88 C		PE
1	Raindrip	346 C		PE
1	Threshold	2005 AV		PE

SET #13

1	Continuous Hinge	MCK-12HD	CLEAR	MC
1	Storeroom Lockset	ML2057 PSA CT6R M21	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer (Stop)	DC8210 A11	689	CR

1	Kickplate	KP50 8" X 2" LDW	32D	MC
1	Perimeter Gasket	S88 C		PE
1	Raindrip	346 C		PE
1	Threshold	2005 AV		PE

SET #14

1	Continuous Hinge	MCK-12HD	CLEAR	MC
1	Storeroom Lockset	ML2057 PSA CT6R M21	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer(Stop/HO)	DC8210 A12	689	CR
1	Kickplate	KP50 8" X 2" LDW	32D	MC
1	Perimeter Gasket	S88 C		PE
1	Raindrip	346 C		PE
1	Threshold	2005 AV		PE

SET #15

6	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
2	Fire Exit Device	ED5400A x PR910 M55	630	CR
2	Magnetic Wall Holder	998	689	RX
2	Surface Closer	DC8210 A3	689	CR
2	Door Silencers	S1M		MC

SET #16

8	Hinges	T4A3786 4 1/2 X 4 1/2	26D	MC
2	Fire Exit Device	ED5470B x PR910 M55	630	CR
2	Magnetic Wall Holder	998	689	RX
2	Surface Closer	DC8210 A3	689	CR
2	Door Silencers	S1M		MC

SET #17

8	Hinges	T4A3786 4 1/2 X 4 1/2	26D	MC
2	Fire Exit Device	ED5470B M55	630	CR
2	Magnetic Wall Holder	998	689	RX
2	Surface Closer	DC8210 A3	689	CR
2	Door Silencers	S1M		MC

SET #18

6	Hinges	T4A3786 4 1/2 X 4 1/2	26D	MC
1	Removable Mullion	710 KM CT6R M57	600	CR
2	Exit Device	ED5200 x PR955 CT6R M52	630	CR
5	Cylinder Core	8027 CKC2	630	CR
2	Surface Closer	DC8210 A3	689	CR
2	Kickplate	KP50 8" X 2" LDW	32D	MC
2	Wall Stop	WS01	32D	MC
2	Door Silencers	S1M		MC

SET #19

3	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1	Alarmed Exit Device	ED5200 M61	630	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer	DC8210 A3	689	CR
1	Wall Stop	WS01	32D	MC
3	Door Silencers	S1M		MC

SET #20

3	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1	Push Plate	P053 C/TK	32D	MC
1	Pull Plate	DP803 CFC	32D	MC
1	Classroom Deadlock	DL4017 CT6	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer (Stop)	DC8210 A11	689	CR
1	Kickplate	KP50 8" X 2" LDW	32D	MC
3	Door Silencers	S1M		MC

SET #21

3	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1	Push Plate	P053 C/TK	32D	MC
1	Pull Plate	DP803 CFC	32D	MC
1	Classroom Deadlock	DL4017 CT6	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer	DC8210 A3	689	CR
1	Kickplate	KP50 8" X 2" LDW	32D	MC
1	Wall Stop	WS01	32D	MC
3	Door Silencers	S1M		MC

SET #22

3	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1	Push Plate	P053 CFC	32D	MC
1	Pull Plate	DP803 C/TK	32D	MC
1	Classroom Deadlock	DL4017 CT6	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer	DC8200 A10	689	CR
1	Kickplate	KP50 8" X 2" LDW	32D	MC
1	Wall Stop	WS01	32D	MC
3	Door Silencers	S1M		MC

SET #23

3	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1	Privacy Set	ML2060 PSA	626	CR
1	Surface Closer	DC8200 A10	689	CR
1	Kickplate	KP50 8" X 2" LDW (Doors B215A & B215B)	32D	MC
1	Wall Stop	WS01	32D	MC
3	Door Silencers	S1M		MC

SET #24

3 Hinges	T4A3786 4 1/2 X 4 1/2	26D	MC
1 Push Plate	P053 CFC	32D	MC
1 Pull Plate	DP803 C/TK	32D	MC
1 Classroom Deadlock	DL4017 CT6	626	CR
1 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer	DC8200 A10	689	CR
1 Kickplate	KP50 8" X 2" LDW	32D	MC
	(Not on Doors B207 & B208)		
1 Wall Stop	WS01	32D	MC
3 Door Silencers	S1M		MC

SET #25

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Hotel Lockset	ML2029 PSA CT6R	626	CR
1 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer	DC8200 A10	689	CR
1 Kickplate	KP50 8" X 2" LDW	32D	MC
	(Not on Door A241)		
1 Wall Stop	WS01	32D	MC
3 Door Silencers	S1M		MC

SET #26

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Storeroom Lockset	ML2057 PSA CT6R M21	626	CR
1 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer	DC8210 A3	689	CR
1 Kickplate	KP50 8" X 2" LDW	32D	MC
	(Doors A114 & A219)		
1 Wall Stop	WS01	32D	MC
3 Door Silencers	S1M		MC

SET #27

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Storeroom Lockset	ML2057 PSA CT6R M21	626	CR
1 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer	DC8200 A10	689	CR
1 Kickplate	KP50 8" X 2" LDW	32D	MC
	(Doors A169B, A181, B113, B177, A205A & B209)		
1 Wall Stop	WS01	32D	MC
3 Door Silencers	S1M		MC

SET #28

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Storeroom Lockset	ML2057 PSA CT6R M21	626	CR
1 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer (Stop)	DC8210 A11	689	CR

3	Door Silencers	S1M		MC

SET #29

6	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
2	Flush Bolt	FB01M-12	26D	MC
1	Storeroom Lockset	ML2057 PSA CT6R M21	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer	DC8210 A3	689	CR
2	Wall Stop	WS01	32D	MC
1	Dust Proof Strike	DPS3	26D	MC
1	Astragal	357 SS		PE
2	Door Silencers	S1M		MC

SET #30

3	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1	Classroom Lockset	ML2055 PSA CT6R	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Wall Stop/Floor Stop	WS01/FS05 As Required	32D	MC
3	Door Silencers	S1M		MC

SET #31

3	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1	Classroom Lockset	ML2055 PSA CT6R	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer	DC8200 A10	689	CR
1	Kickplate	KP50 8" X 2" LDW (Not on Door A184A)	32D	MC
1	Wall Stop	WS01	32D	MC
3	Door Silencers	S1M		MC

SET #32

3	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1	Classroom Lockset	ML2055 PSA CT6R	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer (Stop)	DC8210 A11	689	CR
1	Kickplate	KP50 8" X 2" LDW (Doors B179 & B184A)	32D	MC
3	Door Silencers	S1M		MC

SET #33

3	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1	Classroom Lockset	ML2055 PSA CT6R	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer	DC8200 A10	689	CR
1	Wall Stop	WS01	32D	MC
1	Perimeter Gasket	S88 C		PE
1	Auto Door Bottom	434 ARL		PE

SET #34

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Classroom Lockset	ML2055 PSA CT6R M21	626	CR
1 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer	DC8210 A3	689	CR
1 Kickplate	KP50 8" X 2" LDW	32D	MC
	(Not on door A135)		
1 Wall Stop	WS01	32D	MC
3 Door Silencers	S1M		MC

SET #35

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Intruder Lockset	ML2052 PSA CT6R	626	CR
2 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer	DC8200 A10	689	CR
	(Doors A117, A122, A129, A129A, B136 & C141)		
1 Kickplate	KP50 8" X 2" LDW	32D	MC
	(Doors A122, A129A, B136 & C141)		
1 Wall Stop	WS01	32D	MC
3 Door Silencers	S1M		MC

SET #36

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Intruder Lockset	ML2052 PSA CT6R	626	CR
2 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer	DC8200 A10	689	CR
1 Kickplate	KP50 8" X 2" LDW	32D	MC
1 Wall Stop	WS01	32D	MC
3 Door Silencers	S1M		MC

SET #37

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Intruder Lockset	ML2052 PSA CT6R	626	CR
2 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer	DC8200 A10	689	CR
1 Wall Stop	WS01	32D	MC
1 Perimeter Gasket	S88 C		PE
1 Auto Door Bottom	434 ARL		PE

SET #38

2 Hinges	T4A3786 4 1/2 X 4 1/2	26D	MC
1 Electric Hinge	T4A3786 4 1/2 x 4 1/2 QC12	26D	MC
1 Electrified Lockset	ML20905 PSA CT6R	626	CR
2 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer (Stop)	DC8210 A11	689	CR
1 Kickplate	KP50 8" X 2" LDW	32D	MC
1 Card Reader	FURNISHED BY SECURITY CONTRACTOR		

3 Door Silencers	S1M		MC

Card reader releases electrified lockset allowing access.
Door relocks upon closing.
Door fails secure.
Immediate exiting is available at all times by turning inside lever.

SET #39

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Intruder Lockset	ML2052 PSA CT6R	626	CR
2 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer (Stop)	DC8210 A11	689	CR
1 Kickplate	KP50 8" X 2" LDW	32D	MC
3 Door Silencers	S1M		MC

SET #40

3 Hinges	T4A3786 4 1/2 X 4 1/2	26D	MC
1 Intruder Lockset	ML2052 PSA CT6R	626	CR
2 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer	DC8200 A10 (Door B225 only)	689	CR
1 Kickplate	KP50 8" X 2" LDW (Not on door B178)	32D	MC
1 Wall Stop	WS01	32D	MC
3 Door Silencers	S1M		MC

SET #41

3 Hinges	T4A3786 4 1/2 X 4 1/2	26D	MC
1 Intruder Lockset	ML2052 PSA CT6R	626	CR
2 Cylinder Core	8027 CKC2	630	CR
1 Surface Closer	DC8210 A3 (Doors A223, A223A, A225, A225A, A226, A226A, A228, A238, A238A, A239, A239A, A4-D, C140 & C140A)	689	CR
1 Kickplate	KP50 8" X 2" LDW	32D	MC
1 Wall Stop	WS01	32D	MC
3 Door Silencers	S1M		MC

SET #42

3 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1 Classroom Lockset	ML2055 PSA CT6R	626	CR
1 Cylinder Core	8027 CKC2	630	CR
1 Surface Overhead Stop	10 Series	652	RX
3 Door Silencers	S1M		MC

SET #43

6 Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
2 Flush Bolt	FB01M-12	26D	MC

1	Storeroom Lockset	ML2057 PSA CT6R M21	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer	DC8200 A10	689	CR
2	Wall Stop	WS01	32D	MC
1	Dust Proof Strike	DPS3	26D	MC
1	Astragal	357 SS		PE
2	Door Silencers	S1M		MC

SET #44

1	Continuous Hinge	MCK-12HD	CLEAR	MC
1	Storeroom Lockset	ML2057 PSA CT6R M21	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer (Stop/HO)	DC8210 A12	689	CR
1	Perimeter Gasket	S88 C		PE
1	Raindrip	346 C		PE
1	Threshold	2005 AV		PE

SET #45

3	Hinges	TA2714 4 1/2 X 4 1/2	26D	MC
1	Privacy Set	ML2060 PSA	626	CR
1	Surface Closer (Stop)	DC8210 A11	689	CR
3	Door Silencers	S1M		MC

SET #46

3	Hinges	T4A3786 4 1/2 X 4 1/2	26D	MC
1	Exit Device	ED5200 x PR955 CT6R M52	630	CR
2	Cylinder Core	8027 CKC2	630	CR
1	Surface Closer	DC8210 A3	689	CR
1	Kickplate	KP50 8" X 2" LDW	32D	MC
1	Wall Stop	WS01	32D	MC
3	Door Silencers	S1M		MC

SET #47

3	Hinges	T4A3786 4 1/2 X 4 1/2	26D	MC
1	Intruder Lockset	ML2052 PSA CT6R	626	CR
2	Cylinder Core	8027 CKC2	630	CR
1	Surface Overhead Stop	10 Series (Door B130)	652	RX
1	Wall Stop	WS01 (Balance)	32D	MC
3	Door Silencers	S1M		MC

SET #48

6	Hinges	T4A3786 4 1/2 X 4 1/2	26D	MC
2	Flush Bolt	FB01M-12	26D	MC
1	Intruder Lockset	ML2052 PSA CT6R	626	CR
1	Cylinder Core	8027 CKC2	630	CR

2	Surface Overhead Stop	10 Series	652	RX
1	Dust Proof Strike	DPS3	26D	MC
2	Door Silencers	S1M		MC

SET #49

1	Classroom Lockset	CL3355 PZD CT6R	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Balance of Hardware	REUSE EXISTING		

SET #50

1	Privacy Set	CL3320 PZD	626	CR
1	Balance of Hardware	REUSE EXISTING		

SET #51

1	Storeroom Lockset	CL3357 PZD CT6R M21	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Balance of Hardware	REUSE EXISTING		

SET #52

1	Passage Set	CL3310 PZD	626	CR
1	Balance of Hardware	REUSE EXISTING		

SET #53

1	Classroom Lockset	CL3355 PZD CT6R M21	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Balance of Hardware	REUSE EXISTING		

SET #54

1	Storeroom Lockset	CL3357 PZD CT6R M21	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Astragal	357 SS		PE
1	Balance of Hardware	REUSE EXISTING		

SET #55

1	Storeroom Lockset	CL3357 PZD CT6R M21 SS078	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Astragal	357 SS		PE
1	Balance of Hardware	REUSE EXISTING		

SET #56

1	Classroom Lockset	CL3355 PZD CT6R	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Latch Protector	LP02	32D	MC
1	Floor Stop	FS05 (Door C125)	26D	MC
1	Balance of Hardware	REUSE EXISTING		

SET #57

1	Hotel Lockset	CL3329 PZD CT6R	626	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Balance of Hardware	REUSE EXISTING		

Remove existing slide bolt from door C147

SET #58

1	Intruder Lockset	CL3352 PZD CT6R	626	CR
2	Cylinder Core	8027 CKC2	630	CR
1	Balance of Hardware	REUSE EXISTING		

SET #59

1	Fire Exit Device	ED5200A x PR959 CT6R M21	630	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Balance of Hardware	REUSE EXISTING		

SET #60

1	Exit Device	ED5200 x TH959 CT6R M52	630	CR
2	Cylinder Core	8027 CKC2	630	CR
1	Balance of Hardware	REUSE EXISTING		

SET #61

1	Removable Mullion	710 KM CT6R M57	600	CR
1	Exit Device	ED5200 x TH950 CT6R M52	630	CR
1	Exit Device	ED5200 x TH959 CT6R M52	630	CR
4	Cylinder Core	8027 CKC2	630	CR
1	Balance of Hardware	REUSE EXISTING		

SET #62

1	Removable Mullion	708A KM CT6R M57	600	CR
2	Fire Exit Device	ED5200A x PR955 CT6R	630	CR
2	Cylinder Core	8027 CKC2	630	CR
1	Balance of Hardware	REUSE EXISTING		

SET #63

1	Fire Exit Device	ED5200A x PR955 CT6R	630	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Balance of Hardware	REUSE EXISTING		

SET #64

1	Fire Exit Device	ED5200A x PR959 CT6R M21	630	CR
1	Cylinder Core	8027 CKC2	630	CR
1	Balance of Hardware	REUSE EXISTING		

SET #65

1 Removable Mullion	710 KM CT6R M57	600	CR
2 Exit Device	ED5200 x TH959 CT6R M52	630	CR
5 Cylinder Core	8027 CKC2	630	CR
1 Balance of Hardware	REUSE EXISTING		

SET #66

2 Fire Exit Device	ED5400A x PR955 CT6R	630	CR
2 Cylinder Core	8027 CKC2	630	CR
1 Balance of Hardware	REUSE EXISTING		

SET #67

1 Exit Device	ED5400 x TH950 CT6R M52	630	CR
1 Exit Device	ED5400 x TH959 CT6R M52	630	CR
3 Cylinder Core	8027 CKC2	630	CR
1 Balance of Hardware	REUSE EXISTING		

SET #68

1 Cylinder Core	8027 CKC2	630	CR
1 Mortise Cylinder	1080 CT6	626	CR
1 Balance of Hardware	REUSE EXISTING		

SET #69

1 Keypad Lockset	CL33834 PZZ CT6R M803	626	CR
1 Cylinder Core	8027 CKC2	630	CR
1 Balance of Hardware	REUSE EXISTING		

SET #70

1 Keypad Lockset	CL33834 PZZ CT6R M803	626	CR
1 Cylinder Core	8027 CKC2	630	CR

END OF SECTION 08 71 00

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.
3. Glazed curtain walls.
4. Glazed entrances.
5. Interior borrowed lites.
6. Storefront framing.

B. Related Sections include the following:
1. Division 08 Section "Structural Glass Curtain Walls" for structural-sealant glazing requirements.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions.

Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

a. Specified Design Wind Loads: As indicated.
b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

1) Load Duration: 60 seconds or less.

c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.

1) For monolithic-glass lites heat treated to resist wind loads.
2) For insulating glass.
3) For laminated-glass lites.

d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:

    a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
    b. Solar Heat Gain Coefficient: NFRC 200.
    c. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- square Samples for glass and of 12-inch- long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

C. Samples: For the following products, in the form of 12-inch- square Samples for glass.
1. Each pattern and color of ceramic-coated vision glass.
2. Wired glass.
3. Insulating glass for each designation indicated.

D. 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.

E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

G. Product Test Reports: For each of the following types of glazing products:
1. Coated float glass.
2. Insulating glass.
3. Glazing sealants.
4. Glazing gaskets.

H. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance.

B. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

C. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.

1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

D. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

E. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

F. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and 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 252.

G. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and 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 257.

H. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
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.

I. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
3. Basis-of-Design Product: The design for each glazing product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

1. Ultra-Clear (Low-Iron) Float Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.

a. Available Products:

1) AFG Industries Inc.; Krystal Klear.
2) Pilkington Building Products North America; Optiwhite.
3) PPG Industries, Inc.; Starphire.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
3. For uncoated glass, comply with requirements for Condition A.

4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

C. Ceramic-Coated Vision Glass: Float glass with ceramic enamel applied by silk-screened process and complying with ASTM C 1048, Condition C (other coated glass), Type I (transparent flat glass), Quality-Q3, Specification No. 95-1-31 in GANA Tempering Division's "Engineering Standards Manual," and other requirements specified.

D. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.

E. Wired Glass: ASTM C 1036, Type II (patterned and wired flat glass), Class 1 (clear), Quality-Q-6; and of form and mesh pattern specified.

F. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
4. Sealing System: Dual seal, with primary and secondary sealants as follows:

   a. Manufacturer's standard sealants.

5. Spacer Specifications: Manufacturer's standard spacer material and construction.

2.3 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
1. EPDM, ASTM C 864.
2. Silicone, ASTM C 1115.
3. Thermoplastic polyolefin rubber, ASTM C 1115.
4. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
1. EPDM.

2. Silicone.
3. Thermoplastic polyolefin rubber.
4. Any material indicated above.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.4 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Neutral-Curing Silicone Glazing Sealants:

a. Available Products:
   1) Dow Corning Corporation; 795.
   2) GE Silicones; SilPruf NB SCS9000.
   3) GE Silicones; UltraPruf II SCS2900.
   4) Pecora Corporation; 865.
   5) Pecora Corporation; 895.
   6) Pecora Corporation; 898.

b. Type and Grade: S (single component) and NS (nonsag).
c. Class: 50.
d. Use Related to Exposure: NT (nontraffic).

C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.5 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for

application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type B (bicellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.7 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units 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 publications, 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 outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

2.8 MONOLITHIC FLOAT-GLASS UNITS

A. Uncoated Clear Float-Glass Units MG: Class 1 (clear) annealed or Kind HS (heat-strengthened) float glass where heat strengthening is required to resist thermal stresses induced by differential shading of individual glass lites and to comply with system performance requirements or Kind FT (fully tempered) float glass where indicated or required.

2.9 MONOLITHIC WIRED-GLASS UNITS

A. Polished Wired-Glass Units: Form 1 (wired glass, polished both sides), Quality-Q6, Mesh 1 (M1) (Diamond), 6.0 mm thick.

1. Available Manufacturers:

a. Asahi/AMA Glass Corp.; affiliated with AFG Industries, Inc.
b. Central Glass Co., Ltd.; distributed by Northwestern Industries Inc.
c. Pilkington Sales (North America) Ltd.

2.10 INSULATING-GLASS UNITS

A. Solar-Control Low-E Insulating-Glass Units:

1. Basis-of-Design Product: 1" VE2-2M by Viracon or a comparable product.

2. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm.
3. Interspace Content: Air.
4. Outdoor Lite: Class 2 (tinted) float glass.

a. Tint Color: Green.

5. Indoor Lite: Class 1 (clear) float glass.

6. Low-E Coating: Sputtered on second surface.

7. Visible Light Transmittance: 60 percent minimum.
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: 0.26 maximum.
10. Solar Heat Gain Coefficient: 0.31 maximum.

B. Ceramic-Coated Vision Insulating-Glass Units:

1. Basis-of-Design Product: 1" VE2-2M by Viracon with V1086 on the #3 surface, or a comparable product.

2. Construction: Provide units that comply with requirements specified for insulating-glass units designated except for indoor lite.

3. Indoor Lite: Ceramic-coated spandrel glass.
   a. Ceramic Coating Location: Third surface.
   b. Color: Match Simulated Sandblast (V1086) by Viracon.

4. Visible Light Transmittance: 38 percent minimum.
5. Winter Nighttime U-Factor: 0.30 maximum.
6. Summer Daytime U-Factor: 0.26 maximum.
7. Solar Heat Gain Coefficient: 0.28 maximum.

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. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. 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 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on 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.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches 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.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. 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.

K. 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.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch 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.

3.6 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.

3.7 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances 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 buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:
   1. Tempered glass mirrors qualifying as safety glazing.

B. Related Sections:

   1. Division 08 Section "Glazing" for glass with reflective coatings used for vision and spandrel lites.
   2. Division 10 Section "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

1.3 SUBMITTALS

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

   1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

C. Samples: For each type of the following products:

   1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
   2. Mirror Clips: Full size.

D. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.

E. Maintenance Data: For mirrors to include in maintenance manuals.

F. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

B. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

C. Glazing Publications: Comply with the following published recommendations:

1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

D. Safety Glazing Products: For tempered mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Fifteen years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

A. Glass Mirrors, General: ASTM C 1503.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Arch Aluminum & Glass Co., Inc.
b. Avalon Glass and Mirror Company.
c. Binswanger Mirror; a division of Vitro America, Inc.
d. D & W Incorporated
e. Donisi Mirror Company.
f. Gardner Glass, Inc.
g. Gilded Mirrors, Inc.
h. Guardian Industries.
i. Head West.
j. Independent Mirror Industries, Inc.
k. Lenoir Mirror Company.
l. Maran-Wurzell Glass & Mirror.
m. National Glass Industries.
n. Stroupe Mirror Co., Inc.
o. Sunshine Mirror; Westshore Glass Corp.
p. Virginia Mirror Company, Inc.
q. Walker Glass Co., Ltd.

B. Tempered Clear Glass: Mirror Glazing Quality, for blemish requirements; and comply with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.

1. Nominal Thickness: 6.0 mm.

2.2 MISCELLANEOUS MATERIALS

A. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

B. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Franklin International; Titebond Division.
b. Laurence, C. R. Co., Inc.

c. Macco Adhesives; Liquid Nails Division.
d. OSI Sealants, Inc.
e. Palmer Products Corporation.
f. Pecora Corporation.
g. Royal Adhesives & Sealants; Gunther Mirror Mastics Division.
h. Sommer & Maca Industries, Inc.

C. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.3 FABRICATION

A. Mirror Sizes: To suit Project conditions, and before tempering, cut mirrors to final sizes and shapes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

B. Provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Wall-Mounted Mirrors: Install mirrors with mastic.
1. Install mastic as follows:

a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

SECTION 089000 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.

B. Related Sections:
1. Division 23 Sections for louvers that are a part of mechanical equipment.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

D. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. Design earthquake spectral response acceleration, short period (Sds) for Project is 0.294.
2. Component Importance Factor is 1.0.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

E. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.5 SUBMITTALS

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

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of metal finish required.

E. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Aluminum Castings: ASTM B 26/B 26M, Alloy 319.

D. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

E. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: As indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacings indicated, or if not indicated, as recommended by manufacturer.

1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
2. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

F. Provide subsills made of same material as louvers or extended sills for recessed louvers.

G. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Air Balance Inc.; a Mestek company.
b. Air Flow Company, Inc.
c. Airolite Company, LLC (The).
d. All-Lite Architectural Products.
e. American Warming and Ventilating, Inc.; a Mestek company.
f. Arrow United Industries; a division of Mestek, Inc.
g. Carnes Company, Inc.
h. Cesco Products; a division of Mestek, Inc.
i. Construction Specialties, Inc.
j. Dowco Products Group; Safe-Air of Illinois, Inc.
k. Greenheck Fan Corporation.
l. Industrial Louvers, Inc.
m. Louvers & Dampers, Inc.; a division of Mestek, Inc.
n. Metal Form Manufacturing Inc.
o. NCA Manufacturing, Inc.
p. Nystrom Building Products.
q. Reliable Products, Inc.
r. Ruskin Company; Tomkins PLC.
s. United Enertech Corp.
t. Vent Products Company, Inc.

2. Louver Depth: 4 inches.

3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
4. Louver Performance Ratings:

    a. Free Area: Not less than 8.0 sq. ft. for 48-inch- wide by 48-inch- high louver.
    b. Point of Beginning Water Penetration: Not less than 900 fpm.
    c. Air Performance: Not more than 0.10-inch wg static pressure drop at 800-fpm free-area velocity.

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

B. Horizontal, Nondrainable-Blade Louver:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Air Balance Inc.; a Mestek company.
    b. Air Flow Company, Inc.
    c. Airolite Company, LLC (The).
    d. All-Lite Architectural Products.
    e. American Warming and Ventilating, Inc.; a Mestek company.
    f. Arrow United Industries; a division of Mestek, Inc.
    g. Carnes Company, Inc.
    h. Cesco Products; a division of Mestek, Inc.
    i. Construction Specialties, Inc.
    j. Dowco Products Group; Safe-Air of Illinois, Inc.
    k. Greenheck Fan Corporation.
    l. Louvers & Dampers, Inc.; a division of Mestek, Inc.
    m. Metal Form Manufacturing Inc.
    n. NCA Manufacturing, Inc.
    o. Nystrom Building Products.
    p. Reliable Products, Inc.
    q. Ruskin Company; Tomkins PLC.
    r. United Enertech Corp.
    s. Vent Products Company, Inc.

2. Louver Depth: 2 inches.
3. Blade Profile: Plain blade without center baffle.
4. Frame and Blade Nominal Thickness: Not less than 0.060 inch for blades and 0.080 inch for frames.
5. Louver Performance Ratings:

    a. Free Area: Not less than 7.75 sq. ft. for 48-inch- wide by 48-inch- high louver.
    b. Point of Beginning Water Penetration: Not less than 725 fpm.

2.4 BLANK-OFF PANELS

A. Insulated, Blank-Off Panels: Laminated panels consisting of insulating core surfaced on back and front with metal sheets and attached to back of louver.

1. Thickness: 1 inch.
2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
3. Insulating Core: Rigid, glass-fiber-board insulation or extruded-polystyrene foam.
4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
6. Panel Finish: Same type of finish applied to louvers, but black color.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.6 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: 2-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: Match Architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect unpainted nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

3.4 CLEANING

A. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089000

SECTION 089550

TRANSLUCENT LINEAR CHANNEL GLAZING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Sections Includes:
   1. Translucent linear glass units.
   2. Framing.
   3. Glazing accessories.

1.2 REFERENCES

A. Reference Standards: In addition to requirements shown or specified, comply with applicable provisions of following for design, materials, fabrication, and installation of component parts:
   1. AAMA/NWWDA 101/I.S.2 (AAMA 101)

1.3 DEFINITIONS

A. Translucent Linear Glass: Translucent, channel shaped linear cast glass unit.

B. Basic System: Non-thermally broken aluminum frame with double glazed, translucent, horizontal or vertical linear glass with 2-3/8 inch deep channel flange.

1.4 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Manufacturer Responsible for designing system [units], including anchorage to structural system and necessary modifications to meet specified requirements and maintain visual design concepts.
   2. Drawings: Diagrammatic and intended to establish basic dimension of units, sight lines, and profiles of units.
   3. Provide concealed fastening wherever possible.
   4. Attachment Considerations: Account for site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening and fracturing connection between piping and units.
   5. Maximum Allowable Deflection: ¾".

B. Performance Requirements:
   1. Structural Requirements: MMA 101 and ASTM F588, horizontal or vertical linear applications.
   2. Seismic Requirements: MMA 501.4
      a. Basic System: Passed for use with NEHRP Groups I and II.
   3. Acoustical Requirement: AAMA 1801.

C. Glazing Requirements: ANSI Z97.1 and CPSC Title 16 Part 1201 (16 CFR 1201):

D. Interface With Adjacent Systems: Integrate design and connections with adjacent construction.

1.5 SUBMITTALS

A. Product Data: Submit following:
   1. Product data for translucent linear glass units, framing system, and glazing accessories.
   2. Include sample of warranty customized for this Project.

B. Shop Drawings:
   1. Submit for plan, elevation, connection details, installation details, and interface with adjacent construction.

C. Samples: Submit 12 inch length by full panel width in size illustrating full range of color and appearance.

D. Informational Submittals: Submit following packaged separately from other submittals:
   1. Test Reports: Submit following a certified test reports showing compliance with specified design requirements.
   2. Certifications specified in Quality Assurance article.
   3. Manufacturer's instructions.

E. Closeout Submittals: Submit following:
   1. Warranty.

1.6 QUALITY ASSURANCE

A. Single Source Responsibility: Furnish total system from one manufacturer.

1.7 WARRANTY

A. Special Warranty:
   1. Warrant installed units to be free from defects in material and workmanship for period of 10 years.
   2. Include coverage against crack, warp, pit, corrode, peel or blister under normal use and service.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Technical Glass Products.
   2. Bendheim Wall Systems, Inc.
   3. Glasfabrik Lamberts.

2.2 MATERIALS

A. Glass: ASTM C1036, Type 1, Class 1, Quality q3, rolled glass, channel shape, cast.
   1. Color: Standard Cast (Textured Surface).

2. Profile width: K32/60/7 - 13.03 in.

B. Aluminum: ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H16 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.

C. Vinyl: AAMA 303 external grade unplasticized PVC.

2.3 MANUFACTURED UNITS

A. Unitized System: Shop fabricated units of Basic System including unitized frame, integrally glazed. Fabricate and seal framed unites to meet specified performance requirements.

2.4 COMPONENTS

A. Translucent Linear Glass Units: Standard wireless glass units.

B. Framing:
1. Aluminum: Extruded units to profiles shown or as required to suit conditions indicated; integral pressure equalized offset drainage system.
   a. Minimum thickness of 0.125 inch for framing members and rails, 0.090 inch for sheets, and 0.050 inch for glazing stops and similar components.
2. Vinyl Frame Liner and Glass Support and Spacer: Extruded vinyl spacer engineered for snap-in application in standard aluminum frame to support and space glass units.

2.5 ACCESSORIES

A. Anchorage Devices: Manufacturer's standard formed or fabricated steel or aluminum assemblies or shapes, plates, bars or tubes.
1. Hot-dip galvanized steel assemblies after fabrication, ASTM A123, 0.05 kg [(2.0 ounce)] minimum coating.

B. Fasteners: Aluminum, non-magnetic stainless steel or other non-corrosive materials compatible with items being fastened.
1. Provide concealed fasteners wherever possible.
2. Exposed Locations: Phillips flathead screws with finish matching item fastened.
3. Concealed Locations: Manufacturer's standard fasteners.

C. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

D. Protective Coatings: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 30 mil thickness for each coat; or alkyd type zinc chromate primer, FS TT-P-645.

E. Perimeter Joint Sealant and Backer Rod: Silicone-Glazing.
1. Colors: Standard colors as selected by Architect from manufacturer's full range of colors.
2. Primer: If required by sealant manufacturer for applications show.
3. Sealant Backing, Bond Breaker Rod and Tape: Closed cell unless required by sealant manufacturer.
4. Acceptable Sealant Products and Manufacturers:
   a. 1199, Dow Corning.

b. 5731, Schnee Morehead.
c. Silglaze SCS 2801, General Electric.
d. Tremco Tremsil 600

2.6 FABRICATION

A. Coordination of Fabrication: Check actual frame or door openings required in construction work by accurate field measurements before fabrication.
   1. Fabricate units to withstand loads which will be applied when system is in place.

B. General: Provide each unit of framework continuous.
   1. Disassemble only to extent necessary for shipment and installation.
   2. Conceal fasteners where ever possible.
   3. Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or preformed separators which will prevent contact and corrosion.

C. Aluminum Framing: Provide members of size, shape and profile indicated, designed to provide for glazing from exterior or interior.
   1. Fabricate frame assemblies with mitered or coped joints.
   2. Maintain accurate relation of planes and angles, with hairline fit or contacting members.
   3. Provide spacers and other materials used internally or externally that are corrosive resistant and compatible with adjoining materials
   4. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and Technical Manual.

D. Welding: Comply with recommendations of American Welding Society (AWS).
   1. Use recommended electrodes and methods to avoid distortion and discoloration.
   2. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

2.7 FINISH

A. Clear Anodized: AA-M12C22A41, Architectural Glass I, etched, medium matte, clear anodic coating, 0.7 mil minimum thickness.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Manufacturer trained and approved.

3.2 EXAMINATION

A. Site Verification of Conditions: Do not commence work until satisfactory conditions, complying with manufacturers requirements, are provided.

3.3 INSTALLATION

A. Install units in accordance with manufacturer and approved Shop Drawings, plumb, level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with surrounding construction.

B. Erect framing, vinyl spacer, and glass in accordance with manufacturer's printing installation instructions. Seal glass units continuously on both sides of glass between frame and glass and between linear glass units.

C. Joint Sealant: Install perimeter joint sealant and backing materials between assemblies and adjacent construction.

D. Erection Tolerances:
   1. Limit Variations from Plumb and Level:
      a. 1/8 inch in 10 feet vertically.
      b. 1/8 inch in 20 feet horizontally.
   2. Limit Variations from Theoretical Locations: 1/4 inch for any member at any location.
   3. Limit Offsets in Theoretical End-To-End and Edge-To-Edge Alignment: 1/16 inch from flush surfaces not more than 2 inches apart or out-of-flush by more than 1/4 inch.

3.6 CLEANING

A. Cleaning: Clean as recommended by manufacturer. Do not use materials or methods which may damage finish or surrounding construction.

END OF SECTION 089550

SECTION 090160 - WOOD FLOORING RESTORATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes restoration of existing wood athletic flooring exposed to view and does not include flooring concealed by bleachers while in the closed position.

B. Related Sections:

1. Division 09 Section "Wood Flooring" for traditional solid-wood and engineered-wood, strip, plank, and parquet flooring.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood athletic flooring.

B. Shop Drawings: Include the following:
1. Layout, colors, widths, and dimensions of game lines and markers. Include locations of existing floor inserts for athletic equipment.
2. Photographs of existing game lines and center court artwork.

C. Maintenance Data: For wood athletic flooring and finish systems to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who has refinished wood athletic flooring installations 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.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in unopened cartons or bundles.

1.6 FIELD CONDITIONS

A. Refinish wood athletic flooring after other finishing operations, including painting, have been completed.

1.7 COORDINATION

A. Coordinate game line layout with existing floor inserts and gymnasium equipment.

PART 2 - PRODUCTS

2.1 FINISHES

A. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer, and MFMA approved.

1. Floor-Sealer Formulation: Pliable, penetrating type. MFMA Group 1, Sealers.
2. Finish-Coat Formulation: Formulated for gloss finish indicated and multicoat application.

   a. Type: MFMA Group 3, Gymnasium-Type Surface Finishes.

3. Game-Line and Marker Paint: Industrial enamel compatible with finish coats and recommended in writing by manufacturers of finish coats, and paint for this use.

PART 3 - EXECUTION

3.1 SANDING AND FINISHING

A. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."

B. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.

C. Finish: Apply seal and finish coats of finish system according to finish manufacturer's written instructions. Provide no fewer than four coats total and no fewer than three finish coats.
1. Game-Line and Marker Paint: Apply game-line and marker paint between final seal coat and first finish coat according to paint manufacturer's written instructions.

   a. Mask flooring at game lines and markers, and apply paint to produce lines and markers with sharp edges.
   b. Where game lines cross, break minor game line at intersection; do not overlap lines.
   c. Apply game lines and markers in widths and colors to re-create the existing layout, including center court artwork.

d. Apply finish coats after game-line, marker paint, and artwork is fully cured.

3.2 PROTECTION

A. Protect wood athletic flooring during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.

1. Do not cover flooring after finishing until finish reaches full cure and not before seven days after applying last finish coat.
2. Do not move heavy and sharp objects directly over flooring. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 090160

SECTION 092116 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes gypsum board shaft-wall assemblies for the following:

1. Shaft-wall enclosures.
2. Chase enclosures.
3. Horizontal enclosures.

B. Related Sections include the following:
1. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board shaft-wall assemblies.

1.3 SUBMITTALS

A. Product Data: For each gypsum board shaft-wall assembly indicated.

1.4 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Provide materials and construction identical to those of assemblies with fire-resistance ratings determined according to ASTM E 119 by a testing and inspecting agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

C. Stack panels flat on leveled supports off floor or slab to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Gypsum Company.
2. BPB America Inc.
3. G-P Gypsum.
4. Lafarge North America Inc.
5. National Gypsum Company.
6. PABCO Gypsum.
7. Temple-Inland Forest Products Corporation.
8. USG Corporation.

2.2 GYPSUM BOARD SHAFT-WALL ASSEMBLIES, GENERAL

A. Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.

1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

2.3 PANEL PRODUCTS

A. Gypsum Liner Panels: Comply with ASTM C 442/C 442M and ASTM E 84 for Class A finishes.

1. Type X: Manufacturer's proprietary liner panels with moisture-resistant paper faces.

a. Core: 1 inch thick.
b. Long Edges: Double bevel.

B. Gypsum Board: As specified in Division 09 Section "Gypsum Board."

C. Cementitious Backer Units: As specified in Division 09 Section "Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

A. Framing Members: Comply with ASTM C 754 for conditions indicated.

B. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.

1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized, unless otherwise indicated.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 09 Section "Gypsum Board" that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.

C. Gypsum Board Joint-Treatment Materials: As specified in Division 09 Section "Gypsum Board."

D. Laminating Adhesive: Adhesive or joint compound recommended by manufacturer for directly adhering gypsum face-layer panels and gypsum-base face-layer panels to backing-layer panels in multilayer construction.

E. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

F. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. 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 testing agency.
2. 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 testing agency.

G. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing), produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

H. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

2.6 GYPSUM BOARD SHAFT-WALL ASSEMBLIES

A. Fire-Resistance Rating: As indicated.

B. STC Rating: As indicated.

C. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.

1. Depth: As indicated.
2. Minimum Base-Metal Thickness: 0.0329 inch.

D. Runner Tracks: Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, but at least 2 inches long and in depth matching studs.

1. Minimum Base-Metal Thickness: Matching steel studs.

E. Insulation: Sound attenuation blankets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:

1. ASTM C 754 for installing steel framing except comply with framing spacing indicated.
2. Division 09 Section "Gypsum Board" for applying and finishing panels.
3. Division 09 Section "Tiling" for cementitious backer units.

B. Do not bridge architectural or building expansion joints with shaft-wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.

D. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect, while maintaining fire-resistance rating of gypsum board shaft-wall assemblies.

G. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with ASTM C 919 requirements or with manufacturer's written instructions, whichever are more stringent.

H. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092116

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

B. Related Sections include the following:

1. Division 05 Section "Cold-Formed Metal Framing" for exterior and interior horizontal load-bearing wall studs.
2. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall joint systems installed with non-load-bearing steel framing.
3. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for non-load-bearing metal shaft-wall framing, gypsum panels, and other components of shaft-wall assemblies.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

B. Hanger Attachments to Concrete:

1. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.

1. Depth: 2-1/2 inches.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
2. Steel Studs: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0312 inch.
b. Depth: As indicated on Drawings.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

a. Minimum Base Metal Thickness: 0.0179 inch.

F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; 660-C Drywall Furring System.
c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0296 inch.
2. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Provide the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0296 inch.

D. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0179 inch.
2. Depth: 7/8 inch.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:
1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:

a. Single-Layer Application: 16 inches o.c., unless otherwise indicated.
b. Multilayer Application: 24 inches o.c., unless otherwise indicated.
c. Tile backing panels: 16 inches o.c., unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb, unless otherwise indicated.

b. Where control joints are indicated, install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

D. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.
2. Tile backing panels.

B. Related Sections include the following:

1. Division 05 Section "Cold-Formed Metal Framing" for steel framing that supports gypsum board.
2. Division 06 Section "Rough Carpentry" for wood framing and furring that supports gypsum board.
3. Division 07 Section "Thermal Insulation" for insulation installed in assemblies that incorporate gypsum board.
4. Division 07 Section "Fire-Resistive Joint Systems" for head-of-wall assemblies that incorporate gypsum board.
5. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board.
6. Division 09 Section "Gypsum Board Shaft-Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
7. Division 09 painting Sections for primers applied to gypsum board surfaces.

1.3 SUBMITTALS

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

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.5 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent. Comply with ASTM E 84, for Class A finishes.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Gypsum Co.
b. BPB America Inc.
c. G-P Gypsum.
d. Lafarge North America Inc.

e. National Gypsum Company.
f. PABCO Gypsum.
g. Temple.
h. USG Corporation.

B. Type X:

1. Thickness: 5/8 inch.
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

C. Flexible Type: Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Thickness: 1/4 inch.
2. Long Edges: Tapered.

D. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

2.3 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Custom Building Products; Wonderboard.
b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
c. USG Corporation; DUROCK Cement Board.

2. Thickness: 5/8 inch.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:

a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound.
c. L-Bead: L-shaped; exposed long flange receives joint compound.
d. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Fry Reglet Corp.
   b. Gordon, Inc.
   c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

   1. Interior Gypsum Wallboard: Paper.
   2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

      a. Use setting-type compound for installing paper-faced metal trim accessories.

   3. Fill Coat: For second coat, use drying-type, all-purpose compound.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:
   1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I, (blankets without membrane facing), Class A, produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 3/8 - to 1/2-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
1. Type X: Vertical surfaces, unless otherwise indicated.
2. Flexible Type: Apply double layer at radiused locations.
3. Ceiling Type: Ceiling surfaces.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface. Provide framing supports at 6" o.c..

3.4 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. U-Bead: Use at exposed panel edges.
4. Curved-Edge Cornerbead: Use at curved openings.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, temporary partitions not used for temporary offices, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view, including temporary office walls, unless otherwise indicated.

   a. Primer and its application to surfaces are specified in other Division 09 Sections.

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Ceramic mosaic tile.
2. Glazed wall tile.
3. Stone thresholds installed as part of tile installations.
4. Waterproof membrane for thin-set tile installations.
5. Crack-suppression membrane for thin-set tile installations.

B. Related Sections include the following:

1. Division 02 Section "Selective Structure Demolition" for removing existing finishes.
2. Division 03 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
3. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
4. Division 09 Section "Gypsum Board" for cementitious backer units.
5. Division 09 Section “Resinous Matrix Terrazzo Flooring” for terrazzo tile.

1.3 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 SUBMITTALS

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

B. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.

C. Samples for Verification:

1. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
2. Stone thresholds in 6-inch lengths.
3. Metal edge strips in 6-inch lengths.

1.5 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile from one source or producer.

1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproofing.
3. Metal edge strips.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquid latexes in unopened containers and protected from freezing.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 2 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
3. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. As selected by Architect from manufacturer's full range.

D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.

2.3 TILE PRODUCTS

A. Manufacturers:

1. American Marazzi Tile, Inc.
2. American Olean; Div. of Dal-Tile International Corp.
3. Buchtal Corporation USA.
4. Cerim-Floor Gres Ceramiche.
5. Crossville Ceramics Company, L.P.
6. Daltile; Div. of Dal-Tile International Inc.
7. Florida Tile Industries, Inc.
8. GranitiFiandre.
9. Interceramic.
10. KPT, Inc.
11. Laufen USA.
12. Lone Star Ceramics Company.
13. Metropolitan Ceramics.
14. Monarch Tile, Inc.
15. Porcelanite, Inc.
16. Seneca Tiles, Inc.
17. Summitville Tiles, Inc.
18. United States Ceramic Tile Company.
19. Winburn Tile Manufacturing Company.

B. Unglazed Ceramic Mosaic Tile: Factory-mounted flat tile as follows:

1. Composition: Porcelain.
2. Surface: Smooth, without abrasive admixture.
3. Module Size: 2 by 2 inches.
4. Nominal Thickness: 1/4 inch.
5. Face: Plain with cushion edges.

C. Glazed Ceramic Mosaic Tile: Factory-mounted flat tile as follows:

1. Composition: Porcelain.
2. Module Size: 2 by 2 inches.
3. Thickness: 1/4 inch.
4. Face: Plain with cushion edges.

D. Ceramic Mosaic Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:

1. Base Cove: Cove, module size 2 by 1 inch.
2. Base Cap for Thin-Set Mortar Installations: Surface bullnose, module size 2 by 2 inches.
3. External Corners for Thin-Set Mortar Installations: Surface bullnose, module size 2 by 2 inches.
4. Internal Corners: Cove, module size 2 by 1 inch.

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

B. Granite Thresholds: ASTM C 615, with honed finish.

1. Description: Uniform, fine-grained, gray stone without veining.

2.5 WATERPROOFING FOR THIN-SET TILE INSTALLATIONS

A. General: Manufacturer's standard product that complies with ANSI A118.10.

B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement.

1. Products:

a. Custom Building Products; Trowel & Seal Waterproofing and Anti-Fracture Membrane.
b. LATICRETE International Inc.; Laticrete 9235 Waterproof Membrane.
c. MAPEI Corporation; PRP M19.
d. Summitville Tiles, Inc.; S-9000.

2.6 SETTING AND GROUTING MATERIALS

A. Manufacturers:

1. Atlas Minerals & Chemicals, Inc.
2. Boiardi Products Corporation.
3. Bonsal, W. R., Company.
4. Bostik.
5. C-Cure.
6. Custom Building Products.
7. DAP, Inc.
8. Jamo Inc.
9. LATICRETE International Inc.
10. MAPEI Corporation.
11. Southern Grouts & Mortars, Inc.
12. Summitville Tiles, Inc.
13. TEC Specialty Products Inc.

B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:
1. Prepackaged dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive.

a. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.

C. Polymer-Modified Tile Grout: ANSI A118.7, color as indicated.

1. Polymer Type: Either ethylene vinyl acetate, in dry, redispersible form, prepackaged with other dry ingredients, or acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.

a. Unsanded grout mixture for joints 1/8 inch and narrower.

2.7 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 07 Section "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, 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.

3.3 INSTALLATION, GENERAL

A. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. 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, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

3.4 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.

B. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

3.6 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

3.7 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement 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 only cleaners recommended by tile and grout manufacturers and 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.

B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

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 and rinse neutral cleaner from tile surfaces.

3.8 TILE INSTALLATION SCHEDULE

A. Ceramic Tile Floor Installation: Where interior floor installations of this designation are indicated, comply with the following:

1. Installation Method for Concrete Slabs on Grade: TCA F113.
2. Installation Method for Concrete Slabs above Grade: TCA F122.
3. Setting Bed and Grout: ANSI A118.4 and ANSI A118.6 with the following mortar and grout:

   a. Latex-portland cement mortar.
   b. Unsanded latex-portland cement grout.

B. Ceramic Tile Wall Installations: Where interior wall installations of this designation are indicated, comply with the following:

1 Installation Method: TCA W243.
2 Setting Bed and Grout: ANSI A108.5 with the following mortar and grout:

   a. Latex-portland cement mortar.
   b. Unsanded latex-portland cement grout.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL AND WIRE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes acoustical panels and exposed suspension systems for ceilings.

B. Related Sections include the following:
   1. Division 09 Section "Linear Metal Ceilings."

1.3 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

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

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

   1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

D. Certifications: Manufacturer's certifications that the system complies with specified requirements.
   1. For Seismic Performance: International Code Council Evaluation Report, ESR-1308.

E. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
2. Suspension System: Obtain each type through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class B materials as determined by testing identical products per ASTM E 84:

a. Smoke-Developed Index: 450 or less.

C. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
1. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads" for Seismic Category C.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 1.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING (ACT-1)

A. Products: Subject to compliance with requirements, provide products from one of the following:

1. Armstrong World Industries, Inc.
2. BPB USA.
3. Chicago Metallic Corporation.
4. Ecophon CertainTeed, Inc.
5. USG Interiors, Inc.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted.
2. Pattern: E (lightly textured).

C. Color: White.

D. LR: Not less than 0.90.

E. NRC: Not less than 0.70.

F. CAC: Not less than 35.

G. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension system members.

H. Thickness: 3/4 inch.

I. Modular Size: As indicated on Drawings.

2.3 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING (ACT-2)

A. Products: Subject to compliance with requirements, provide products from one of the following:

1. Armstrong World Industries, Inc.
2. BPB USA.
3. Chicago Metallic Corporation.
4. Ecophon CertainTeed, Inc.
5. USG Interiors, Inc.

B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
1. Type and Form: Type XII, glass-fiber base with membrane-faced overlay; Form 2.
2. Pattern: E (lightly textured).

C. Color: White.

D. LR: Not less than 0.90.

E. NRC: Not less than 0.95.

F. CAC: Not less than 25.

G. AC: Not less than 190.

H. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension system members.

I. Thickness: 1 inch.

J. Modular Size: As indicated on Drawings.

2.4 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING (ACT-3)

A. Products: Provide products complying with the following:

B. Classification: Provide panels complying with ASTM E 1264 for type as follows:
1. Type: Type XX, open-cell wire.

C. Color: Chrome.

D. Construction: 1/8" inch welded steel wire, 2" x 2" cells.

E. Modular Size: As indicated on Drawings.

2.5 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Power-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 per ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

E. Beam End Retaining Clips: Manufacturer's standard hot-dipped galvanized clip used to join main beam or cross tee to wall molding.

2.6 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING ACT-1 & ACT-2

A. Products: Subject to compliance with requirements, provide one of the following:

1. Armstrong World Industries, Inc.
2. BPB USA.
3. Chicago Metallic Corporation.
4. Ecophon CertainTeed, Inc.
5. USG Interiors, Inc.

B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip

galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 9/16-inch- wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.
2. Face Design: Flat, flush.
3. Cap Material: Steel or aluminum cold-rolled sheet.
4. Cap Finish: Painted white.

2.7 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING ACT-3

A. Basis-of-Design Product: Subject to compliance with requirements, provide USG Interiors, Inc.; Donn Brand Gridware Suspension System or a comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. BPB USA.
3. Chicago Metallic Corporation.
4. Ecophon CertainTeed, Inc.

B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch- wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. Face Design: Flat, flush.
3. Cap Material: Steel or aluminum cold-rolled sheet.
4. Cap Finish: Painted Silver Satin.

2.8 METAL EDGE MOLDINGS AND TRIM

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.
2. BPB USA.
3. Chicago Metallic Corporation.
4. Fry Reglet Corporation.
5. Gordon, Inc.
6. USG Interiors, Inc.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.9 PERIMETER TRIM

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries; Axiom Classic Perimeter Trim or a comparable product by one of the following:
1. BPB USA.
2. Chicago Metallic Corporation.
3. Fry Reglet Corporation.
4. Gordon, Inc.
5. USG Interiors, Inc.

B. Extruded, Aluminum Trim: Type and profile indicated; extruded from aluminum and of same finish and color as that used for exposed flanges of suspension system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated, unless otherwise indicated.

2.10 ALUMINUM CLOSURE

A. Roll-Formed, Sheet-Metal Closure: Profile indicated; formed from aluminum of same finish and color as that used for exposed flanges of suspension system runners.
1. Thickness: 0.032 inch

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 095423 - LINEAR METAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes strip linear metal pans and suspension systems for ceilings.

B. Related Sections:

1. Division 09 Section "Acoustical Panel Ceilings" for ceilings consisting of mineral-base and glass-fiber-base acoustical panels and exposed suspension systems.
2. Divisions 21, 23, and 26 Sections for light fixtures, sprinklers, and air-distribution components.

1.3 DEFINITIONS

A. LR: Light Reflectance coefficient.

B. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

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

B. Samples for Initial Selection: For components with factory-applied color and other decorative finishes.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below:

1. Linear Metal Pan: Set of 12-inch- long Samples of each type and color and a 12-inch-long spliced section.
2. Suspension System Members: 12-inch- long Sample of each type.
3. Exposed Molding and Trim: Set of 12-inch- long Samples of each type, finish, and color.
4. Filler Strips: Set of 12-inch- long Samples of each type, finish, and color.
5. Sound Absorber: 12 inches long.
6. End Cap: Full size.

D. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory with the experience and capability to conduct the testing indicated. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations: Obtain each set of linear metal pans and suspension systems from one source with resources to provide products of consistent quality in appearance, physical properties, and performance.

C. Surface-Burning Characteristics: Complying with ASTM E 1264 for Class B materials, as determined by testing identical products according to ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

D. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
   1. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads" for Seismic Category C.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver linear metal pans, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Handle linear metal pans, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install linear metal ceilings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.8 COORDINATION

A. Coordinate layout and installation of linear metal pans and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Linear Metal Ceiling Components: Quantity of each pan, carrier, accessory, and exposed molding and trim equal to 2 percent of quantity installed.

PART 2 - PRODUCTS

2.1 LINEAR METAL CEILING PANS

A. Acoustical Metal Pan Standard: Provide manufacturer's standard linear metal pans of configuration indicated that comply with ASTM E 1264 classifications as designated by types unless otherwise indicated.

B. Sheet Metal Characteristics: For metal components exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, roughness, stains, or discolorations.

1. Steel Sheet: Commercial-quality, cold-rolled, carbon-steel sheet; stretcher leveled; with protective coating complying with ASTM C 635.

a. Painted Finishes: Electrolytic zinc-coated steel complying with ASTM A 591/A 591M, 40Z coating; surface treatment as recommended by finish manufacturer for type of use and finish indicated.

C. Moldings and Trim: Provide manufacturer's standard moldings and trim for exposed members, and as indicated or required, for edges, at changes in ceiling height, and for other conditions; of same metal and finish as linear metal ceiling pans.

2.2 METAL SUSPENSION SYSTEMS

A. Metal Suspension Systems Standard: Provide ceiling manufacturer's standard metal suspension systems of types and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Suspension Systems: Provide systems complete with carriers, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, retention clips, load-resisting struts, fixture adapters, and other suspension components required to support ceiling units and other ceiling-supported construction.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.

D. Wire Hangers, Braces, and Ties: Provide wire complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

2. Size: Select wire diameter so its stress at 3 times the hanger design load indicated in ASTM C 635, Table 1, Direct Hung will be less than yield stress of wire, but provide not less than 0.106-inch- diameter wire.

E. Carriers: Factory finished with matte-black baked finish.
1. Main Carriers: Steel, not less than 0.0209-inch nominal thickness, cold-rolled sheet, with factory-applied protective coating, complying with ASTM C 635.

F. Carrier Splices: Same metal, profile, and finish as indicated for carriers.

G. Stabilizer Channels, Tees, and Bars: Manufacturer's standard components for stabilizing main carriers at regular intervals and at light fixtures, air-distribution equipment, access doors, and other equipment; spaced as standard with manufacturer for use indicated; and factory finished with matte-black baked finish.

2.3 STEEL PANS AND SUSPENSION SYSTEM FOR LINEAR METAL CEILING

A. Steel Pans and Suspension System:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Chicago Metallic; Intaline or a comparable product by one of the following:

a. Ceilings Plus.
b. Hunter Douglas Architectural Products, Inc.
c. USG Interiors, Inc.

B. Panel Thickness: Not less than 0.020 inch.

C. Panel Edge Detail: Round.

D. Panel Depth: 8 inches deep.

E. Pan Face Finish: Painted black.

F. End Cap, Finish of Exposed Portions: Matte black.

G. Suspension-System Main-Carrier Material: Manufacturer's standard material and protective finish.

2.4 ACCESSORIES

A. Access Panels: For access at locations indicated, provide door hinge assembly, retainer clip, and retainer bar, assembled with ceiling panels and carrier sections into access doors of required size, permitting upward or downward opening.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 GALVANIZED-STEEL SHEET FINISHES

A. Color-Coated Finish: Manufacturer's standard powder-coat baked paint finish complying with coating manufacturer's written instructions for surface preparation, pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which linear metal ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of linear metal ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of linear metal pans to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width or -length pans at borders, and comply with layout shown on reflected ceiling plans and Coordination Drawings.

3.3 INSTALLATION

A. Comply with ASTM C 636 and seismic requirement indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate to which hangers are attached and for type of hanger involved.
5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Install suspension system carriers so they are aligned and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

D. Cut linear metal pans for accurate fit at borders and at interruptions and penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.

E. Install linear metal pans in coordination with suspension system and exposed moldings and trim.

1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.
3. Install pans with butt joints using internal alignment sleeves and in the following joint configuration:

   a. Aligned.

3.4 CLEANING

A. Clean exposed surfaces of linear metal ceilings, including trim and edge moldings after removing strippable, temporary protective covering if any. Comply with manufacturer's written instructions for stripping of temporary protective covering, cleaning, and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

END OF SECTION 095423

SECTION 095429 - WOOD PANEL CEILING CANOPIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

A. Section Includes:
   1. Wood veneer ceiling canopies.
   2. Suspension system.
   3. Cable hangers and fasteners.
B. Related Sections:
   1. Section 064023 - Interior Architectural Woodwork
   2. Section 095113 - Acoustical Panel and Wire Ceilings
   3. Division 26 Sections - Electrical Work

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   2. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot- Dip Process.
   3. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   6. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   7. ASTM E 580 Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint.

B. International Code Council Evaluation Service
   AC156 - Acceptance Criteria for Seismic Qualification Testing of Non-structural Components

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of ceiling unit and suspension system required.

B. Installation Instructions: Submit manufacturer's installation instructions as referenced in Part 3, Installation.
C. Samples: Minimum 8-3/8 inch x 11-1/2 inch samples of specified panel; 8 inch long samples of exposed suspension system.
D. Shop Drawings: Submit manufacturer's shop drawings as referenced in Part 3, Installation
E. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide ceiling panel units and grid components by a single manufacturer.
B. Fire Performance Characteristics: Identify ceiling components with appropriate markings of applicable testing and inspecting organization.
    1. Surface Burning Characteristics: Tested per ASTM E 84:
        a. Flame Spread: 25 or less
C. Woodworking standards: Manufacturer must comply with specified provisions of Architectural Woodworking Institute quality standards.
D. Seismic Performance: System seismic performance verified through full-scale testing in accordance with ICC-ES – AC-156 Acceptance Criteria for Seismic Qualification Testing of Non-Structural components.
E. Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to light fixtures, electrical systems, and sprinklers.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store ceiling components in a dry interior location in their cartons prior to installation to avoid damage. Store cartons in a flat, horizontal position. The protectors between the panels should not be removed until installation.
B. Do not store in unconditioned spaces with humidity greater than 55 percent or lower than 25 percent relative humidity and temperatures lower than 50 degrees F or greater than 86 degrees F. Panels must not be exposed to extreme temperatures, for example, close to a heating source or near a window with direct sunlight.
C. Handle ceiling units carefully to avoid chipped edges or damage to units in any way.

1.7 PROJECT CONDITIONS

A. Wood veneer ceiling materials should be permitted to reach room temperature and have a stabilized moisture content for a minimum of 72 hours before installation. (Remove plastic wrap to allow panels to climatize).
B. The wood veneer panels should not be installed in spaces where the temperature or humidity conditions vary greatly from the temperatures and conditions that will be normal in the occupied space.

1.8 WARRANTY

A. Wood Veneer Ceiling Canopy System: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to:

1. Defects in materials or factory workmanship.

B. Warranty Period:
   1. Wood Veneer Ceiling Canopy System: Standard - One (1) year from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Product: The design for the wood panel ceiling canopy is based on the product indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   1. WoodCeilings, Inc.
   2. Rulon Company.
   3. Architectural Components Group, Inc.

B. Products: Basis-of-Design
   1. WoodWorks Custom Canopy System, Armstrong World Industries.

2.2.0 SUSPENSION SYSTEM

A. Suspension System: Type-1
B. Product: Armstrong WoodWorks Custom Canopy Suspension System
C. Components:
   1. H-bar suspension component.
      A. Made of commercial-quality extruded aluminum and radiused to the curve of the wood panel canopy and suspended from U-profile carrying channels.
   2. Hanger wire.
      A. Galvanized carbon steel per ASTM A641, soft temper, prestretched, with a yield stress load of at least three (3) times design load, but not less than 12 gage (0.106") diameter.

2.2.0 WOOD VENEER CEILING CANOPY UNITS

A. Wood Panels: Type WP-1
   1. Type: WoodWorks Wood Veneer Ceiling Panel Canopy
   2. Surface Texture: Smooth
   3. Substrate: Duraflake FR, Class A rated fire-retardant particleboard.
   4. Size: According to architectural drawings
   5. Surface Finish:
      a. Grade: A
      b. Veneer Species: Select White Maple
      c. Cut: Plain Sliced

6. Perforations: Unperforated.
8. Edge Banding and Trim: Panel edges finished to match panel surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out.

3.2 PREPARATION

A. Examine construction and conditions under which the system will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

A. Install suspension system and panels in compliance with ASTM C636, with the authorities having jurisdiction, and in accordance with the manufacturer's shop drawings and installation instructions.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.
B. Clean exposed surfaces of ceilings panels, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095429

SECTION 096400 - WOOD FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes field-finished wood flooring.

B. Related Sections include the following:
   1. Division 06 Section "Rough Carpentry" for wood decking.

1.3 SUBMITTALS

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

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and finishes available for wood flooring.

C. Samples for Verification: For each type of wood flooring and accessory, with stain color and finish required, approximately 12 inches long and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.

1.4 QUALITY ASSURANCE

A. Source Limitations: For field-finished wood flooring, obtain each species, grade, and cut of wood from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. Maple Flooring: Comply with applicable MFMA grading rules for species, grade, and cut.

C. Softwood flooring: Comply with WCLIB No. 17 grading rules for species, grade, and cut.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver wood flooring materials in unopened cartons or bundles.

B. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.

C. Store wood flooring materials in a dry, warm, ventilated, weathertight location.

1.6 PROJECT CONDITIONS

A. Conditioning period begins not less than seven days before wood flooring installation, is continuous through installation, and continues not less than seven days after wood flooring installation.

1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants in spaces to receive wood flooring during the conditioning period.
2. Wood Flooring Conditioning: Move wood flooring into spaces where it will be installed, no later than the beginning of the conditioning period.

a. Do not install flooring until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.
b. Open sealed packages to allow wood flooring to acclimatize immediately on moving flooring into spaces in which it will be installed.

B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.

PART 2 - PRODUCTS

2.1 FIELD-FINISHED WOOD FLOORING

A. Solid-Wood, Strip Flooring: Kiln dried to 6 to 9 percent maximum moisture content, tongue and groove and end matched, and with backs channeled (kerfed) for stress relief.

1. Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Aged Woods; Yesteryear Floorworks Company.
b. Bruce; Division of Armstrong.
c. Carlisle Restoration Lumber.
d. Heartpine Lumber and Millwork.
e. International Hardwood Flooring, Inc.
f. Kentucky Wood Floors.
g. Memphis Hardwood Flooring Co.; Chicksaw Hardwood Flooring.
h. Miller and Company, Inc.; Cahaba Brand Hardwood Flooring.
i. Oregon Lumber Company.
j. Sandy Pond Hardwoods, Inc.
k. World Flooring International.

2. Species and Grade: MFMA-RL First Grade hard maple.
3. Cut: Plain sawn.
4. Thickness: 3/4 inch.

5. Face Width: 2-1/4 inches.
6. Lengths: Random-length strips complying with applicable grading rules.

B. Solid Wood-Block Flooring: Air-seasoned or kiln dried, meeting ASTM D1031-81.

1. Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   a. Kaswell & Co., Inc
   b. Jennison-Wright Co.
   c. Delta Industries, Inc

2. Species: Southern Yellow Pine.
3. Thickness: 1-1/2 inch (nominal).
4. Face Size: 4" x 8" (nominal).
5. Preservative Treatment: Penetrating, water-repellent wood preservative that protects against mold, mildew, staining, and decay fungi.

C. Urethane Finish System: Complete solvent-based, oil-modified system of compatible components that is recommended by flooring manufacturer for application indicated.

1. Finish Coats: Formulated for multicoat application on wood flooring.

2.2 ACCESSORY MATERIALS

A. Wood Sleepers and Subfloor: As specified in Division 06 Section "Rough Carpentry."

B. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 8.0 mils thick.

C. Asphalt-Saturated Felt: ASTM D 4869, Type II.

D. Wood Flooring Adhesive: Mastic recommended by flooring and adhesive manufacturers for application indicated.

E. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood flooring manufacturer.

F. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines: Wood Flooring."

G. Cork Expansion Strip: Composition cork strip.

H. Wood Filler: Compatible with finish system components and recommended by manufacturers for use indicated. If required to match approved Samples, provide pigmented filler.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood flooring.

1. Verify that substrates comply with tolerances and other requirements specified in other Sections.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Concrete Moisture Testing: Perform anhydrous calcium chloride test per ASTM F 1869, as follows:

1. Perform not less than 2 tests in each installation area with test areas evenly spaced in installation area.
2. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. in 24 hours.
3. Perform alkalinity and adhesion tests recommended in writing by manufacturer or, if none, according to NWFA's "Installation Guidelines: Wood Flooring." Proceed with installation only after substrates pass testing.

3.2 PREPARATION

A. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.

1. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

B. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."

B. Wood Sleepers and Subfloor: Install according to requirements in Division 06 Section "Rough Carpentry."

C. Provide expansion space at walls and other obstructions and terminations of flooring of not less than 3/4 inch.

D. Asphalt-Saturated Felt: Where strip or plank flooring is nailed to solid-wood subfloor, install flooring over a layer of asphalt-saturated felt.

E. Vapor Retarder:

1. Wood Flooring Nailed to Sleepers over Concrete: Install flooring over a layer of polyethylene sheet with edges overlapped over sleepers and turned up behind baseboards.

F. Solid-Wood, Strip Flooring: Blind nail or staple flooring to substrate.

G. Solid Wood-Block Flooring: Install blocks in a running bond, set in adhesive in accordance with manufacturers recommendations.

3.4 FIELD FINISHING OF STRIP FLOORING

A. Machine-sand flooring to remove offsets, ridges, cups, and sanding-machine marks that would be noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish.

1. Comply with applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."

B. Fill and repair wood flooring seams and defects.

C. Apply floor-finish materials in number of coats recommended by finish manufacturer for application indicated, but not less than one coat of floor sealer and three finish coats.

D. Do not cover wood flooring after finishing until finish reaches full cure, and not before seven days after applying last finish coat.

3.5 FIELD FINISHING OF BLOCK FLOORING

A. Machine-sand flooring to remove offsets, ridges, cups, and sanding-machine marks that would be noticeable after finishing.

1. Comply with applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."

B. Fill and repair wood flooring seams and defects, filling all voids and removing all excess filler from the surface

C. Machine-sand flooring again, after which all surplus sanding dust and filler particles shall be removed from the surface.

D. Apply floor-finish materials in number of coats recommended by finish manufacturer for application indicated, but not less than one coat of floor sealer and three finish coats. Prior to the final coat, the entire floor shall be machine sanded using #1 sandpaper, then carefully cleaned to remove all dust and other particles from the surface.

E. Do not cover wood flooring after finishing until finish reaches full cure.

3.6 PROTECTION

A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.

1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096400

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient stair accessories.
3. Resilient molding accessories.

B. Related Sections:
1. Division 09 Section "Resilient Tile Flooring" for resilient floor tile.

1.3 SUBMITTALS

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

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 60 deg F or more than 90 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 90 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 5 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allstate Rubber Corp.; Stoler Industries.
b. Armstrong World Industries, Inc.
c. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
d. Endura Rubber Flooring; Division of Burke Industries, Inc.
e. Estrie Products International; American Biltrite (Canada) Ltd.
f. Flexco, Inc.
g. Mondo Rubber International, Inc.
h. Musson, R. C. Rubber Co.
i. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
j. PRF USA, Inc.
k. Roppe Corporation, USA.
l. VPI, LLC; Floor Products Division.

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous) or Group II (layered).
3. Style: Cove (base with toe) at resilient flooring, straight (flat or toeless) at carpet.

C. Minimum Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Preformed.

G. Inside Corners: Job formed or preformed.

H. Finish: As selected by Architect from manufacturer's full range.

I. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 RESILIENT STAIR ACCESSORIES

A. Resilient Stair Treads:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
b. Endura Rubber Flooring; Division of Burke Industries, Inc.
c. Estrie Products International; American Biltrite (Canada) Ltd.
d. Flexco, Inc.
e. Mondo Rubber International, Inc.
f. Musson, R. C. Rubber Co.
g. Nora Rubber Flooring; Freudenberg Building Systems, Inc.
h. PRF USA, Inc.
i. R.C.A. Rubber Company (The).
j. Roppe Corporation, USA.
k. VPI, LLC; Floor Products Division.

B. Resilient Stair Treads Standard: ASTM F 2169.

1. Material Requirement: Type TP (rubber, thermoplastic).
2. Surface Design:

a. Class 1, Smooth (flat).

3. Manufacturing Method: Group 1, tread with embedded abrasive strips.

C. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.

D. Thickness: 1/4 inch and tapered to back edge.

E. Size: Lengths and depths to fit each stair tread in one piece.

F. Risers: Smooth, flat, toeless, height and length to cover risers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

1. Thickness: 0.125 inch.

G. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 RESILIENT MOLDING ACCESSORIES

A. Resilient Molding Accessories:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
b. Flexco, Inc.
c. R.C.A. Rubber Company (The).
d. Roppe Corporation, USA.
e. VPI, LLC; Floor Products Division.

B. Description: Carpet edge for glue-down applications, reducer strip for resilient floor covering, and joiner for tile and carpet.

C. Material: Rubber.

D. Profile and Dimensions: As indicated.

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

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.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Rubber floor tile.
   2. Vinyl composition floor tile.

B. Related Sections:
   1. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.3 SUBMITTALS

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

B. Samples for Initial Selection: For each type of floor tile indicated.

C. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.5 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish 1 box for every 100 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 RUBBER FLOOR TILE

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:

1. Burke Mercer Flooring Products, Division of Burke Industries Inc.
2. Endura Rubber Flooring, a division of Burke Industries Inc.
3. Flexco.
4. Johnsonite.
5. Mondo Rubber International, Inc.
6. Nora Rubber Flooring, Freudenberg Building Systems, Inc.
7. Roppe Corporation, USA.

B. Tile Standard: ASTM F 1344, Class I-A, homogeneous rubber tile, solid color.

C. Hardness: Manufacturer's standard hardness.

D. Wearing Surface: Smooth.

E. Thickness: 0.125 inch.

F. Size: 12 by 12 inches.

G. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 VINYL COMPOSITION FLOOR TILE

A. Products: Subject to compliance with requirements, provide one of the following:
1. Armstrong World Industries, Inc.; Standard Excelon Imperial Texture.
2. Congoleum Corporation; Alternatives.
3. Tarkett, Inc.; Expressions.

B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

F. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.

   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

   1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

   1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply three coat(s).

E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096566 - RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Rubber floor tile.

B. Related Sections include the following:

   1. Division 09 Sections for resilient floor coverings installed in areas other than athletic-activity spaces.
   2. Division 09 Section "Resilient Base and Accessories" for wall base and accessories installed with floor coverings.

1.3 SUBMITTALS

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

B. Samples for Initial Selection: For each type of floor covering indicated.

C. Maintenance Data: For floor coverings to include in maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storing.

B. Store materials to prevent deterioration. Store tiles on flat surfaces.

1.5 PROJECT CONDITIONS

A. Adhesively Applied Products:

   1. Maintain temperatures within range recommended in writing by manufacturer, but not less than 65 deg F or more than 95 deg F, in spaces to receive floor coverings during the following time periods:

a. 48 hours before installation, unless longer period is recommended in writing by manufacturer.
b. During installation.
c. 48 hours after installation, unless longer period is recommended in writing by manufacturer.

2. After postinstallation period, maintain temperatures within range recommended in writing by manufacturer, but not less than 55 deg F or more than 95 deg F.
3. Close spaces to traffic during floor covering installation.
4. Close spaces to traffic for 48 hours after floor covering installation, unless manufacturer recommends longer period in writing.

B. Install floor coverings after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish no fewer than 1 box for each 50 boxes or fraction thereof, of each type, color, pattern, and size of floor tile installed.

PART 2 - PRODUCTS

2.1 RUBBER FLOOR TILE

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Products: Subject to compliance with requirements, provide one of the following:

1. American Floor Products Company, Inc.
2. Connor Sports Flooring, Inc.
3. Dodge-Regupol, Inc.
4. Freudenberg Building Systems Inc., Nora Rubber Flooring.
5. Johnsonite.
6. Mondo.
7. R. C. Musson Rubber Co.
8. Robbins Sports Surfaces.
9. Surface America Incorporated.
10. Tuflex Rubber Products, Inc.

C. Material: Recycled-rubber compound.

D. Installation Method: Fully Adhered.

E. Traffic-Surface Texture: Smooth.

F. Size: Manufacturer's standard-size square tile.

G. Thickness: 3/8 inch.

H. Weight: Not less than 2 lbs per sq. ft.

I. Color and Pattern: As selected by Architect from manufacturer's full range.

J. Accessories:

1. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by floor covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

C. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

D. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation, unless manufacturer recommends a longer period in writing.

1. Do not install floor coverings until they are same temperature as space where they are to be installed.

E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 FLOOR COVERING INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions.

B. Scribe, cut, and fit floor coverings to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.

C. Extend floor coverings into toe spaces, door reveals, closets, and similar openings, unless otherwise indicated.

D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on floor coverings. Use nonpermanent, nonstaining marking device.

E. Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and floor covering manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.

1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 FLOOR TILE INSTALLATION

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

B. Discard broken, cracked, chipped, or deformed tiles.

C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered.

1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).

3.5 CLEANING AND PROTECTING

A. Perform the following operations immediately after completing floor covering installation:
1. Sweep and vacuum floor coverings thoroughly.
2. Damp-mop floor coverings to remove marks and soil.

B. Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Do not move heavy and sharp objects directly over floor coverings. Protect floor coverings with plywood or hardboard panels to prevent damage from storing or moving objects over floor coverings.

END OF SECTION 096566

SECTION 096623 - PRECAST TERRAZZO FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Precast terrazzo units.

B. Related Section:

   1. Division 07 Section "Joint Sealants" for sealants installed with terrazzo.

1.3 SUBMITTALS

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

B. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:

   1. Divider strips.
   2. Control-joint strips.
   3. Accessory strips.
   4. Precast terrazzo jointing and edge configurations.
   5. Terrazzo patterns.

C. Samples for Verification: For each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes, and proportions. Prepare samples of same thickness and from same material to be used for the Work in size indicated below:
   1. Precast Terrazzo: 12-inch- square Samples.
   2. Accessories: 6-inch- long Samples of each exposed strip item required.

D. Maintenance Data: For terrazzo to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is acceptable to terrazzo manufacturer to install manufacturer's products.

B. Source Limitations: Obtain primary terrazzo materials from one source from a single manufacturer. Provide secondary materials including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.

C. Source Limitations for Aggregates: Obtain each color, grade, type, and variety of granular materials from one source with resources to provide materials of consistent quality in appearance and physical properties.

D. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified.

E. TCA Standards: Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number if any.

B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting terrazzo installation.

B. Field Measurements: Verify actual dimensions of construction contiguous with precast terrazzo by field measurements before fabrication.

C. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.

D. Close spaces to traffic during terrazzo application and for not less than 24 hours after application unless manufacturer recommends a longer period.

E. Control and collect dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations.

PART 2 - PRODUCTS

2.1 PRECAST TERRAZZO

A. Precast Terrazzo Units: Precast epoxy-resin terrazzo tile units.

1. Size: 24" x 24" x 7/8" nominal.
2. Color, and Pattern: Match Architect's sample.
3. Finish:
   a. Type 1: Chamfered edge, factory ground and polished.
   b. Type 2: Chamfered edge, ¾" factory ground and polished border, light sandblast field finish.

B. Precast Terrazzo Base Units: 7/8 inch thick; 24" long.

1. Type: Straight.
2. Height: 2-1/2".
3. Color and Pattern: Match adjacent terrazzo tile flooring.
4. Finish: Chamfered edge, factory ground and polished.

2.2 STRIP MATERIALS

A. Thin-Set Divider Strips: L-type angle or T-type.

1. Material: Aluminum.
2. Top Width: 1/4 inch.

B. Accessory Strips: Match divider strip width, material, and color unless otherwise indicated. Use the following types of accessory strips as required to provide a complete installation:
1. Edge-bead strips for exposed edges of terrazzo.

2.3 MISCELLANEOUS ACCESSORIES

A. Cleaner: Chemically neutral cleaner with pH factor between 7 and 10 that is biodegradable, phosphate free, and recommended by sealer manufacturer for use on terrazzo type indicated.

B. Sealer: Slip- and stain-resistant penetrating-type sealer that is chemically neutral with pH factor between 7 and 10; does not affect color or physical properties of terrazzo; is recommended by sealer manufacturer; and complies with NTMA's "Terrazzo Specifications and Design Guide" for terrazzo type indicated.

C. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Boiardi Products; a QEP company.
   b. Bonsal American; an Oldcastle company.
   c. Bostik, Inc.
   d. C-Cure.
   e. Custom Building Products.
   f. Jamo Inc.
   g. Laticrete International, Inc.

h. MAPEI Corporation.
i. Mer-Kote Products, Inc.
j. Southern Grouts & Mortars, Inc.
k. Summitville Tiles, Inc.
l. TEC; a subsidiary of H. B. Fuller Company.

D. Polymer-Modified Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Boiardi Products; a QEP company.
b. Bonsal American; an Oldcastle company.
c. Bostik, Inc.
d. C-Cure.
e. Custom Building Products.
f. Jamo Inc.
g. Laticrete International, Inc.
h. MAPEI Corporation.
i. Southern Grouts & Mortars, Inc.
j. Summitville Tiles, Inc.
k. TEC; a subsidiary of H. B. Fuller Company.

E. Temporary Protective Coating: 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.

F. Crack Isolation Membrane: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
1. Provide one part liquid applied membrane for non-directional cracks.
2. Provide sheet membrane for bridging saw cut and cold joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 PREPARATION

A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.

B. Concrete Slabs:

1. Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.
   a. Repair damaged and deteriorated concrete according to terrazzo manufacturer's written recommendations.
   b. Use patching and fill material to fill holes and depressions in substrates according to terrazzo manufacturer's written instructions.

2. Verify that concrete substrates are visibly dry and free of moisture.

C. Protect other work from dust generated by grinding operations. Control dust to prevent air pollution and comply with environmental protection regulations.

D. Installation of terrazzo indicates acceptance of surfaces and conditions.

3.3 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions.

B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.4 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. 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, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. Where adjoining tiles on floor and base are specified, align joints.

E. Joint Widths: Unless otherwise indicated, install tile with 3/16" joint widths.

F. Metal Edge Strips: Install at locations indicated.

3.5 CLEANING AND PROTECTION

A. Cleaning:

   1. Prior to grouting, apply a grout release to the tile. After grout ahs set, remove the grout release.
   2. Wash surfaces with cleaner according to NTMA's written recommendations and manufacturer's written instructions; rinse surfaces with water and allow to dry thoroughly.

B. Sealing:

   1. Seal surfaces according to NTMA's written recommendations.
   2. Apply sealer according to sealer manufacturer's written instructions.

C. Protection: Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure that terrazzo is without damage or deterioration at time of Substantial Completion.

3.6 TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

   1. Tile Installation F113: Thin-set mortar; TCA F113.
      a. Thin-Set Mortar: Latex- portland cement mortar.
      b. Grout: Polymer-modified sanded grout.

END OF SECTION 096623

SECTION 096723 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes resinous flooring systems with acrylic body coat(s) and ESD (electro static dissipative) resinous flooring systems with acrylic body coat(s).

1. Application Method: Self-leveling slurry with broadcast aggregates.

B. Related Sections include the following:

1. Division 07 Section "Joint Sealants" for sealants installed at joints in resinous flooring systems.

2. Division 07 Section "Surface Applied Vapor Reduction System" for primer at resinous flooring.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

B. Samples for Initial Selection: For each type of exposed finish required.

C. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.

D. Material Test Reports: For each resinous flooring component.

E. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.

1. Engage an installer who employs only persons trained and approved by resinous flooring manufacturer for applying resinous flooring systems indicated.

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

C. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Apply full-thickness mockups on 48-inch- square floor area selected by Architect.

a. Include 48-inch length of integral cove base.

2. Simulate finished lighting conditions for Architect's review of mockups.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store materials to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING (RF)

A. Available Manufacturers: Subject to compliance with requirements, manufacturers that may be incorporated into the Work include, but are not limited to, the following:
1. Degafloor Ltd.

2. Dur-A-Flex Inc.
3. Sika Corporation

B. System Characteristics:

1. Color and Pattern: As selected by Architect from manufacturer's full range.
2. Wearing Surface: Smooth.
3. Integral Cove Base: 4 inch or 5-1/2 inch height as indicated.
4. Overall System Thickness: 3/16 inch.

C. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Body Coat(s):

   a. Resin: Methyl mathacrylate (MMA).
   b. Application Method: Self-leveling slurry with broadcast aggregates.

      1) Thickness of Coat: 1/8 inch.
      2) Number of Coats: One.

   c. Aggregates: Manufacturer's standard.

2. Primer: Type recommended by manufacturer for substrate and body coat(s) indicated.

3. Concrete Patching and Fill Materials: Flexible resin formulation that is recommended by manufacturer for substrate and primer and body coat(s) indicated and that prevents substrate cracks from reflecting through resinous flooring.

4. Topcoat: UV-resistant sealing or finish coat(s).

   a. Resin: Two component acrylic.
   b. Type: Pigmented.
   c. Finish: Gloss.
   d. Number of Coats: Two.

5. ESD Topcoat: Provide manufacturers standard electro static dissipative topcoat where indicated.

   a. Resin: Two component acrylic.
   b. Type: Pigmented.
   c. Finish: Gloss.
   d. Number of Coats: Two.

D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Compressive Strength: 8,000 psi per ASTM C 579.
2. Tensile Strength: 1,350 psi per ASTM C 307.

3. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation per MIL-D-3134.
4. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch per MIL-D-3134.
5. Flammability: Self-extinguishing per ASTM D 635.
6. Electrical Resistivity of Body Coat: 10^{12} ohm surface resistance per ASTM D257.
7. Electrical Resistivity of ESD Topcoat: $1x10E^{6}$ to $1x10E^{8}$ ohm surface resistance per ASTM D257.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:
   a. Comply with ASTM C 811 requirements and ASTM D 4259 for Surface Preparation unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
3. Verify that concrete substrates are dry.

   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab in 24 hours.

4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.

   a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply waterproofing membrane, where indicated, in manufacturer's recommended thickness.

1. Apply waterproofing membrane to integral cove base substrates.

D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.

E. Apply self-leveling slurry body coat(s) in thickness indicated for flooring system.

1. Broadcast aggregates and, after resin is cured, remove excess aggregates to provide surface texture indicated.

F. Apply troweled or screeded body coat(s) in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, sand to remove trowel marks and roughness.

G. Apply grout coat, of type recommended by resinous flooring manufacturer to fill voids in surface of final body coat and to produce wearing surface indicated.

H. Apply topcoat(s) in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.3 FIELD QUALITY CONTROL

A. Material Sampling: Owner may at any time and any number of times during resinous flooring application require material samples for testing for compliance with requirements.

1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.

3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.4 CLEANING AND PROTECTING

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 096723

SECTION 096816 - SHEET CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Tufted carpet.

B. Related Sections include the following:
1. Division 02 Section "Selective Structure Demolition" for removing existing floor coverings.
2. Division 09 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

A. Product Data: For the following, including installation recommendations for each type of substrate:

1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
2. Carpet type, color, and dye lot.
3. Locations where dye lot changes occur.
4. Seam locations, types, and methods.
5. Pattern type, repeat size, location, direction, and starting point.
6. Pile direction.
7. Type, color, and location of edge, transition, and other accessory strips.
8. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet: 12-inch- square Sample.

2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- long Samples.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

E. Maintenance Data: For carpet to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet.

F. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.

1.7 WARRANTY

A. Special Warranty for Carpet: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.

2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, wrinkles, and delamination.
3. Warranty Period: 3 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 TUFTED CARPET

A. Basis-of-Design Product: The design for carpet is based on product indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following
1. Blue Ridge Commercial Carpet; Broadloom
2. Tandus US, Inc; Crosley

B. Products: Basis of design:

1. Shaw Contract Group; Style number 60689.

a. Color: As selected by Architect from manufacturer's full range.

C. Fiber Content: 100 percent C-F nylon with soil hiding features.

D. Fiber Type: Antron III, also IV, Zeftron or Ultron.

E. Pile Characteristic: Multilevel pattern loop.

F. Yarn Ply: 3 (minimum).

G. Face Weight: 28 oz./sq. yd.

H. Total Weight: 67 oz./sq. yd. for finished carpet.

I. Primary Backing: Synthetic.

J. Secondary Backing: Woven synthetic.

K. Width: 12 feet.

L. Performance Characteristics: As follows:

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
2. Delamination: Not less than 3.5 lbf/in. per ASTM D 3936.
3. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC 165.
4. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) per AATCC 16, Option E.
5. Electrostatic Propensity: Less than 3.5 kV per AATCC 134.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.

C. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

A. Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:

1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."

B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

F. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.

3.4 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.
3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet adhesive manufacturer.

END OF SECTION 096816

SECTION 098413 - FIXED SOUND-ABSORPTIVE PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes back-mounted acoustical wall panels.

B. Related Sections include the following:

1. Division 09 Section "Acoustical Panel Ceilings" for acoustical ceiling panels supported by exposed suspension system and tested for noise reduction.

1.3 DEFINITIONS

A. NRC: Noise reduction coefficient.

1.4 SUBMITTALS

A. Product Data: For each type of panel edge, core material, and mounting indicated.

B. Shop Drawings: For acoustical wall panels. Include mounting devices and detailS; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Include elevations showing panel sizes. Indicate panel edge and core materials.

C. Samples for Initial Selection: For each type of fabric facing material from acoustical wall panel manufacturer's full range.

D. Samples for Verification: For the following products. Prepare Samples from same material to be used for the Work.
1. Sample Panels: No larger than 36 by 36 inches. Show joints and mounting methods.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of acoustical wall panel.

F. Maintenance Data: For acoustical wall panels to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

G. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Source Limitations: Obtain acoustical wall panels through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide acoustical wall panels 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:

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and acoustical wall panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

C. Protect panel edges from crushing and impact.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical wall panels until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Air-Quality Limitations: Protect acoustical wall panels from exposure to airborne odors, such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.

C. Field Measurements: Verify locations of acoustical wall panels by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of acoustical wall panels that fail in performance, materials, or workmanship within specified warranty period.

1. Failure in performance includes, but is not limited to, acoustical performance.

2. Failures in materials include, but are not limited to, fabric sagging, distorting, or releasing from panel edge; or warping of core.
3. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CORE MATERIALS

A. Glass-Fiber Board: ASTM C 612, Type IA or Types IA and IB; density as specified, unfaced, dimensionally stable, molded rigid board, with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

B. Impact-Resistant, Acoustically Transparent, Copolymer Face-Sheet Layer for High-Abuse Applications: 1/16- to 1/8-inch- thick layer of perforated, noncombustible, copolymer sheet laminated to face of core.

2.2 BACK-MOUNTED, EDGE-REINFORCED ACOUSTICAL WALL PANELS WITH GLASS-FIBER BOARD CORE (AWP)

A. Basis of Design: High Impact Resistant Panel (Type h.i.r. 1) by Decoustics. Provide "Claro" finish.

B. Other Manufacturers: Subject to compliance with requirements, products may be provided by one of the following:

1. Wall Technology.

2. Armstrong World Industries.

3. Ecophon Certain Teed, Inc.

C. Panel Construction: Manufacturer's standard panel construction consisting of facing material laminated to front face, edges, and back border of dimensionally stable, rigid glass-fiber board core; with edges chemically hardened to reinforce panel perimeter against warpage and damage.

D. Nominal Core Density: 6 to 7 lb/cu. ft.

E. Core-Face Layer: Impact-resistant, acoustically transparent, copolymer face-sheet.

F. Facing Material: Fabric from same dye lot; color and pattern as indicated by manufacturer's designations.

G. Nominal Core Thickness and Overall System NRC: 1 inch and not less than NRC 0.80, for Type A mounting per ASTM E 795.

H. Panel Width: As indicated on Drawings.

I. Panel Height: Fabricated height as indicated on Drawings; mounting height as indicated on Drawings.

J. Panel Edge Detail: Square.

K. Corner Detail: Square to form continuous profile to match edge detail.

2.3 FABRICATION

A. Sound-Absorption Performance: Provide acoustical wall panels with minimum NRCs indicated, as determined by testing per ASTM C 423 for mounting type specified.

B. Acoustical Wall Panels: Panel construction consisting of facing material adhered to edges and back border of dimensionally stable core; with rigid edges to reinforce panel perimeter against warpage and damage.

1. Glass-Fiber Board: Resin harden areas of core for attachment of mounting devices.

C. Fabric Facing: Stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other foreign matter. Applied with visible surfaces fully covered.

1. Where square corners are indicated, tailor corners.

D. Core-Face Layer: Evenly stretched over core face and edges and securely attached to core; free from puckers, ripples, wrinkles, sags.

E. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.

F. Back-Mounting Devices: Concealed on backside of panel, recommended to support weight of panel, with base-support bracket system where recommended by manufacturer for additional support of panels, and as follows:
1. Metal "Z" Clips: Two-part panel clips, with one part of each clip mechanically attached to back of panel and the other part to wall substrate, designed to allow for panel removal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabric, substrates, blocking, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of acoustical wall panels.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install acoustical wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with acoustical wall panel manufacturer's written instructions for installation of panels using type of concealed mounting accessories indicated or, if not indicated, as recommended by manufacturer. Anchor panels securely to supporting substrate.

C. Match and level fabric pattern and grain among adjacent panels.

D. Installation Tolerances: As follows:

1. Variation from Level and Plumb: Plus or minus 1/16 inch.
2. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

3.3 CLEANING

A. Clean panels with fabric facing, on completion of installation, to remove dust and other foreign materials according to manufacturer's written instructions.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that acoustical wall panels are without damage or deterioration at time of Substantial Completion.

B. Replace acoustical wall panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 098413

SECTION 099120 - PAINTING (PROFESSIONAL LINE PRODUCTS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry".
2. Division 5 Section "Structural Steel".
3. Division 6 Section "Exterior Finish Carpentry".
4. Division 7 Section "Roof Accessories".
5. Division 8 Section "Custom Steel Doors And Frames".
6. Division 9 Section "Multicolored Interior Coatings".
7. Division 10 Section "Wire Mesh Partitions".

C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface. If a color is not indicated, Architect will select colors. The painter should assume that different items will be different colors, e.g. exposed metal deck and exposed structural steel. Also, the painter should assume each space will have one accent wall that is a different color from the other walls.

1. Painting includes field painting of all exposed bare and covered pipes (including ANSI color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

a. Architectural woodwork.
b. Metal toilet enclosures.
c. Metal lockers.

d. Elevator entrance doors and frames.
e. Elevator equipment.
f. Finished mechanical and electrical equipment.
g. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Foundation spaces.
b. Furred areas.
c. Ceiling plenums, unless visible from below.
d. Utility tunnels.
e. Pipe spaces.
f. Duct shafts.
g. Elevator shafts.

3. Finished metal surfaces, with the exception of piping, conduit, and exposed metal deck, include the following:

a. Aluminum.
b. Stainless steel.
c. Chromium plate.
d. Copper and copper alloys.
e. Bronze and brass.
f. Zinc coated steel (galvanized).

4. Operating parts include moving parts of operating equipment and the following:

a. Valve and damper operators.
b. Linkages.
c. Sensing devices.
d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

E. Related Sections include the following:

1. Division 32 Section "Asphalt Paving" for traffic-marking paint.
2. Division 5 Section "Structural Steel" for shop priming structural steel.
3. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
4. Division 8 Section "Custom Steel Doors and Frames" for factory priming steel doors and frames.
5. Division 9 Section "Gypsum Board Assemblies" for surface preparation of gypsum board.
6. Division 9 Section "Multicolored Interior Coatings" for spray-applied multicolored coatings.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. Samples for Initial Selection: For each type of finish-coat material indicated.

1. After color selection, Architect will furnish color chips for surfaces to be coated.

C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
3. Submit Samples on the following substrates for Architect's review of color and texture only:

a. Concrete Unit Masonry: 4-by-8-inch Samples of masonry for each finish.
b. Ferrous Metal: 4-inch- square Samples of flat metal and 6-inch- long Samples of solid metal for each color and finish.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.

1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.

   a. Wall Surfaces: Provide samples on at least 100 sq. ft.
   b. Small Areas and Items: Architect will designate items or areas required.

2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.

   a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.

3. Final approval of colors will be from benchmark samples.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.7 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: Furnish Owner with extra paint materials in quantities indicated below:

a. Exterior, Semigloss Acrylic Enamel: 2 gal. of each color applied.
b. Interior, Flat Acrylic Paint: 2 gal. of each color applied.
c. Interior, Low-Luster Acrylic Finish: One case of each color applied.
d. Interior, Semigloss Acrylic Enamel: One case of each color applied.
e. Interior, Gloss Acrylic Enamel: One gal. Of each color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: The schedule of paint types names the products of Sherwin-Williams as the standard of quality.

B. Manufacturers' Names: Provide products from one of the following manufacturers:

1. Benjamin Moore & Co. (Benjamin Moore).
2. ICI Dulux Paint Centers (ICI Dulux Paints).
3. PPG Industries, Inc. (Pittsburgh Paints).
4. Sherwin-Williams Co. (Sherwin-Williams).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application

indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Match Architect's samples.

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.
1. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils.

2.4 EXTERIOR PRIMERS

A. Exterior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex primer for exterior application.
1. Sherwin-Williams; Loxon Exterior Masonry Acrylic Primer A24W300: Applied at a dry film thickness of not less than 3.0 mils.

B. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.
1. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils.

C. Primer, Galvanized: As recommended in writing by topcoat manufacturer.

2.5 INTERIOR PRIMERS

A. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.
1. Sherwin-Williams; PrepRite Masonry Primer B28W300: Applied at a dry film thickness of not less than 3.0 mils.

B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
1. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series: Applied at a dry film thickness of not less than 1.6 mils.

C. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.
1. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils.

D. Interior Non-Ferrous Metal Primer: Factory-formulated quick-drying alkyd-based metal primer.

1. Sherwin-Williams; Kem-Flash 500: Applied at a dry film thickness of not less than 1.5 mils.

E. Interior Plastic Primer: Factory-formulated latex-based primer for interior application.
1. Sherwin-Williams; Kem Aqua Bonding Primer for Plastics E61W525: Applied at a dry film thickness of not less than 0.6 mils.

2.6 EXTERIOR FINISH COATS

A. Exterior Full-Gloss Acrylic Enamel: Factory-formulated full-gloss waterborne acrylic-latex enamel for exterior application.
1. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series: Applied at a dry film thickness of not less than 2.4 mils.

B. Exterior Semi-Gloss Acrylic Enamel: Factory-formulated semigloss alkyd enamel for exterior application.
1. Sherwin-Williams; A-100 Semi-Gloss A82 Series: Applied at a dry film thickness of not less than 1.3 mils.

C. Exterior Flat Acrylic Enamel: Factory-formulated flat acrylic-emulsion latex paint for exterior application.
1. Sherwin-Williams; A-100 Flat A6 Series: Applied at a dry film thickness of not less than 1.2 mils.

2.7 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application.
1. Sherwin-Williams; ProMar 200 Interior Latex Flat Wall Paint B30W200 Series: Applied at a dry film thickness of not less than 1.4 mils.

B. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.
1. Sherwin-Williams; ProMar 200 Interior Latex Egg-Shell Enamel B20W200 Series: Applied at a dry film thickness of not less than 1.6 mils.

C. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.
1. Sherwin-Williams; ProMar 200 Interior Latex Semi-Gloss Enamel B31W200 Series: Applied at a dry film thickness of not less than 1.3 mils.

D. Interior Semigloss Epoxy Resin: Factory-formulated semigloss water based, catalyzed epoxy interior enamel.
1. Sherwin-Williams; Water Based Catalyzed Epoxy B70-200 Series: Applied at a dry film thickness of not less than 2.5 mils.

E. Interior Full-Gloss Acrylic Enamel: Factory-formulated full-gloss acrylic-latex interior enamel.
1. Sherwin-Williams; ProMar 200 Interior Latex Gloss Enamel B21W201: Applied at a dry film thickness of not less than 1.5 mils.

F. Interior Full-Gloss Industrial Acrylic Enamel: Factory-formulated industrial full-gloss acrylic-latex interior enamel.
   1. Sherwin-Williams; Kem Aqua Gloss Enamel F77W550: Applied at a dry film thickness of not less than 1.1 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

   1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
   2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

   1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

   1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

   1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

   1. Provide barrier coats over incompatible primers or remove and reprime.

2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
    c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.

    a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
    b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated and insulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Tanks that do not have factory-applied final finishes.
5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

G. Electrical items to be painted include, but are not limited to, the following:
1. Panelboards.
2. Electrical equipment that is indicated to have a factory-primed finish for field painting.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying

paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
1. Full-Gloss Alkyd-Enamel Finish: Two finish coats over a rust-inhibitive primer.

a. Primer: Exterior ferrous-metal primer.
b. Finish Coats: Exterior full-gloss alkyd enamel.

B. Fiber-Cement Substrates: Provide the following finish systems over fiber-cement panels.

1. Latex Finish System: Two finish coats.
a. Finish Coats: Exterior semi-gloss latex.

3.8 INTERIOR PAINT SCHEDULE

A. Concrete and Masonry (Other Than Concrete Unit Masonry): Provide the following paint systems over interior concrete and brick masonry substrates:
1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior concrete and masonry primer.
b. Finish Coats: Interior semigloss acrylic enamel.

B. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:

1. Interior Semi-Gloss Acrylic-Enamel Finish: Two finish coats over a block filler.

    a. Block Filler: Concrete unit masonry block filler.
    b. Finish Coats: Interior semi-gloss acrylic enamel or, where indicated, semi-gloss epoxy resin.

C. Gypsum Board: Provide the following finish systems over interior gypsum board ceilings (except Toilet Room ceilings) and soffits:

1. Flat Acrylic Finish: Two finish coats over a primer.

    a. Primer: Interior gypsum board primer.
    b. Finish Coats: Interior flat acrylic paint.

D. Gypsum Board: Provide the following finish systems over gypsum board ceilings in Toilet Rooms, and gypsum board walls;

1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.

    a. Primer: Interior gypsum board primer.
    b. Finish Coats: Interior low-luster acrylic enamel.

E. Ferrous and Non-Ferrous Metal: Provide the following finish systems over non-ferrous metal:
1. Alkyd-Enamel Finish: Two finish coats over a primer. Note that in new Shop Wing, Building Areas C and D, the paint color for the exposed steel roof deck will be different from the paint color for the trusses and beams.

    a. Primer: Interior non-ferrous-metal primer.
    b. Finish Coats: Interior semigloss or gloss alkyd enamel as selected by the Architect.

F. All-Service Jacket over Insulation: Provide the following finish system on plastic insulation covering:

1. Gloss Acrylic Finish: Two finish coats.

    a. Primer: Interior plastic primer

    b. Finish Coats: Interior full gloss industrial acrylic enamel.

END OF SECTION 099120

SECTION 099419 - MULTICOLOR INTERIOR FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and field application of multicolor interior coating systems.

B. Related Sections include the following:
   1. Division 09 painting Sections for special-use coatings and general field painting.

1.3 SUBMITTALS

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

B. Samples for Initial Selection: For each coating system indicated.

C. Samples for Verification: For each coating system and in each color, pattern, and pigment density indicated.

   1. Submit Samples on rigid backing, 8 inches square.
   2. Label each Sample for location and application area.

1.4 QUALITY ASSURANCE

A. Master Painters Institute (MPI) Standards: Comply with recommendations in "MPI Architectural Painting Specification Manual" applicable to products and coating systems indicated.

B. Mockups: Apply benchmark samples of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Architect will select one surface to represent surfaces and conditions for application of each coating system and type of substrate.

      a. Wall Surfaces: Provide samples of at least 100 sq. ft.
      b. Other Items: Architect will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. Final approval of color and pattern selections will be based on benchmark samples.

    a. If preliminary color and pattern selections are not approved, apply additional benchmark samples of additional colors and patterns selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply coatings until spaces are enclosed and weatherproof, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged for storage and identified with labels describing contents.
1. Provide 2 gallons of multi-colored coatings for each color provided.

PART 2 - PRODUCTS

2.1 MULTICOLOR COATING SYSTEMS, GENERAL

A. Material Compatibility: Provide materials for use within each coating system that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.2 FILLERS AND PRIMERS

A. General: Undercoatings recommended in writing for use in coating systems by manufacturer of multicolor interior coating on substrates and under conditions indicated.

B. Latex Block Filler: Waterborne, high-solids, emulsion-type, pigmented coating product recommended in writing for use in coating system indicated by manufacturer of multicolor

interior coating, with bridging and filling properties, and formulated for filling surfaces of CMU for subsequent applications of finish coatings.

C. Primer/Sealer for Multicolor Systems: Acrylic or acrylic/polyvinyl acetate (PVA) co-polymer emulsion-type, pigmented primer/sealer product recommended in writing for use in coating system indicated by manufacturer of multicolor interior coating.

D. Interior Alkyd Primer/Sealer: Solvent-based, pigmented primer/sealer.

E. Water-Based Bonding Primer: Water-based, emulsion-type, pigmented primer product recommended in writing for use in coating system indicated by manufacturer of multicolor interior coating, and formulated to promote adhesion of subsequent coatings.

F. Solvent-Based Bonding Primer: Solvent-based, pigmented product recommended in writing for use in coating system indicated by manufacturer of multicolor interior coating, and formulated to promote adhesion of subsequent coatings to substrate.

2.3 MULTICOLOR COATINGS

A. Multicolor Coatings: Complying with MPI #112 and listed in "MPI Approved Products List."

1. Available Products: Subject to compliance with requirements, provide one of the following:
   a. Zolatone, Polymyx Airless; Master Coating Technologies.
   b. Scuffmaster; Master Coating Technologies.
   c. Roxatone Multicolored Coatings; Sky Coatings Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of coatings.

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

   a. Concrete: 12 percent.
   b. Masonry (Clay and CMU): 12 percent.
   c. Wood: 15 percent.
   d. Gypsum Board: 12 percent.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Proceed with coating application only after unsatisfactory conditions have been corrected and surfaces receiving coating are dry.
4. Coating application indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.

1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.

C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible primers, paints, and encapsulants.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

E. Clay Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

F. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

3.3 APPLICATION

A. Apply coatings according to manufacturer's written instructions using applicators and techniques suited for coating and substrate indicated.

B. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.

C. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

D. Apply coating systems to produce uniformly textured, colored, and patterned finished-surface films without substrates, undercoats, marks, or stains showing through. Produce sharp, even glass lines and color breaks.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.5 MULTICOLOR INTERIOR COATING SCHEDULE

A. Vertical Concrete Substrates:

1. Prime Coat: Primer/sealer for multicolor systems.
2. Multicolor Base Coat: Multicolor coating, MPI #112.
3. Multicolor Pattern Coat: Multicolor coating, MPI #112.

B. Cementitious Composition Board Substrates:

1. Prime Coat: Primer/sealer for multicolor systems.
2. Multicolor Base Coat: Multicolor coating, MPI #112.
3. Multicolor Pattern Coat: Multicolor coating, MPI #112.

C. Clay Masonry Units Substrates:

1. Prime Coat: Primer/sealer for multicolor systems tinted to match multicolor basecoat.
2. Multicolor Base Coat: Multicolor coating, MPI #112.
3. Multicolor Pattern Coat: Multicolor coating, MPI #112.

D. CMU Substrates:

1. Block Filler: Latex block filler.
2. Prime Coat: Primer/sealer for multicolor systems.
3. Multicolor Base Coat: Multicolor coating, MPI #112.
4. Multicolor Pattern Coat: Multicolor coating, MPI #112.

E. Gypsum Board Substrates:

1. Prime Coat: Primer/sealer for multicolor systems.
2. Multicolor Base Coat: Multicolor coating, MPI #112.
3. Multicolor Pattern Coat: Multicolor coating, MPI #112.

F. Ceramic Substrates:

1. Prime Coat: Primer/sealer for multicolor systems.
2. Multicolor Base Coat: Multicolor coating, MPI #112.
3. Multicolor Pattern Coat: Multicolor coating, MPI #112.

END OF SECTION 099419

SECTION 101100 - VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Markerboards.
2. Tackboards.

1.2 SUBMITTALS

A. Product Data: For each type of visual display board and accessory indicated.

B. Shop Drawings: Include plans, elevations, sections, details of installation, and attachments to other Work.

C. Samples: For each exposed finish.

1.3 WARRANTY

A. Porcelain Enamel Markerboard Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace chalkboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within specified warranty period, provided manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.

1. Warranty Period: 50 years from date of Substantial Completion.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of visual display surface through one source from a single manufacturer.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 75 or less.
2. Smoke-Developed Index: 450 or less.

PART 2 - PRODUCTS

2.1 PORCELAIN ENAMEL MARKERBOARDS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers that may be incorporated into the Work, but are not limited to, the following:
   1. PolyVision Corporation
   2. Aarco Products, Inc
   3. Claridge Products and Equipment, Inc

B. Face Sheet Thickness: 0.024-inch.

C. Face Sheet Material: Enameling grade steel. Coat exposed face and edges with three-coat process consisting of primer, ground coat, and color cover coat. Coat concealed face with two-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at manufacturer's standard firing temperatures, but not less than 1200 deg F.

D. Face Sheet Cover Coat: Light-colored, special writing surface with high gloss finish, intended for use with erasable dry markers.

E. Core: 1/2-inch-thick, particleboard core material complying with requirements in ANSI A208.1, Grade 1-M-1.

F. Backing Sheet: 0.015-inch- thick, aluminum sheet.

G. Laminating Adhesive: Moisture-resistant, thermoplastic-type adhesive.

2.2 TACKBOARDS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers that may be incorporated into the Work, but are not limited to, the following:
   1. PolyVision Corporation
   2. Aarco Products, Inc
   3. Claridge Products and Equipment, Inc

B. Natural-Cork Tackboards: Single-layer, 1/4-inch- thick, seamless, compressed fine-grain, bulletin board quality, natural-cork sheet; face sanded for natural finish; complying with MS MIL-C-15116, Type II.

2.3 METAL TRIM AND ACCESSORIES

A. Field-Applied Trim: Screw-on trim with Phillips flat-head screws.

B. Chalktray: Box-type, aluminum chalktray with slanted front and cast-aluminum end closures.

C. Map Rail: Furnish map rail at top of each unit, complete with the following accessories:

   1. Display Rail: Continuous cork display rail approximately 2 inches wide, integral with map rail.
   2. End Stops: One at each end of map rail.

3. Map Hooks: Two map hooks with flexible metal clips for every 48 inches of map rail or fraction thereof.

2.4 FABRICATION

A. Fabricate frames and trim of not less than 0.062-inch- thick, extruded-aluminum alloy. Provide straight, single-length units. Keep joints to a minimum. Miter corners to a neat, hairline closure.

1. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated.

B. Factory-assembled chalkboard and tackboard units, unless field-assembled units are required.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board.
2. Provide vertical joint system between abutting sections of chalkboards.
3. Provide mullion trim at joints between chalkboards and tackboards.

2.5 ALUMINUM FINISHES

A. Anodized Finish: Class II, clear anodic coating complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units in with perimeter lines level, straight, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Coordinate Project-site-assembled units with grounds, trim, and accessories. Join parts with a neat, precise fit.

C. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls. Do not use adhesives.

1. Field-Applied Aluminum Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at not more than 24 inches o.c.

a. Attach chalktrays to boards with fasteners at not more than 12 inches o.c.

END OF SECTION 101100

SECTION 101200 - DISPLAY CASES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Illuminated display cases.

B. Related Sections:
   1. Division 10 Section "Visual Display Surfaces" for tackboards.
   2. Division 26 Sections for wiring and other electrical work associated with illuminated display cases.

1.3 DEFINITIONS

A. Bulletin Board: Tackable visual display surface or tackboard enclosed in a display case.

B. Display Case: Glazed cabinet with adjustable shelves.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases.

B. Shop Drawings: For display cases. Include plans, elevations, sections, details, and attachments to other work.

   1. Show location of seams and joints in visual display surfaces.
   2. Include sections of typical trim members.
   3. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Verification: For each type of product indicated.

   1. Visual Display Surface: Not less than 8-1/2 by 11 inches, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
   2. Trim: 6-inch- long sections of each trim profile.

D. Maintenance Data: For visual display surfaces, operating hardware, and illuminated units to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain display cases from single source from single manufacturer.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install display cases until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of openings for display cases by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hardboard: ANSI A135.4, tempered.

B. Particleboard: ANSI A208.1, Grade M-1.

C. Fiberboard: ASTM C 208.

D. Hardwood Plywood: HPVA HP-1.

E. Natural Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.

F. Extruded-Aluminum Bars and Shapes: ASTM B 221, Alloy 6063.

G. Aluminum Tubing: ASTM B 429, Alloy 6063.

H. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering, and 6 mm thick unless otherwise indicated.

I. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for

exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

2.2 DISPLAY CASE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A-1 Visual Systems.
2. AARCO Products, Inc.
3. ADP Lemco, Inc.
4. Best-Rite Manufacturing.
5. Claridge Products and Equipment, Inc.
6. Ghent Manufacturing, Inc.
7. Nelson-Harkins Industries.
8. Platinum Visual Systems; a division of ABC School Equipment, Inc.
9. Poblocki Sign Company.
10. PolyVision Corporation; a Steelcase company.
11. Tablet & Ticket Co. (The).

B. Recessed Cabinet: Factory-fabricated cabinet; with tackboard assembly on back inside surface, operable glazed doors at front, and trim on face to cover edge of recessed opening.

1. Cabinet Box: Hardwood veneer plywood.
2. Cabinet Frame and Trim: Aluminum.
3. Veneer Species: Maple or birch with manufacturers standard transparent finish.
4. Aluminum Finish: Clear anodic.

C. Glazed Sliding Doors: Tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.

1. Thickness: Not less than 6 mm thick.
2. Number of Doors: As indicated on Drawings.

D. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.

1. Shelf Width: 8 inches.
2. Number of Shelves: Three.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface. Provide standards full height of display case.

F. Tack Surface: Natural-cork tackboard assembly.

G. Illumination System: Concealed top-lighting system consisting of fluorescent-strip fixtures. Include lamps and internal wiring with single concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.

1. Ballasts: Low-temperature, high-power-factor, low-energy, fluorescent lamp ballasts that comply with Certified Ballast Manufacturers Association standards and carry its label.

H. Width: As indicated on Drawings.

I. Height: As indicated on Drawings.

J. Depth: 12 inches.

2.3 FABRICATION

A. Fabricate display cases to requirements indicated for dimensions, design, and thickness and finish of materials.

B. Use metals and shapes of thickness and reinforcing to produce flat surfaces, free of oil-canning, and to impart strength for size, design, and application indicated.

C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.

D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power system to verify actual locations of connections before installation of illuminated units.

C. Examine walls and partitions for proper backing for display cases.

D. Examine walls and partitions for suitable framing depth if recessed units will be installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for display cases as required by type and size of unit.

3.3 INSTALLATION

A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches o.c.

C. Comply with requirements in Division 26 for connecting illuminated display cases.

1. After installation is complete, install new fluorescent lamps.

D. Install display case shelving level and straight.

3.4 ADJUSTING AND CLEANING

A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 101200

SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Panel signs.

B. Related Sections include the following:

   1. Division 01 Section "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.

   2. Division 10 Section "Electronic Message Signage" for outdoor LED signage.
   3. Division 22 Section "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
   4. Division 23 Section "Identification for HVAC Piping and Equipment" for labels, tags, and nameplates for HVAC systems and equipment.
   5. Division 26 Section "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
   6. Division 26 Section "Interior Lighting" for illuminated Exit signs.

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details for signs.
   1. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:
   1. Acrylic sheet.

D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
   1. Acrylic Sheet: 8 by 10 inches for each color required.
   2. Panel Signs: Not less than 12 inches square.
   3. Accessories: Manufacturer's full-size unit.

E. Sign Schedule: Use same designations indicated on Drawings.

F. Maintenance Data: For signs to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

C. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

1.7 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

2.2 PANEL SIGNS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kroy; Tactile Signs or a comparable product by one of the following:

   1. ACE Sign Systems, Inc.
   2. Advance Corporation; Braille-Tac Division.

3. Allen Industries Architectural Signage
4. Allenite Signs; Allen Marking Products, Inc.
5. APCO Graphics, Inc.
6. ASI-Modulex, Inc.
7. Best Sign Systems Inc.
8. Bunting Graphics, Inc.
9. Fossil Industries, Inc.
10. Gemini Incorporated.
11. Grimco, Inc.
12. Innerface Sign Systems, Inc.
13. InPro Corporation
14. Matthews International Corporation; Bronze Division.
15. Mills Manufacturing Company.
16. Mohawk Sign Systems.
17. Nelson-Harkins Industries.
18. Seton Identification Products.
19. Signature Signs, Incorporated.
20. Supersine Company (The)

B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:
   1. Acrylic-Backed Photopolymer Sheet: Provide photopolymer face layer bonded to an acrylic base layer to produce a composite sheet with overall, face layer, and base-layer thicknesses, respectively, of 0.040, and 0.118 inch.
   2. Edge Condition: Square cut.
   3. Corner Condition: Radius.
   4. Mounting: Unframed.
      a. Manufacturer's standard mechanical anchors for substrates encountered.
   5. Colors: As selected by Architect from manufacturer's full range.
   6. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting colors.

C. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.

   1. Panel Material: Photopolymer.
   2. Raised-Copy Thickness: Not less than 1/32 inch.

D. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for five years for application intended.
   1. Color: As selected by Architect from manufacturer's full range.

E. Schedule: Provide panel signs indicating room number for each room and text as indicated.

2.3 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.4 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.
   1. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
   2. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
   3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.5 FINISHES, GENERAL

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, are sized and located to accommodate signs.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
   1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
   2. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 101400

SECTION 101401 – SITE SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Panel signs.
   2. Stop signs.
   3. Do not enter signs.
   4. Buses only signs.
   5. One way signs.
   6. Faculty parking signs.
   7. Handicapped parking sign.
   8. Entry sign

1.2 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details for signs.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions of the Standard Specifications Form 816.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Form 816 - State of Connecticut Department of Transportation "Standard Specification for Road, Bridges, and Incidental Construction" 2004 edition <u>shall be used for materials compliance and execution of the work in this section</u>.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate signs and accessories where indicated, and complying with the Standard Specifications Form 816.

B. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.

END OF SECTION 101401

SECTION 101463 – ELECTRONIC MESSAGE SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Outdoor LED Message Center.

B. Related Sections include the following:
   1. Division 26 Sections for electrical service and connections for illuminated signs.

1.3 SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details for signs.

   1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   2. Wiring Diagrams: Power, signal, and control wiring.

C. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
   1. Aluminum: For each form, finish, and color, on 6-inch- long sections of extrusions and squares of sheet at least 4 by 4 inches.

D. Maintenance Data: For signs to include in maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. 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.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of metal finishes beyond normal weathering.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 Basis-of-Design Product: Subject to compliance with requirements, provide Trans-Lux; LED CaptiVue with "ProLine 100 Remote" control software or a comparable product.

A. Available manufacturers: Subject to compliance with requirements, manufactures that may be utilized, but are not limited to, the following:
1. Daktronics.
2. Hyperion.

2.2 MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 6063-T5.

C. Fabricated Two View Message Center Cabinet(s): Form exposed faces and sides of characters to produce surfaces free from warp and distortion. Include internal bracing for stability and attachment of mounting accessories. Comply with the following requirements:

1. Display Characters: Manufacturer's standard solid-state, circuit card mounted LED's including transformers, insulators, and other components with a 1-3/8" pixel pitch. Each pixel shall contain four amber LED's. Display shall feature three lines of minimum 9-inch characters. Horizontal viewing angle shall be no less than 90 degrees. Make provisions for servicing and concealing connections to building electrical system.
2. Aluminum Sheet: Not less than 0.050 inch thick.

   a. Finish: Painted, custom color.
3. Provide manufacturer's hardware for mounting of cabinet.
4. Size: Nominal 33-inch high by 8-inch deep by 100-inch long display. Cabinet size as indicated. Include custom graphics on cabinet.
5. Control: Message center (MC) shall be remotely controlled via a phone modem from the control point. Control software shall interface with Owner's computer (NIC) and be capable of creating messages in 256 shades of amber. Provide temperature and dimmer probe.

2.3 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors as required for corrosion resistance.

2.4 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.
1. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
2. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are

acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils, medium gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate MC where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.

B. Bracket-Mounted Signs: Provide manufacturer's standard brackets, fittings, and hardware for mounting signs. Attach brackets and fittings securely to substrate with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.

C. Install control software on computers designated by Owner.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

3.4 DEMONSTRATION AND TRAINING

A. Demonstrate complete operation of system to Owner. Provide two separate training sessions on days and times designated by the Owner.

END OF SECTION 101463

SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes solid-polymer units as follows:

1. Toilet Enclosures: Overhead braced, floor anchored.

B. Related Sections include the following:
1. Division 10 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.

C. Samples for Initial Selection: For each type of unit indicated.

D. Samples for Verification: Of each type of color and finish required for units, prepared on 6-inch- square Samples of same thickness and material indicated for Work.

1.4 QUALITY ASSURANCE

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating toilet compartments without

field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 SOLID-POLYMER UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Accurate Partitions Corporation.
2. Ampco.
3. Bradley Corporation; Mills Partitions.
4. Capitol Partitions, Inc.
5. Comtec Industries.
6. General Partitions Mfg. Corp.
7. Global Steel Products Corp.
8. Metpar Corp.
9. Santana Products, Inc.
10. Sanymetal; a Crane Plumbing Company.
11. Weis-Robart Partitions, Inc.

B. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) or polypropylene (PP) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

1. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range of colors and patterns.

C. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.

D. Brackets (Fittings):

1. Stirrup Type: Ear or U-brackets, chrome-plated, nonferrous, cast zinc alloy (zamac) or clear anodized aluminum.
2. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum.

E. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-polymer components to prevent burning.

2.2 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Chrome-plated, nonferrous, cast zinc alloy (zamac) or clear anodized aluminum.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

C. Doors: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be accessible to people with disabilities.

1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.

b. Panels and Walls: 1 inch.

2. Stirrup Brackets: Secure panels to walls and to pilasters with not less than three brackets attached at midpoint and near top and bottom of panel.

   a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor, unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

SECTION 102123 - CUBICLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Curtain tracks and curtain carriers.
2. Cubicle curtains.

1.3 PERFORMANCE REQUIREMENTS

A. Curtains: Provide curtain fabrics with the following characteristics:

1. Fabrics are launderable to a temperature of not less than 160 deg F.
2. Fabrics are flame resistant and are identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.

   a. Identify fabrics with appropriate markings of applicable testing and inspecting agency.

1.4 SUBMITTALS

A. Product Data: Include durability, laundry temperature limits, fade resistance, and fire-test-response characteristics for each type of curtain fabric indicated.

1. Include data on each type of applied curtain treatment.

B. Shop Drawings: Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.

C. Samples for Initial Selection: For each type of curtain material indicated.

D. Samples for Verification: For each type of product required, prepared on Samples of size indicated below.

1. Curtain Fabric: 12-inch- square swatch or larger as required to show complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.
2. Mesh Top: Not less than 4 inches square.
3. Curtain Track: Not less than 4 inches long.
4. Curtain Carrier: Full-size unit.

E. Operation and Maintenance Data: For curtains, track, and hardware to include in operation and maintenance manuals.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install cubicles until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Curtain Carriers and Track End Caps: Ten (10) full-size units.
2. Curtains: One full-size unit.

PART 2 - PRODUCTS

2.1 CURTAIN TRACKS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ADC Hospital Equipment; Division of Automatic Devices Company.
2. Alderman Acres Mfg, Inc.
3. Barjan Manufacturing Ltd.
4. Coldraco, Inc.
5. Covoc Corporation.
6. Crowder, K. N. Manufacturing, Inc.
7. Cubicle Curtain Factory, Inc.
8. Diamond Drapery Co.
9. Erwin and Associates, Inc.
10. General Cubicle Company, Inc.
11. Imperial Fastener Company, Inc.
12. InPro Corporation.
13. Nelson, A. R. Co.

14. Pryor Products.
15. Salsbury Industries.
16. Silent Gliss USA Inc.
17. Tubular Specialties Manufacturing, Inc.

B. Extruded-Aluminum Track: Not less than 1-1/4 inches wide by 3/4 inch high; with minimum wall thickness of 0.058 inch.

1. Curved Track: Factory-fabricated, 12-inch- radius bends.
2. Finish: Satin anodized.

C. Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.
1. End Stop: Nonremovable.

D. Curtain Carriers: Two nylon rollers and nylon axle with chrome-plated steel or aluminum hook.

E. Exposed Fasteners: Stainless steel.

F. Concealed Fasteners: Hot-dip galvanized.

2.2 CURTAINS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ADC Hospital Equipment; Division of Automatic Devices Company.
2. Alderman Acres Mfg, Inc.
3. Barjan Manufacturing Ltd.
4. Catalina Curtain Company.
5. Coldraco, Inc.
6. Covoc Corporation.
7. Cubicle Curtain Factory, Inc.
8. Diamond Drapery Co.
9. Erwin and Associates, Inc.
10. General Cubicle Company, Inc.
11. Imperial Fastener Company, Inc.
12. InPro Corporation.
13. Nelson, A. R. Co.
14. Pryor Products.
15. Salsbury Industries.
16. Tubular Specialties Manufacturing, Inc.

B. Cubicle Curtain Fabric: Curtain manufacturer's standard, 100 percent polyester, inherently and permanently flame resistant, stain resistant, and antimicrobial.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. KoSa; Avora FR.
b. Trevira, R-M Schulz Consulting, Inc.; Trevira CS.

2. Color: As selected by Architect from manufacturer's full range.

C. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches o.c.; machined into top hem.

D. Mesh Top: No. 50 nylon mesh.

2.3 CURTAIN FABRICATION

A. Fabricate curtains to comply with the following requirements:

1. Width: Equal to track length from which curtain is hung plus 10 percent added fullness, but not less than 12 inches added fullness.
2. Length: Equal to floor-to-ceiling height, with 16-inch mesh top, and minus distance above the finished floor at bottom as follows:

   a. Cubicle Curtains: 16 inches.

3. Top Hem: Not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lock stitched.
4. Mesh Top: Top hem not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lock stitched. Double lock stitch bottom of mesh directly to 1/2-inch triple thickness, top hem of curtain fabric.
5. Bottom Hem: Not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced, and double lock stitched.
6. Side Hems: Not less than 1/2 inch and not more than 1-1/4 inches wide, with triple turned edges, and single lock stitched.

B. Vertical Seams: Not less than 1/2 inch wide, double turned and double stitched.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install tracks level and plumb, according to manufacturer's written instructions.

B. Provide track fabricated from 1 continuous length.

1. Curtain Track Mounting: Surface.

C. Surface Track Mounting: Fasten surface-mounted tracks at intervals of not less than 24 inches. Fasten support at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:
   1. Mechanically fasten to suspended ceiling grid with screws.

D. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.

E. Curtain Carriers: Provide curtain carriers adequate for 6-inch spacing along full length of curtain plus an additional carrier.

F. Curtains: Hang curtains on each curtain track.

END OF SECTION 102123

SECTION 102213 - WIRE MESH PARTITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Heavy-duty wire mesh partitions.

B. Related Sections:

   1. Division 03 Section "Cast-in-Place Concrete" for building anchors into concrete construction for wire mesh partitions.
   2. Division 04 Section "Unit Masonry" for building anchors into masonry construction for wire mesh partitions.
   3. Division 08 Section "Door Hardware" for door cylinders.
   4. Division 09 Section "Painting" for field painting wire mesh items.
   5. Division 32 Section "Chain Link Fences and Gates" for chain-link fencing.

1.3 DEFINITIONS

A. As defined in ASTM E 2016:
   1. Lock Crimp: Deep crimps at points of the intersection that lock wires securely in place.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design wire mesh units, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Wire mesh units shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to SEI/ASCE 7:

   1. Seismic Loads: As indicated.
   2. Live Loads: Horizontal load of 5 lbs/sf.
   3. Impact Load: 200 lbs applied horizontally anywhere along the partition.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wire mesh items.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Include clearances required for operation of doors and gates.

C. Setting Drawings: For anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: 12-by-12-inch panel constructed of specified frame members and wire mesh. Show method of finishing members at intersections.

F. Delegated-Design Submittal: For wire mesh units indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by a Connecticut licensed professional engineer responsible for their preparation.

G. Maintenance Data: For wire mesh unit hardware to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Installer's responsibilities include fabricating and installing wire mesh items and providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of data for wire mesh items, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Source Limitations: Obtain wire mesh items from single source from single manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver wire mesh items palleted to provide protection during transit and Project-site storage. Use vented plastic.

B. Inventory wire mesh partition door hardware on receipt and provide secure lockup for wire mesh partition door hardware delivered to Project site.

1. Tag each item or package separately with identification and include basic installation instructions with each item or package.

C. Deliver keys to Owner.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of construction contiguous with wire mesh units by field measurements before fabrication.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Locks: Equal to 1 lock for each type indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acorn Wire & Iron Works, Inc.
2. American Woven Wire Corporation.
3. California Wire Products Corporation.
4. Central Wire and Iron.
5. Donaldson, R. J., Inc.
6. Folding Guard Corporation.
7. G-S Company (The).
8. Indiana Wire Products, Inc.
9. Jesco Industries, Inc.
10. Kenco Wire and Iron Products Inc.
11. Kentucky Metal Products Co.
12. King Wire Partitions, Inc.
13. Lakeside Wire and Iron Company.
14. Miller Wire Works, Inc.
15. Newark Wire Works Inc.
16. Standard Wire & Steel Works.
17. Wire Crafters, LLC.

2.2 MATERIALS

A. Steel Wire: ASTM A 510.

B. Steel Plates, Channels, Angles, and Bars: ASTM A 36/A 36M.

C. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

D. Steel Pipe: ASTM A 53/A 53M, Schedule 40 unless another weight is indicated or required by structural loads.

E. Square Steel Tubing: ASTM A 500, cold-formed structural-steel tubing.

F. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.

G. Panel-to-Panel Fasteners: Manufacturer's standard steel bolts, nuts, and washers.

H. Postinstalled Expansion Anchors: With capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Carbon Steel: Zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition (mild).
2. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
3. For Postinstalled Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

I. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated and 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 wire mesh construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

J. Seismic Bracing: Angles with legs not less than 1-1/4 inch wide, formed from 0.04-inch- thick, metallic-coated steel sheet; with bolted connections and 1/4-inch- diameter bolts.

K. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.3 HEAVY-DUTY WIRE MESH PARTITIONS

A. Mesh: 0.192-inch- diameter, intermediate-crimp steel wire woven into 2-inch diamond mesh.

B. Vertical and Horizontal Panel Framing: 1-1/2-by-3/4-by-1/4-inch cold-rolled steel channels; with 3/8-inch- diameter bolt holes spaced not more than 18 inches o.c. along center of framing. Provide vertical panel stiffeners in shapes and sizes as recommended by manufacturers.

C. Horizontal Panel Stiffeners: 2 cold-rolled steel channels, not less than 1 by 1/2 by 1/8 inch, bolted or riveted toe to toe through mesh or 1-1/2-by-3/4-by-1/8-inch cold-rolled steel channels with wire woven through.

D. Top Capping Bars: 3-inch-by-4.1-lb hot-rolled steel channels.

E. Posts for 90-Degree Corners: 2-by-2-by-1/8-inch steel angles with 3/8-inch- diameter bolt holes aligning with bolt holes in vertical framing; with floor anchor clips.

F. Posts for Other-Than-90-Degree Corners: Manufacturer's standard steel 2-inch- OD pipe or tubing with 3/8-inch- diameter bolt holes aligning with bolt holes in vertical framing.

G. Line Posts: 3-inch-by-4.1-lb or 3-1/2-by-1-1/4-by-0.1265-inch steel channels; with 5-by-18-by-1/4-inch steel base plates punched for attachment to floor.

H. Floor Shoes: Steel, cast iron, or cast aluminum, not less than 2 inches high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.

I. Swinging Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/2-by-3/4-by-1/8-inch steel channels or C-channels, banded with 1-1/2-by-1/8-inch flat steel bar cover plates on 4 sides, and with 1/8-inch- thick angle strike bar and cover on strike jamb.

1. Hinges: Full-surface type, 3-1/2-by-3-1/2-inch steel, 1-1/2 pairs per door; bolted, riveted, or welded to door and jamb framing.
2. Padlock Lug: Mortised into door framing and enclosed with steel cover.
3. Cylinder Lock: Mortise type with cylinder specified in Division 08 Section "Door Hardware"; operated by key outside and lever inside.

J. Swinging Dutch Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/2-by-3/4-by-1/8-inch steel channels or C-channels, banded with 1-1/2-by-1/8-inch flat steel bar cover plates on 4 sides, and with 1/8-inch- thick angle strike bar and cover on strike jamb.

1. Hinges: Full-surface type, 3-1/2-by-3-1/2-inch steel, 1 pair per section of door (top and bottom); bolted, riveted, or welded to door and jamb framing.
2. Cylinder Lock: Mortise type with cylinder specified in Division 08 Section "Door Hardware" operated by key outside and lever inside.
3. Bolt: Mounted in, securing upper section of door.
4. Shelf: Fabricated from 0.097-inch- thick, cold-rolled steel sheet, 12 inches deep by full width of door; with corners rounded and edges finished smooth; mounted on top of lower section of door and braced with manufacturer's standard brackets.

K. Accessories:
1. Adjustable Filler Panels: Not less than 0.0598-inch- thick, cold-rolled steel sheet; capable of filling openings from 2 to 12 inches.
2. Wall Clips: Manufacturer's standard, cold-rolled steel sheet; allowing up to 1 inch of adjustment.

L. Finish for Uncoated Ferrous Steel: Powder-coated finish unless otherwise indicated.

1. Color: As selected by Architect from manufacturer's full range.

2.4 WIRE MESH STAIRWAY PARTITIONS

A. Heavy-Duty Stairway Partitions:
   1. Square Mesh: 0.192-inch- diameter, lock-crimp steel wire woven into 2-inch square pattern, inserted through frame holes and welded into frame. Vertical wires are plumb, and horizontal wires are perpendicular to vertical wires.
   2. Vertical and Horizontal Panel Framing: 1-1/2-by-3/4-by-0.0966-inch cold-rolled, C-shaped steel channels; with 3/8-inch- diameter bolt holes spaced not more than 18 inches o.c. along center of framing.
   3. Horizontal Panel Stiffeners: 1-1/2-by-3/4-by-1/8-inch cold-rolled steel channels with wire woven through, or two 1-by-1/2-by-1/8-inch cold-rolled steel channels bolted or riveted toe to toe through mesh.

B. Door Jamb Framing: 2-by-2-by-1/8-inch steel pipe or tubing.

C. Floor Shoes: Steel, cast iron, or cast aluminum, not less than 2 inches high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.

D. Wall Clips: Manufacturer's standard, cold-rolled steel sheet; allowing up to 1 inch of adjustment.

E. Finish for Uncoated Ferrous Steel: Powder-coated finish unless otherwise indicated.

   1. Color: As selected by Architect from manufacturer's full range.

2.5 FABRICATION

A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. As required for complete installation, provide bolts, hardware, and accessories with manufacturer's standard finishes.

   1. Fabricate wire mesh items to be readily disassembled.
   2. Welding: Weld corner joints of framing and finish sand.

B. Heavy-Duty Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.

   1. Mesh: Securely clinch mesh to framing.
   2. Framing: Fabricate framing with mortise and tenon corner construction.

      a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
      b. Fabricate partition and door framing with slotted holes for connecting adjacent panels.

   3. Fabricate wire mesh partitions with 3 inches of clear space between finished floor and bottom horizontal framing.

4. Fabricate wire mesh partitions with bottom horizontal framing flush with finished floor.
5. Doors: Align bottom of door with bottom of adjacent panels.

   a. For doors that do not extend full height of partition, provide transom over door, fabricated from same mesh and framing as partition panels.

6. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing as required to install hardware.

C. Wire Mesh Stairway Partitions: Provide door jamb framing on each side of doors. Attach tamper shields centered behind exit devices.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.7 STEEL AND IRON FINISHES

A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

B. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

C. Shop Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard one-coat, shop-coat finish suitable for use intended. Comply with paint manufacturer's written instructions for applying and curing.

D. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, baked-on finish, suitable for use indicated, consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine floors for suitable conditions where wire mesh items will be installed.

C. Examine walls to which wire mesh items will be attached for properly located blocking, grounds, and other solid backing for attachment of support fasteners.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 WIRE MESH PARTITIONS ERECTION

A. Anchor wire mesh partitions to floor with 3/8-inch- diameter, postinstalled expansion anchors at 12 inches o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.

1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.

B. Anchor wire mesh partitions to walls at 12 inches o.c. through back corner panel framing and 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.

C. Secure top capping bars to top framing channels with 1/4-inch- diameter "U" bolts spaced not more than 28 inches o.c.

D. Provide line posts at locations indicated or, if not indicated, as follows:
1. For partitions that are 7 to 9 feet high, spaced at 15 to 20 feet o.c.
2. For partitions that are 10 to 12 feet high, located between every other panel.
3. For partitions that are more than 12 feet high, located between each panel.

E. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.

F. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.

G. Install doors complete with door hardware.

H. Bolt accessories to wire mesh partition framing.

3.3 WIRE MESH STAIRWAY PARTITIONS ERECTION

A. Anchor wire mesh stairway partitions to floor with 3/8-inch- diameter, postinstalled expansion anchors at 12 inches o.c. through floor shoes located at each post. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.

1. Anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if indicated on Shop Drawings.

B. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.

3.4 ADJUSTING AND CLEANING

A. Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Remove and replace defective work including doors and framing that are warped, bowed, or otherwise unacceptable.

C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

D. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

END OF SECTION 102213

SECTION 102226.13 - ACCORDION FOLDING PARTITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Manually operated, accordion folding partitions.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for supports that attach supporting tracks to overhead structural system.

1.3 DEFINITIONS

A. STC: Sound Transmission Class.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design accordion folding partitions, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Seismic Performance: Accordion folding partitions shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Acoustical Performance: Provide accordion folding partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:

1. Sound-Transmission Requirements: Accordion folding partition assembly tested in a laboratory for sound transmission loss performance according to ASTM E 90, calculated according to ASTM E 413, and rated for not less than the STC value indicated.

1.5 SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Indicate storage and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.
2. Indicate facing-material seam locations if any.

C. Samples for Initial Selection: For each type of exposed material, facing material, and finish indicated.

1. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed material, facing material, and finish indicated, prepared on Samples of size indicated below:
1. Facing Material: Manufacturer's standard-size unit, not less than 3 inches square.
2. Edge Material: Not less than full width by 3 inches long.
3. Hardware: Manufacturer's standard exposed door-operating device.

E. Delegated-Design Submittal: For accordion folding partitions indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for seismic restraints.

F. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.

G. Product Certificates: For each type of accordion folding partition, from manufacturer.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each accordion folding partition.

I. Operation and Maintenance Data: For accordion folding partitions to include in maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Facing materials and finishes for exposed trim and accessories. Include precautions for cleaning materials and methods that could be detrimental to finishes and performance.
2. Seals, hardware, track, carriers, and other operating components.

J. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Fire-Test-Response Characteristics: Provide partitions with finishes meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.

   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.

2. Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 286.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of accordion folding partition openings by field measurements before fabrication.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of accordion folding partitions that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:

      a. Faulty operation of accordion folding partitions.
      b. Deterioration of metals, metal finishes, and other materials beyond normal wear.

   2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

2.2 ACCORDION FOLDING PARTITION

A. Accordion Folding Partition: Accordion folding frame with hinged sections designed for horizontal extension and retraction, covered with decorative facing material, reinforced for hardware attachment, supported by overhead suspension system, and equipped with manufacturer's standard air-release method to prevent billowing.

   1. Basis-of-Design Product: Subject to compliance with requirements, provide Cornell Iron Works, Inc; Tranzform Sound model ESP20 or comparable product by one of the following:

      a. Curtition; a division of T&C Industries, Inc.
      b. Holcomb & Hoke Mfg. Co., Inc.
      c. Hufcor, Inc.
      d. KWIK-WALL Company.
      e. Moderco Inc.
      f. Modernfold, Inc.; a DORMA Group company.

g. Panelfold Inc.
h. Won-Door Corporation.
i. Woodfold Mfg., Inc.

B. Partition Type: As indicated on Drawings with the following hardware:
1. Lead Post Locking Hardware: Key-operated lock cylinder, keyed to master key system, operable from both sides of post.
2. Meeting Post: Attached, with meeting/closing arrangement as indicated on Drawings.
3. Storage-End Hardware: Sliding jamb within storage pocket.
4. Pendant Pull: Near top of lead post in addition to standard pull handle/latch.

C. STC Rating: 45.

D. Dimensions:

1. Stack Width (Stored): Maximum 13-1/2 inches.
2. Width When Extended: Maximum 12 inches.
3. Total Stack Depth (Stored): Maximum 8'-5".

E. Facing Material: Vinyl film.

1. Color/Pattern: As selected by Architect from manufacturer's full range.

2.3 COMPONENTS

A. Posts and Seals: Provide types of posts and seals that produce accordion folding partitions complying with performance requirements.

1. Posts: Steel or aluminum; formed with deep-nesting and interlocking interfaces and fabricated to ensure rigidity of accordion folding partition.
2. Perimeter Seals: Manufacturer's standard vinyl, neoprene, or woven silica vertical seals, horizontal top and bottom seals, and closures for lead posts and jambs.

B. Hardware: Manufacturer's standard manually operated pulls, latches, locks, and bolts as required to operate accordion folding partitions; with decorative, protective finish.

C. Trim: Manufacturer's standard with decorative, protective finish.

D. Tiebacks: As required to maintain accordion folding partitions in stacked position; with manufacturer's standard finish.

2.4 SUSPENSION SYSTEMS

A. Suspension Tracks: Steel or aluminum mounted directly to overhead structural support,] [with adjustable steel hanger rods for overhead support, designed for type of operation, size, and weight of accordion folding partition indicated. Size track to support partition operation and storage without damage to suspension system, accordion folding partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports.

Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.

B. Carriers: Trolley system as required for size and weight of partition and for easy, quiet operation; with manufacturer's standard ball-bearing carriers at lead post and manufacturer's standard ball-bearing carriers at intermediate panel supports.

1. Wheels: Manufacturer's standard.

C. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.

D. Steel Finish: Factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

2.5 FACING MATERIALS

A. General: Provide facing materials with appropriate backing that comply with indicated fire-test-response characteristics, and that are factory attached to accordion folding partitions with concealed fasteners.

1. Factory-apply facing material free of air bubbles, wrinkles, blisters, and other defects; with vertical invisible seams complying with Shop Drawings for location; and with no gaps or overlaps. Tightly secure and conceal raw and selvage edges of facing material for finished appearance. Horizontal butted edges or seams are not permitted.
2. Where facing material with directional or repeating pattern, directional weave, or matching grain is indicated, mark facing-material top and attach facing material in same direction.

B. Vinyl Film: Manufacturer's standard vinyl film laminated to partition substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of accordion folding partitions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with ASTM E 557 except as otherwise required by accordion folding partition manufacturer's written installation instructions. Install accordion folding partitions level and plumb, with tight joints and uniform appearance, and free of deformation and surface and finish irregularities.

B. Install accordion folding partitions and accessories after other finishing operations, including painting, have been completed.

3.3 ADJUSTING

A. Adjust accordion folding partitions to operate smoothly, without warping or binding. Lubricate hardware and other moving parts.

3.4 CLEANING

A. Clean soiled surfaces of accordion folding partitions, to remove dust, loose fibers, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain accordion folding partitions.

END OF SECTION 102226.13

SECTION 102800 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Public-use washroom accessories.
2. Custodial accessories.

B. Related Sections include the following:

1. Division 08 Section "Mirrors" for frameless mirrors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
1. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.

C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.

C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co. (GAMCO).

B. Toilet Tissue (Roll) Dispenser:

1. Basis-of-Design Product: Bobrick, B-4288.
2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
3. Mounting: Surface mounted.
4. Capacity: Designed for 5-inch- diameter tissue rolls.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

C. Grab Bar:

1. Basis-of-Design Product: Bobrick, B-5806.99.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/4 inches.
5. Configuration and Length: As indicated on Drawings.

D. Liquid-Soap Dispenser:

1. Basis-of-Design Product: Bobrick, B-212.
2. Description: Designed for dispensing soap in liquid or lotion form.
3. Mounting: Horizontally oriented, surface mounted.
4. Capacity: 40 oz.
5. Material and Finish: Stainless steel, No. 4 finish (satin).
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

E. Swing-Up Grab Bar:

1. Basis-of-Design Product: Bobrick, B-4112.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

    a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.

4. Outside Diameter: 1-1/4 inches.
5. Configuration and Length: Straight, 29 inches long.

F. Sanitary-Napkin Disposal Unit:

1. Basis-of-Design Product: Bobrick, B-270.
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

G. Sanitary-Napkin Disposal Unit:

1. Basis-of-Design Product: Bobrick, B-4354.
2. Mounting: Partition mounted.
3. Door or Cover: Self-closing disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

H. Paper Towel (Roll) Dispenser:

1. Basis-of-Design Product: Bobrick, B-2860.
2. Description: Lever-actuated mechanism permits controlled delivery of paper rolls in preset lengths per stroke.
3. Mounting: Surface mounted.
4. Minimum Capacity: 8-inch wide, 800-foot long roll.
5. Material and Finish: Stainless steel, No. 4 finish (satin).
6. Lockset: Tumbler type.

I. Combination Towel (Roll) Dispenser/Waste Receptacle:

1. Basis-of-Design Product: Bobrick, B-4369.
2. Description: Combination unit for dispensing preset length of roll paper towels, with removable waste receptacle.
3. Mounting: Semirecessed.
4. Minimum Towel-Dispenser Capacity: 8-inch wide, 800-foot long roll.
5. Minimum Waste Receptacle Capacity: 12 gal.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
7. Liner: Reusable, vinyl waste-receptacle liner.
8. Lockset: Tumbler type for towel dispenser compartment and waste receptacle.

J. Mirror Unit:

1. Basis-of-Design Product: Bobrick, B-165/B290.
2. Frame: Stainless-steel channel.

   a. Corners: Manufacturer's standard.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

   a. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

4. Size: As indicated on Drawings.

2.3 CUSTODIAL ACCESSORIES

A. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. General Accessory Manufacturing Co. (GAMCO).

B. Mop and Broom Holder: Provide for rooms C161 and 260.

1. Basis-of-Design Product: Bobrick, B-239.
2. Description: Unit with shelf, hooks, and holders.
3. Length: 34 inches.
4. Hooks: Four.
5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).

   a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.

2.4 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and re-supplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104415 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Portable fire extinguishers.
2. Fire-protection cabinets.
3. Mounting brackets for fire extinguishers.
4. High security key box.

1.2 SUBMITTALS

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

1. Fire Extinguishers: Include rating and classification.
2. Fire-Protection Cabinets: Include door hardware, cabinet type, trim style, panel style, and details of installation.

B. Maintenance data.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

C. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.4 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209.
2. Extruded Shapes: ASTM B 221.

C. Stainless-Steel Sheet: ASTM A 666, Type 304.

2.3 PORTABLE FIRE EXTINGUISHERS

A. Available Manufacturers:

1. Amerex Corporation.
2. Ansul Incorporated.
3. Badger Fire Protection.
4. Buckeye Fire Equipment Company.
5. Fire End & Croker Corporation.
6. General Fire Extinguisher Corporation.
7. JL Industries, Inc.
8. Kidde Fyrnetics.
9. Larsen's Manufacturing Company.
10. Modern Metal Products; Div. of Technico.
11. Moon American.
12. Potter Roemer; Div. of Smith Industries, Inc.
13. Watrous; Div. of American Specialties, Inc.

B. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet indicated.

1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

C. Multipurpose Dry-Chemical Type in Steel Container: In building areas A and C, provide UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

D. Multipurpose Dry-Chemical Type in Steel Container: In building areas B and D, provide UL-rated 4-A:80-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container..

2.4 FIRE-PROTECTION CABINET

A. Basis-of-Design Product: Larsen's "Architectural" or a comparable product by one of the following:

B. Available Manufacturers:

1. Fire End & Croker Corporation.
2. General Accessory Mfg. Co.
3. JL Industries, Inc.
4. Kidde Fyrnetics.
5. Larsen's Manufacturing Company.
6. Modern Metal Products; Div. of Technico.
7. Moon American.
8. Potter Roemer; Div. of Smith Industries, Inc.
9. Watrous; Div. of American Specialties, Inc.

C. Cabinet Type: Suitable for fire extinguisher.

D. Cabinet Construction: Match fire resistance rating of wall where cabinet is installed.

E. Cabinet Material: Enameled-steel sheet.

F. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.

G. Door Material: Aluminum sheet.

H. Door Style: Flush opaque panel, frameless, with no exposed hinges.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide manufacturer's standard.

J. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, with plated or baked-enamel finish.
2. Identification: Identify fire extinguisher in fire-protection cabinet with the words "**FIRE EXTINGUISHER**."

    1) Location: Applied to cabinet door.
    2) Application Process: Pressure-sensitive vinyl letters.
    3) Lettering Color: Black.
    4) Orientation: Vertical.

K. Finishes:

1. Aluminum: Class I, clear anodic coating complying with AAMA 611.

2.5 MOUNTING BRACKETS

A. Available Manufacturers:

1. Amerex Corporation.
2. Ansul Incorporated.
3. Badger Fire Protection.
4. Buckeye Fire Equipment Company.
5. Fire End & Croker Corporation.
6. General Fire Extinguisher Corporation.
7. JL Industries, Inc.
8. Larsen's Manufacturing Company.
9. Potter Roemer; Div. of Smith Industries, Inc.

B. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

1. Color: Black.

2.6 HIGH SECURITY KEY BOX

A. Basis-of-Design Product: Knox Company "3200 Series" or a comparable product.

B. Recessed Hinged Door Key Box: Manufacturer's standard ¼" plate steel housing, ½" thick steel door with interior gasket seal and stainless steel door hinge. Box and lock UL Listed.
1. Size: 7"H x 7"W recessed mount flange.

2. Color: Aluminum.

2.7 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth.

1. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.

B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.

C. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

D. Install fire-protection specialties in locations and at mounting heights indicated.

E. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

F. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

G. Identification: Apply vinyl lettering at locations indicated.

H. Adjust fire-protection cabinet doors to operate easily without binding.

I. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair.

END OF SECTION 104415

SECTION 105113 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. All-welded, heavy-duty metal lockers.
   2. Locker benches.

B. Related Sections include the following:

   1. Division 06 Section "Rough Carpentry" for furring, blocking, and shims required for installing metal lockers and concealed within other construction before metal locker installation.

1.3 DEFINITIONS

A. Uncoated Steel Sheet Thicknesses: Indicated as the minimum thicknesses.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

   1. Show base, sloping tops, filler panels, and recess trim and other accessories.
   2. Include locker identification system.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For metal lockers, in manufacturer's standard sizes.

E. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of metal locker manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain metal lockers and accessories through one source from a single manufacturer.

C. Regulatory Requirements: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)," ICC A117.1, and FED-STD-795, "Uniform Federal Accessibility Standards."
   1. Provide hardware that does not require tight grasping, pinching, or twisting of the wrist, and that operates with a force of not more than 5 lbf.
      a. Quantity: Provide compliant handles for 5% of lockers provided.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for metal locker installation.

B. Deliver combination control charts to Owner.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify the following by field measurements before fabrication and indicate measurements on Shop Drawings:

   1. Concealed framing, blocking, and reinforcements that support metal lockers before they are enclosed.
   2. Recessed openings.
   3. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish recessed opening dimensions and proceed with fabricating metal lockers without field measurements. Coordinate wall and floor construction to ensure that actual recessed opening dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below, before construction begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Full-size units of the following metal locker hardware items equal to 5 percent of amount installed for each type and finish installed, but no fewer than 5 units:

a. Locks.
b. Identification plates.
c. Hooks.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS) Type B, suitable for exposed applications.

B. Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.

C. Anchors: Select material, type, size, and finish required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.3 ALL-WELDED, METAL LOCKERS

A. Available Products:

1. Art Metal Products, Div. of Fort Knox Storage Co.; Champ Corridor Lockers.
2. DeBourgh Mfg. Co.; Sentry Corridor/Personnel Lockers.
3. List Industries Inc.; Marquis Protector Single-Point Latch Corridor Lockers.
4. Lyon Workspace Products; All-Welded Lockers.
5. Penco Products, Inc., Subsidiary of Vesper Corporation; All-Welded Lockers.

B. Locker Arrangement: Double tier.
   1. Size:
      a. All Corridors and Rooms B205A, B215, and C141A; 15"W x 15"D x 36"H.
      b. Rooms B108, B118, B120, B127, B158B, B164, B172, B181, and B189; 15"W x 18"D x 36"H.

C. Body: Assembled by welding body components together. Fabricate from unperforated, cold-rolled steel sheet with thicknesses as follows:

   1. Tops, Bottoms, and Sides: 0.0528 inch thick.
   2. Backs: 0.0428 inch thick.
   3. Shelves: 0.0528 inch thick, with double bend at front and single bend at sides and back.

D. Frames: Channel formed; fabricated from 0.0528-inch- thick, cold-rolled steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.

   1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.

E. Locker Base: Structural channels, formed from 0.0528-inch- thick, cold-rolled steel sheet; welded to front and rear of side-panel frames.

F. Doors: One-piece; fabricated from 0.0677-inch- thick, cold-rolled steel sheet; formed into channel shape with double bend at vertical edges, and with right-angle single bend at horizontal edges.
   1. Door Style: Vented panel as follows:

      a. Louvered Vents: Not less than three louver openings at top and bottom for double-tier lockers.

G. Hinges: Welded to door and attached to door frame with not less than 2 factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
   1. Continuous Hinges: Manufacturer's standard, steel, full height.

H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; pry resistant.

   1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks or padlocks; positive automatic and prelocking.

      a. Latch Hooks: Equip doors with 2 latch hooks; fabricated from minimum 0.1116-inch- thick steel; welded to full-height door strikes; with resilient silencer on each latch hook.
      b. Latching Mechanism: Manufacturer's standard rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

I. Combination Padlocks: Key-controlled, three-number dialing combination locks; capable of five combination changes.

J. Equipment: Equip each metal locker with identification plate and the following, unless otherwise indicated:
   1. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.

K. Accessories:

   1. Continuous Zee Base: Fabricated from, manufacturer's standard thickness, but not less than 0.060-inch nominal-thickness steel sheet.

      a. Height: 4 inches.

   2. Continuous Sloping Tops: Fabricated from minimum 0.048-inch- thick, cold-rolled steel sheet; approximately 20-degree pitch.

      a. Closures: Vertical-end type.

   3. Recess Trim: Fabricated from 0.048-inch- thick, cold-rolled steel sheet.
   4. Filler Panels: Fabricated from 0.048-inch- thick, cold-rolled steel sheet.
   5. Boxed End Panels: Fabricated from 0.048-inch- thick, cold-rolled steel sheet.

L. Finish: Baked enamel or powder coat.

   1. Colors: Provide four custom colors to match architects samples.

2.4 LOCKER BENCHES

A. Provide bench unit with overall assembly height of 17-1/2 inches.

B. Bench Top: Manufacturer's standard one-piece units, with rounded corners and edges.

   1. Width: 20-inch wide tops.

   2. Length: Provide minimum 42-inch long top.

   3. Thickness: 1-1/4-inch.
   4. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.

C. Fixed Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:

   1. Tubular Steel: 1-1/2-inch- diameter steel tubing threaded on both ends, with standard pipe flange at top and bell-shaped cast-iron base; with baked-enamel or powder-coat finish; anchored with exposed fasteners.

      a. Color: As selected by Architect from manufacturer's full range.

2.5 FABRICATION

A. General: Fabricate metal lockers square, rigid, and without warp; with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet, unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for a complete installation.

B. Unit Principle: Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.

C. All-Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections, with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.

D. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

E. Identification Plates: Manufacturer's standard etched, embossed, or stamped aluminum plates; with numbers and letters at least 3/8 inch high.

F. Continuous Base: Formed into channel or Z profile for stiffness, and fabricated in lengths as long as practicable to enclose base and base ends of metal lockers; finished to match lockers.

G. Continuous Sloping Tops: Fabricated in lengths as long as practicable, without visible fasteners at splice locations; finished to match lockers.

1. Sloped top corner fillers, mitered.

H. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practicable; finished to match lockers.

I. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip joint filler angle formed to receive filler panel.

J. Boxed End Panels: Fabricated with 1-inch- wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

2.6 STEEL SHEET FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Factory finish steel surfaces and accessories except stainless-steel and chrome-plated surfaces.

C. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond. Use manufacturer's standard methods.

D. Baked-Enamel Finish: Immediately after cleaning, pretreating, and phosphatizing, apply manufacturer's standard thermosetting baked-enamel finish. Comply with paint manufacturer's written instructions for application, baking, and minimum dry film thickness.

E. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion, using concealed fasteners.
2. Anchor single rows of metal lockers to walls near top of lockers and to floor.

B. All-Welded Metal Lockers: Connect groups of all-welded metal lockers together with standard fasteners, with no exposed fasteners on face frames.

C. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification indicated on Drawings.

    a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

4. Attach recess trim to recessed metal lockers with concealed clips.
5. Attach filler panels with concealed fasteners. Locate fillers panels where indicated on Drawings.
6. Attach sloping top units to metal lockers, with closures at exposed ends.

7. Attach boxed end panels with concealed fasteners to conceal exposed ends of nonrecessed metal lockers.

D. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit metal locker use during construction.

C. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal locker manufacturer.

END OF SECTION 105113

SECTION 107500 - FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes wall-mounted aluminum flagpoles.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:

1. Seismic Loads: According to SEI/ASCE 7.
2. Wind Loads: According to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles."
3. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole.

1.3 SUBMITTALS

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

B. Delegated-Design Submittal: For flagpole assemblies indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include loads, point reactions, and locations for attachment of flagpoles to building's structure.

C. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Flagpole; a Kearney-National Inc. company.
2. Atlantic Fiberglass Products, Inc.
3. Baartol Company.

4. Concord Industries, Inc.
5. Eder Flag Manufacturing Company, Inc.
6. Ewing Flagpoles.
7. Lingo Inc.; Acme Flagpole Company Division.
8. Millerbernd Manufacturing Company.
9. Morgan-Francis; Division of Original Tractor Cab Co., Inc.
10. PLP Composite Technologies, Inc.
11. Pole-Tech Company Inc.
12. U.S. Flag & Flagpole Supply, LP.
13. USS Manufacturing Inc.

2.2 FLAGPOLE

A. Exposed Height: 30 feet.

B. Aluminum Flagpoles: Provide entasis-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.

C. Wall Mount: Cast-aluminum mounting bracket complete with escutcheon, mounting plate and through-wall anchorage; vertical type. Provide units with same finish as flagpole.

D. Finial Ball: Manufacturer's standard flush-seam ball, sized to match flagpole-butt diameter. Fabricate from 0.063-inch spun aluminum, finished to match flagpole.

E. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch- diameter, braided polypropylene halyard and 9-inch cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.

F. Halyard Flag Snaps: Provide two swivel snap hooks per halyard.

2.3 MISCELLANEOUS MATERIALS

A. Elastomeric Joint Sealant: Joint sealant complying with requirements in Division 07 Section "Joint Sealants."

2.4 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

B. Mounting Brackets and Bases: Anchor brackets and bases securely through to structural support with fasteners as indicated on Shop Drawings.

END OF SECTION 107500

SECTION 115000 - EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes furnishing and installing equipment indicated on Drawings and schedules.

B. Owner-Furnished Equipment: Where indicated, Owner will furnish equipment items.

C. Related Sections include the following:

1. Refer to Divisions 21, 22, and 23 Sections for supply and exhaust fans; exhaust ductwork; service roughing-ins; drain traps; vents; valves, pipes, and fittings; fire-extinguishing systems; and other materials required to complete equipment installation.
2. Refer to Division 26 Sections for wiring, disconnects, and other electrical materials required to complete equipment installation.

1.3 SUBMITTALS

A. Product Data: For each type of equipment indicated. Include manufacturer's model number and accessories and requirements for access and maintenance clearances, water and drainage, power or fuel, and service-connections including roughing-in dimensions.

B. Shop Drawings: For equipment not manufactured as standard production and catalog items by manufacturers. Include plans, elevations, sections, roughing-in dimensions, fabrication details, service requirements, and attachments to other work.

1. Wiring Diagrams: Details of wiring for power, signal, and control systems and differentiating between manufacturer-installed and field-installed wiring.
2. Piping Diagrams: Details of piping systems and differentiating between manufacturer-installed and field-installed piping.

C. Coordination Drawings: For locations of equipment and service utilities. Key equipment with item numbers and descriptions indicated in Contract Documents. Include plans and elevations of equipment, access- and maintenance-clearance requirements, details of concrete or masonry bases and floor depressions, and service-utility characteristics.

D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for exposed products with selectable color finishes.

E. Product Certificates: Signed by manufacturers or their authorized agents certifying that systems furnished comply with requirements.

F. Maintenance Data: Operation, maintenance, and parts data for equipment to include in the maintenance manuals specified in Division 1. Include a product schedule as follows:

1. Product Schedule: For each equipment item, include item number and description indicated in Contract Documents, manufacturer's name and model number, and authorized service agencies' addresses and telephone numbers.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage experienced installers to perform work of this Section, who are authorized by the equipment manufacturers, who have completed installations similar in design and extent to that indicated for this Project, and who have a record of successful in-service performance.

B. Manufacturer Qualifications: Engage firms experienced in manufacturing equipment indicated for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain each type of equipment through one source from a single manufacturer.

D. Product Options: Drawings indicate equipment based on the specific products indicated. Other manufacturers' equipment with equal size and performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

E. Regulatory Requirements: Comply with National Fire Protection Association (NFPA) codes, including but not limited to:

1. NFPA 17, "Dry Chemical Extinguishing Systems."
2. NFPA 17A, "Wet Chemical Extinguishing Systems."
3. NFPA 54-99, "National Fuel Gas Code."
4. NFPA 70-02, "National Electrical Code."
5. NFPA 33, “Standard for Spray Application Using Flammable or Combustible Materials.”
6. NFPA 86, “Standard for Ovens and Furnaces.”
7. NFPA 91, “Standard for Exhaust Systems for Air Conveying of Materials.”

F. Listing and Labeling: Provide electrically operated equipment or components specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

G. AGA Certification: Provide gas-burning equipment certified by the American Gas Association (AGA).

H. ASME Compliance: Fabricate and label steam-generating and closed steam-heating equipment to comply with ASME Boiler and Pressure Vessel Code.

I. ASHRAE Compliance: Provide mechanical refrigeration systems complying with the American Society of Heating, Refrigerating and Air-Conditioning Engineers' ASHRAE 15, "Safety Code for Mechanical Refrigeration."

J. ANSI Standards: Comply with applicable ANSI standards for electric-powered and gas-burning appliances; for piping to compressed-gas cylinders; and for plumbing fittings, including vacuum breakers and air gaps, to prevent siphonage in water piping.

K. Seismic Restraints: Provide seismic restraints for equipment according to the Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

L. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Review methods and procedures related to equipment including, but not limited to, the following:

1. Review access requirements for equipment delivery.
2. Review equipment storage and security requirements.
3. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
4. Review structural loading limitations.
5. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver equipment as factory-assembled units with protective crating and covering.

B. Store equipment in original protective crating and covering and in a dry location.

1.6 COORDINATION

A. Coordinate equipment layout and installation with other work, including light fixtures, HVAC equipment, and fire-suppression system components.

B. Coordinate location and requirements of service-utility connections.

C. Coordinate size, location, and requirements of concrete bases, positive slopes to drains, floor depressions, and other items. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be

in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Warranty Period: Manufacturer's standard warrantee but not less than 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless-Steel Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304, stretcher leveled, and in finish specified in "Stainless-Steel Finishes" Article.

B. Stainless-Steel Tube: ASTM A 554, Grade MT-304, and in finish specified in "Stainless-Steel Finishes" Article.

C. Zinc-Coated Steel Sheet: ASTM A 653, G115 coating designation; commercial quality; cold rolled; stretcher leveled; and chemically treated.

D. Zinc-Coated Steel Shapes: ASTM A 36, zinc-coated according to ASTM A 123 requirements.

E. Plastic Laminate: Complying with NEMA LD 3 and NSF 35 requirements; NSF certified for end-use application indicated; 0.050 inch thick for horizontal and vertical surfaces and 0.042 inch thick for post-formed surfaces; smooth texture; and easily cleanable.

1. Color: As selected by Architect from manufacturer's full range of colors.

F. Plywood and Lumber: Provide plywood and lumber as specified in Division 6 Section "Interior Architectural Woodwork."

G. Sealant: Provide sealants as specified in Division 7 Section "Joint Sealants".

H. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), Class 1 (clear), Quality q3 (glazing select). Provide products complying with ANSI Z97.1, manufactured by horizontal (roller-hearth) process, and 6 mm thick, unless otherwise indicated. Provide exposed safety edges, if any, seamed before tempering.

2.2 FABRICATION, GENERAL

A. Factory assemble equipment to greatest extent possible.

B. Welding: Use welding rod of same composition as metal being welded. Use methods that minimize distortion and develop strength and corrosion resistance of base metal. Provide ductile welds free of mechanical imperfections such as gas holes, pits, or cracks.

1. Welded Butt Joints: Provide full-penetration welds for full-joint length.
2. Grind exposed welded joints flush with adjoining material and polish to match adjoining surfaces.

3. Coat unexposed stainless-steel welded joints with suitable metallic-based paint to prevent corrosion.
4. After zinc-coated steel is welded, clean welds and abraded areas and apply SSPC-Paint 20, high-zinc-dust-content, galvanizing repair paint to comply with ASTM A 780.

C. Fabricate field-assembled equipment prepared for field-joining methods indicated. For metal butt joints, comply with referenced SMACNA standard, unless otherwise indicated.

D. Where stainless steel is joined to a dissimilar metal, use stainless-steel welding material or fastening devices.

E. Form metal with break bends that are not flaky, scaly, or cracked in appearance; where breaks mar uniform surface appearance of material, remove marks by grinding, polishing, and finishing.

F. Sheared Metal Edges: Finish free of burrs, fins, and irregular projections.

G. Cap exposed fastener threads with stainless-steel lock washers and stainless-steel cap (acorn) nuts.

H. Provide pipe slots on equipment with turned-up edges and sized to accommodate service and utility lines and mechanical connections.

I. Seismic Restraints: Fabricate to comply with referenced SMACNA standard, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, service-utility connections, and other conditions affecting installation and performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine roughing-in for piping, mechanical, and electrical systems to verify actual locations of connections before installation.

3.2 INSTALLATION, GENERAL

A. Install equipment level and plumb, according to manufacturer's written instructions, original design, and referenced standards.

B. Complete equipment field assembly, where required, using methods indicated.

1. Provide closed butt and contact joints that do not require a filler.

2. Grind field welds on stainless-steel equipment smooth, and polish to match adjacent finish. Comply with welding requirements in "Fabrication, General" Article.

C. Install equipment with access and maintenance clearances according to manufacturer's written instructions and requirements of authorities having jurisdiction.

D. Provide cutouts in equipment, neatly formed, where required to run service lines through equipment to make final connections.

E. Except for mobile and adjustable-leg equipment, securely anchor and attach items and accessories to walls, floors, or bases with stainless-steel fasteners, unless otherwise indicated.

F. Install seismic restraints according to referenced SMACNA standard.

G. Install trim strips and similar items requiring fasteners in a bed of sealant. Fasten with stainless-steel fasteners at 48 inches o.c. maximum.

H. Install sealant in joints between equipment and abutting surfaces with continuous joint backing, unless otherwise indicated.

3.3 PROTECTING

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure equipment is without damage or deterioration at the time of Substantial Completion.

3.4 COMMISSIONING

A. Startup Services: Engage factory-authorized service representatives to perform startup services and to demonstrate and train Owner's maintenance personnel as specified below.

1. Coordinate equipment startup with service-utility testing, balancing, and adjustments.
2. Remove protective coverings and clean equipment, both inside and out, and relamp equipment with integral lighting. Where applicable, comply with manufacturer's written cleaning instructions.
3. Test each equipment item for proper operation. Repair or replace equipment that is defective in operation, including units that operate below required capacity or that operate with excessive noise or vibration.
4. Test refrigeration equipment's ability to maintain specified operating temperature under heavy-use conditions. Repair or replace equipment that does not maintain specified operating temperature.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
6. Test motors and rotating equipment for proper rotation and lubricate moving parts according to manufacturer's written instructions.
7. Test water, drain, gas, steam, oil, refrigerant, and liquid-carrying components for leaks. Repair or replace leaking components.

8. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance for each equipment item.
9. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Contract Closeout" and Division 1 Section "Operation and Maintenance Data".
10. Schedule training with Owner with at least 7 days' advance notice.

3.5 EQUIPMENT SCHEDULE: See Drawings for Quantities.

A. AUTO BODY SHOP

1. ITEM # AB4: SPRAY BOOTH, DOWN DRAFT TYPE

Global Finishing Solutions
Model: Ultra Cabin
Size: 14' wide x 9' high x 24' long (inside)
12,000 CFM 34" tube-axial exhaust fan, 10 HP direct-drive intake motor, and automatic pressure control via exhaust mounted Variable Frequency Drive. Provide soft start and economy mode where booth airflow slows by 50% when technician has not pulled the trigger of the spray gun for more than pre-set time. Interlock exhaust with booth compressed air to prohibit use of paint spray when exhaust is not running.
1,200,000 BTU/HR gas direct-fire burner.
Dual skin insulated panel construction.
Provide all items required for a complete installation.

2. ITEM # AB10: FLAMMABLE STORAGE CABINET

Eagle Manufacturing Company
Model 1947 Safety Cabinet
Capacity: 45 gallons.

3. ITEM # AB3: PREP STATION, DOWN DRAFT TYPE

Global Finishing Solutions
Model Number 9330
Size: 12' wide x 9' high x 20-6"' long (inside)
12,000 CFM, 10 HP, direct drive backward inclined fan.
Provide all items required for a complete installation.

4. ITEM # AB8: WELDING CURTAIN

Tempro Tec Inc
Model TecGlass GL 2025/9383
Welding Curtain: 6'-0" high, 100% fiberglass yarns, 0.055" thick, 24 oz./yd, FM 4950 approved, with grommets and rollerhooks with reinforced top and bottom panels. Color as selected by Architect from manufacturers full range.
Curtain Track: See section 102123 for requirements for welding curtain tracks and carriers.

5. ITEM # AB7: MINI SPRAY BOOTH

Global Finishing Solutions
Model Number IFPX-876

125 FPM Air Velocity
Size: 8'-4" wide x 7'-2" high x 9'-2" deep
7000 CFM, 2 HP, 460/3 Booth Mounted Fan, One class 1 division 2, 4 tube fluorescent light fixture with T-8 color corrected lamps.
Paint arrestor filters with one complete replacement set, manometer, top exhaust outlet.
Accessories: Motor starter, safety interlocks, light switches, air solenoid and interlocks to prevent spraying when exhaust is not operating.
Provide all items required for a complete installation.

6. ITEM # AB5: PAINT MIXING BOOTH

Global Finishing Solutions
Size: Custom 12'' wide x 6' deep x 10' high
1150 CFM, ½ HP Centrifugal Fan
Paint Mix Room, with two lights and two doors (modified door arrangement).
Accessories: Provide side observation window, exhaust stack kit, and remote roof mounted exhaust fan.
Provide all items required for a complete installation.
Attach to, and coordinate with, spray booth.

7. ITEM # AB18: CENTRAL VAC

Managed Air Systems, LLC
Pulse Jet Cartridge Filter Vacuum System by Eurovac Inc.
Provide two (2) 8.5 HP vacuum pumps, separator with waste receptacle and cartridge filter, and control panel.
Provide all items required for a complete installation.

B. AUTO MECHANICS

1. ITEM # AM11: FLAMMABLE STORAGE CABINET

Eagle Manufacturing Company
Model 1947 Safety Cabinet
Capacity: 45 gallons.

2. ITEM # AM9: WELDING CURTAIN

Tempro Tec Inc
Model TecGlass GL 2025/9383
Welding Curtain: 6'-0" high, 100% fiberglass yarns, 0.055" thick, 24 oz./yd, FM 4950 approved, with grommets and rollerhooks with reinforced top and bottom panels. Color as selected by Architect from manufacturers full range.

Curtain Track: See section 102123 for requirements for welding curtain tracks and carriers.

C. CARPENTRY SHOP

1. ITEM # C26: FLAMMABLE STORAGE CABINET

Eagle Manufacturing Company
Model 1947 Safety Cabinet
Capacity: 45 gallons.

D. HVAC SHOP

1. ITEM # H17: FLAMMABLE STORAGE CABINET

Eagle Manufacturing Company
Model 1947 Safety Cabinet
Capacity: 45 gallons.

E. MANUFACTURING TECHNOLOGY

1. ITEM # M36: FLAMMABLE STORAGE CABINET

Eagle Manufacturing Company
Model 1947 Safety Cabinet
Capacity: 45 gallons.

F. PLUMBING SHOP

1. ITEM # P5: WELDING CURTAIN

Tempro Tec Inc
Model TecGlass GL 2025/9383
Welding Curtain: 6'-0" high, 100% fiberglass yarns, 0.055" thick, 24 oz./yd, FM 4950 approved, with grommets and rollerhooks with reinforced top and bottom panels. Color as selected by Architect from manufacturers full range.
Curtain Track: See section 102123 for requirements for welding curtain tracks and carriers.

2. ITEM # P1: FLAMMABLE STORAGE CABINET

Eagle Manufacturing Company
Model 1947 Safety Cabinet

Capacity: 45 gallons.

G. HEALTH TECHNOLOGY

1. ITEM # HT1: HEADWALL

Modular Services Company
Model 7111-IR
Quantity: 4

H. SERVICE GARAGE

1. ITEM # SG1: FLAMMABLE STORAGE CABINET

Eagle Manufacturing Company
Model 1992 Safety Cabinet
Capacity: 90 gallons.
Quantity: 2

I. PREP A224, A227

1. ITEM # SC1: FLAMMABLE STORAGE CABINET

Eagle Manufacturing Company
Model 1992 Safety Cabinet
Capacity: 90 gallons.
Quantity: 1 per room, 2 total.

END OF SECTION 115000

SECTION 115213 - PROJECTION SCREENS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Manually operated projection screens.
2. Electrically operated projection screens and controls.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for metal support framing for projection screens.
2. Division 26 Sections for electrical service and connections including device boxes for switches and conduit, where required, for low-voltage control wiring.

1.3 DEFINITIONS

A. Gain of Front-Projection Screens: Ratio of light reflected from screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per SMPTE RP 94.

1.4 SUBMITTALS

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

B. Shop Drawings: For projection screens. Show layouts and types of projection screens. Include the following:

1. For electrically operated projection screens and controls:

a. Location of screen centerline relative to ends of screen case.
b. Location of wiring connections for electrically operated units.
c. Location of seams in viewing surfaces.
d. Drop lengths.
e. Anchorage details, including connection to supporting structure for suspended units.
f. Details of juncture of exposed surfaces with adjacent finishes.
g. Accessories.

h. Wiring diagrams.

C. Samples for Initial Selection: For finishes of surface-mounted screen cases.

D. Maintenance Data: For projection screens to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations for Projection Screens: Obtain projection screens from single manufacturer. Obtain accessories, including necessary mounting hardware, from screen manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Environmental Limitations: Do not deliver or install projection screens until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Store rear-projection screens in manufacturer's protective packaging and according to manufacturer's written instructions.

1.7 COORDINATION

A. Coordinate layout and installation of projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, and partitions.

PART 2 - PRODUCTS

2.1 MANUALLY OPERATED PROJECTION SCREENS

A. General: Manufacturer's standard spring-roller-operated units, consisting of case, screen, mounting accessories, and other components necessary for a complete installation.

1. Screen Mounting: Top edge securely anchored to a 3-inch- diameter, rigid steel roller; bottom edge formed into a pocket holding a tubular metal slat, with ends of slat protected by plastic caps, and with a saddle and pull attached to slat by screws.

B. Surface-Mounted, Metal-Encased, Manually Operated Screens: Units designed and fabricated for surface mounting on wall or ceiling, fabricated from formed-steel sheet not less than 0.027 inch thick or from aluminum extrusions; with flat back design and vinyl covering or baked-enamel finish. Provide units with matching end caps and concealed mounting.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Bretford, Inc.; Series 65.
   b. Da-Lite Screen Company; Model C.
   c. Draper Inc.; Luma 2.

2.2 ELECTRICALLY OPERATED PROJECTION SCREENS

A. General: Manufacturer's standard units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Provide units that are listed and labeled as an assembly by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Controls: Remote, three-position control switch installed in recessed device box with flush cover plate matching other electrical device cover plates in room where switch is installed.
   a. Provide power supply for low-voltage systems if required.
   b. Provide key-operated, power-supply switch.

2. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
3. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch- diameter metal rod with ends of rod protected by plastic caps.
   a. Roller for motor in roller supported by vibration- and noise-absorbing supports.

B. Suspended, Electrically Operated Screens without Ceiling Closure: Motor-in-roller units designed and fabricated for suspended mounting, with bottom of case entirely or partially open under screen compartment.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Motor in Roller:

      1) BEI Audio-Visual Products; Alpine XL.
      2) Da-Lite Screen Company; Professional Electrol.
      3) Draper Inc.; Paragon.
      4) Stewart Filmscreen Corporation; Model A-B.
2. Provide metal or metal-lined wiring compartment on units with motor in roller.
3. Screen Case: Made from metal, wood, wood products, and fire-retardant materials.
4. Provide screen case constructed to be installed with underside flush with ceiling.
5. Finish on Exposed Surfaces: Prime painted.

C. Suspended, Electrically Operated Screens with Automatic Ceiling Closure: Motor-in-roller units designed and fabricated for suspended mounting; with bottom of case composed of two panels, fully enclosing screen, motor, and wiring; one panel hinged and designed to open and close automatically when screen is lowered and fully raised, the other removable or openable for access to interior of case.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Motor in Roller:

      1) Da-Lite Screen Company; Director Electrol.
      2) Draper Inc.; Signature/Series E.
      3) Stewart Filmscreen Corporation

2. Provide metal or metal-lined motor enclosure on units with end-mounted motor.
3. Provide metal or metal-lined wiring compartment on units with motor in roller.
4. Screen Case: Made from metal and fire-retardant materials.
5. Provide screen case with trim flange to receive ceiling finish.
6. Finish on Exposed Surfaces: Prime painted.

2.3 FRONT-PROJECTION SCREEN MATERIAL

A. Matte-White Viewing Surface: Peak gain not less than 0.9, and gain not less than 0.8 at an angle of 50 degrees from the axis of the screen surface.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. BEI Audio-Visual Products; Matte White.
   b. Bretford, Inc.; Matte White.
   c. Da-Lite Screen Company; Matte White.
   d. Draper Inc.; Fiberglass Matte White.

B. Material: Vinyl-coated, glass-fiber fabric.

C. Flame Resistance: Passes NFPA 701.

D. Flame-Spread Index: Not greater than 75 when tested according to ASTM E 84.

E. Seams: Where length of screen indicated exceeds maximum length produced without seams in material specified, provide screen with horizontal seam placed as follows:

1. At top of screen at juncture between extra drop length and viewing surface.

F. Edge Treatment: Without black masking borders.

PART 3 - EXECUTION

3.1 FRONT-PROJECTION SCREEN INSTALLATION

A. Install front-projection screens at locations indicated to comply with screen manufacturer's written instructions.

B. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.

1. Install low-voltage controls according to NFPA 70 and complying with manufacturer's written instructions.

   a. Wiring Method: Install wiring in raceway except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

2. Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.
3. Test manually operated units to verify that screen-operating components are in optimum functioning condition.

3.2 PROJECTION SCREEN SCHEDULE

A. Typical Manually Operated, Front-Projection Screen: Surface mounted, metal encased.
   1. Viewing Surface Size: 60 by 80 inches.

B. Manually Operated, Front-Projection Screen (Stage C102B): Surface mounted, metal encased.
   1. Viewing Surface Size: 144 by 144 inches.
   2. Extra Drop Length: 24 inches.

   This projection screen is part of Supplemental Bid No. 3 and is NOT to be included in the Base Bid.

C. Electrically Operated, Front-Projection Screen Type (Library A169): Suspended, with automatic ceiling closure.
   1. Viewing Surface Size: 60 by 80 inches.
   2. Extra Drop Length: As needed at top of screen for bottom of screen to be 48 inches above floor.

D. Electrically Operated, Front-Projection Screen Type (Multipurpose A153): Suspended, without ceiling closure.
   1. Viewing Surface Size: 87 by 116 inches.
   2. Extra Drop Length: As needed at top of screen for bottom of screen to be 48 inches above floor.

END OF SECTION 115213

SECTION 115313 - LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Floor-mounted laboratory fume hoods.
2. Fume hood base cabinets.
3. Fume hood base stands.
4. Work tops within fume hoods.
5. Laboratory sinks and cup sinks in fume hoods.
6. Water, laboratory gas, and electrical service fittings in fume hoods.
7. 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 09 Section "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring fume hoods.
2. Division 09 Section "Resilient Base and Accessories" for resilient base applied to fume hood base cabinets.
3. Division 23 Sections for fume hood duct connections, including ducts and exhaust fans.
4. Division 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.
5. Division 23 and 26 Sections for connecting service utilities at back of fume hoods. Piping and wiring within fume hoods are specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. Containment: Provide fume hoods that comply with the following when tested according to ASHRAE 110 at a release rate of 4.0 L/min.:

1. Average Face Velocity: 100 fpm plus or minus 10 percent with sashes fully open.
2. Face-Velocity Variation: Not more than 20 percent of average face velocity.
3. Sash Position: Fully open.

   a. Test hoods with horizontal sashes with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.

b. Test hoods with combination sashes fully raised, with maximum opening on one side, with maximum opening in the center, and with one opening at each side equal to half of maximum opening.

4. As-Manufactured (AM) Rating: AM 0.05 (0.05 ppm).
5. As-Installed (AI) Rating: AI 0.10 (0.10 ppm).

B. Static-Pressure Loss: Not more than 1/2-inch wg at 100-fpm face velocity when measured at four locations 90 degrees apart around the exhaust duct and at least three duct diameters downstream from duct collar.

C. Structural Performance: Provide fume hood components capable of withstanding the following loads without permanent deformation, excessive deflection, or binding of cabinet drawers and doors:
1. Fume Hood Base Stands: 50-lb/ft. work top, 75 lb/ft. on work top, plus weight of hood.

D. Seismic Performance: Fume hoods, including attachments to other work, shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. Design earthquake spectral response acceleration, short period (Sds) for Project is 0.295g.
2. Component Importance Factor is 1.5.

1.4 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. Include calculations demonstrating that anchorages comply with seismic performance requirements.
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.
5. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from above items.
6. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Samples for Initial Selection: For fume hood exterior finishes, resin sinks, and resin work tops.

D. Samples for Verification: For fume hood exterior finishes, interior lining, and work top material, in manufacturer's standard sizes.

E. Delegated-Design Submittal: For fume hoods indicated to comply with seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. 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.

G. Source quality-control reports.

1.5 QUALITY ASSURANCE

A. Source Limitations for Laboratory Fume Hoods: Obtain fume hoods from single manufacturer.

1. Obtain from same from same manufacturer as laboratory casework specified in Division 12 Section "Laboratory Casework."

B. 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."

C. Product Standards: Comply with SEFA 1, "Laboratory Fume Hoods - Recommended Practices." Provide fume hoods UL listed and labeled for compliance with UL 1805. Fume Hood liner panels must be non-combustible or FM 4922 Approved.

D. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install fume hoods until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for lateral support of fume hoods.

B. Coordinate installation of fume hoods with laboratory casework, fume hood exhaust ducts, and plumbing and electrical work.

1.9 EXTRA MATERIALS

A. Furnish complete touchup kit for each type and color of fume hood finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged fume hood finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide ADA Thin Wall Fumehood by Sheldon, Laboratory Systems, or comparable product by one of the following:
   1. Fisher Hamilton L.L.C.
   2. Keur Industries, Inc.
   3. Kewaunee Scientific Corporation; Laboratory Products Group.
   4. Laboratory Design & Supply.

2.2 MATERIALS

A. Steel Sheet: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.

B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness.

   1. For perchloric acid fume hoods, use Type 316L instead of Type 304.

C. Epoxy: Factory molded, modified epoxy-resin formulation with smooth, nonspecular finish.

   1. Physical Properties:

      a. Flexural Strength: Not less than 10,000 psi.
      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.
      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: Black.

D. Retain first paragraph below if phenolic-composite work tops are used. Phenolic-composite work top materials with melamine-resin surface must be adhesively laminated to produce a raised edge

E. Glass: Clear, laminated tempered glass complying with ASTM C 1172, Kind LT, Condition A, Type I, Class I, Quality-Q3; with clear, polyvinyl butyral interlayer.

F. Fasteners: Provide stainless-steel fasteners where exposed to fumes.

2.3 FUME HOOD VENTILATION

A. Bypass Fume Hoods: Provide bypass fume hoods. Compensating bypass above sash opens as sash is closed. Provide sufficient bypass capacity so that face velocity with sash opening of 6 inches does not exceed three times the face velocity with sash fully open.

2.4 FABRICATION

A. General: Assemble fume hoods in factory to greatest extent possible. Disassemble fume hoods only as necessary for shipping and handling limitations. Fume hoods shall be capable of being partly disassembled as necessary to permit movement through a 35-by-79-inch door opening.

B. Steel Exterior: Fabricate from steel sheet, not less than 0.0478 inch thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil and to allow access to plumbing lines and service fittings. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.

C. Ends: Fabricate with double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.

D. Interior Lining: Provide one of the following unless otherwise indicated:
   1. Epoxy, not less than 1/4 inch thick.
   2. Glass-fiber-reinforced epoxy, not less than 1/4 inch thick.
   3. Phenolic composite, not less than 1/4 inch thick.

E. 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. Punch fume hood lining side panels to receive service fittings and remote controls. Provide removable plug buttons for holes not used for indicated fittings.

F. Rear Baffle: Unless otherwise indicated, provide baffle, of same material as fume hood lining, at rear of hood with openings at top and bottom for airflow through hood. Secure baffle to cleats at rear of hood with stainless-steel screws. Fabricate baffle for easy removal for cleaning behind baffle.
   1. Provide adjustable baffles with control adjustment strips at top with plastic or stainless-steel knobs.

G. 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.

H. Bypass Grilles: Provide grilles at bypass openings of bypass and restricted bypass fume hoods.

I. Sashes: Provide operable sashes of type indicated.
   1. Glaze with laminated safety glass.
   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.

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: Comply with Division 12 Section "Laboratory Casework."

M. Fume Hood Base Stands: Fabricated from not less than 2-inch- square, electrically welded steel tubing. Provide leg stretchers where necessary to comply with structural performance requirements. Weld leg stretchers, cross stretchers, and work top support rails to legs, and finish entire assembly with chemical-resistant finish. Provide leveling device at each corner of base stand at floor. Associated base cabinet shall comply with Division 12 Section "Laboratory Casework".

   1. Provide clear floor space not less than 30 inches wide by 19 inches deep by 27 inches high within fume hood base. Clear space must be free of all pipes and obstructions.

N. Work Top and Sinks:

   1. Work Tops, General: Provide units with smooth surfaces free of defects. Make exposed edges and corners straight and uniformly beveled.
   2. Resin Work Tops: Provide front overhang of 1 inch, with continuous drip groove on underside 1/2 inch from edge. Mount work tops at 34" AFF.

      a. Work Top Material: Solid epoxy composition.
      b. Work Top Configuration: Raised (marine) edge, 1 inch thick at raised edge, with beveled or rounded edge and corners.

   3. Sinks, General: Provide 3-by-6-inch oval epoxy cup sink.

a. Outlets: Provide with polypropylene strainers and integral tailpieces, NPS 1-1/2, unless otherwise indicated.

O. Filler Strips: Provide as needed to close spaces between fume hoods and adjacent building construction. Fabricate from same material and with same finish as fume hoods or fume hood base cabinets, as applicable.

P. 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.

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.

2.5 CHEMICAL-RESISTANT FINISH

A. General: Prepare, treat, and finish welded assemblies after welding. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling. Prepare, treat, and finish concealed surfaces same as exposed surfaces.

B. Preparation: Clean steel surfaces, other than stainless steel, of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

C. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply fume hood manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 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.

2.6 ACCESSORIES

A. Service Fittings: Comply with requirements in Division 12 Section "Laboratory Casework" and the following:

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 or made from PVDF.

a. Water: One remote-control, rigid, gooseneck, single-service faucet(s) with vacuum breaker and removable serrated outlet.

b. Laboratory Gas for Gas (Fuel Gas): One flange-type fitting(s) with outlet and remote-control ground-key cock.
c. Electrical: One duplex receptacle, switch, and pilot light at one end of hood, mounted on exterior front face.

1) Provide GFCI receptacles.

B. Airflow Alarm: Provide fume hoods with audible and visual alarm that activates when airflow sensor reading is outside of preset range.

1. Provide with thermal-anemometer or aneroid (Magnehelic-type) gage airflow sensor.
2. Provide with reset and test switches.
3. Provide with switch that silences audible alarm and automatically resets when airflow returns to within preset range.

C. Sash Stops: Provide fume hoods with sash stops to limit hood opening to 50 percent of sash height. Sash stops can be manually released to open sash fully for cleaning fume hood and for placing large apparatus within fume hood.

D. Bypass Grille Blank-off Panel: Provide fume hoods with blank-off panel on bypass grille designed for use with sash stops to reduce exhaust air volume and provide design face velocity with sash at 50 percent open position.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fume hoods.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fume hoods according to Shop Drawings and manufacturer's written instructions. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework. Securely attach access panels, but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Comply with requirements in Division 12 Section "Laboratory Casework" for installing fume hood base cabinets, work tops, and sinks.

3.3 FIELD QUALITY CONTROL

A. Field test installed fume hoods according to ASHRAE 110 to verify compliance with performance requirements.

1. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.
2. After making corrections, retest fume hoods that failed to perform as specified.

3.4 ADJUSTING AND CLEANING

A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.

B. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 115313

SECTION 116143 - STAGE CURTAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes the following:
   1. Removal of existing stage curtains, lighting rigging, divider rigging and selected stage curtain supports.
   2. New stage curtains including valance, main traveler, borders, side legs and rear traveler.
   3. New vinyl mesh divider curtain and walk along tracks.
   4. Remedial repairs to existing rigging.

B. Related Sections:

   1. Division 05 Section "Metal Fabrications" for steel framing and supports for stage-curtain systems.
   2. Division 26 Sections for new stage lighting, electrical wiring and removal of existing stage lighting fixtures and wiring.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Rigging shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

   1. Design Loads: Weight of curtains and 20 lbs per linear foot.

1.4 SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details for stage curtains. Include plans, elevations, sections, details, attachments to other work, and the following:

   1. Operating clearances.
   2. Requirements for supporting curtains, track, and equipment. Verify capacity of each track and rigging component to support loads.

C. Samples for Initial Selection: For each type of stage curtain indicated. Include color charts showing the full range of colors, textures, and patterns available, together with a 12-inch-square Sample (any color) of each type of fabric.

D. Curtain Fabric Samples for Verification: Full width by 36-inch- long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.

E. Product Certificates: For the following, from manufacturer:
   1. Rigging: Compliance of suspended battens and tracks with requirements.

F. Operation and Maintenance Data: For stage curtains and rigging to include in operation and maintenance manuals.

G. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of stage curtains.

B. Fire-Test-Response Characteristics: Provide stage curtains with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or a testing and inspecting agency acceptable to authorities having jurisdiction.

   1. Flame-Resistance Ratings: Passes NFPA 701.

      a. Permanently attach label to each fabric of curtain assembly indicating fabric is inherently and permanently flame resistant.

C. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings and construction contiguous with stage curtains and rigging by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of rigging equipment that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, faulty operation of rigging equipment.
   2. Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STAGE CURTAIN FABRICS

A. General: Provide fabrics inherently and permanently flame resistant. Provide fabrics of each type and color from same dye lot.

B. Polyester Velour: Napped fabric of 100 percent polyester weighing not less than 26 oz./linear yd., with pile height approximately 75 mils; inherently and permanently flame resistant; 54-inch minimum width.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. JB Martin Company; Dante.
   b. J. L. de Ball America, Inc.; Diablo.
   c. KM Fabrics, Inc.; Prestige.

2. Color, Texture, and Pattern: As selected by Architect from manufacturer's full range.

2.2 STAGE DIVIDER CURTAIN

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AALCO Manufacturing.
2. ADP Lemco Inc.
3. American Athletic, Inc.
4. Douglas Industries, Inc.
5. Draper Inc.
6. Institutional Products Inc.
7. Jaypro Sports, LLC.
8. Performance Sports Systems.
9. P. W. Athletic Mfg. Co.

B. Divider Curtains: Manually operated, walk draw, and as follows:

1. Curtain, Mesh: Woven fabric of 100 percent polyester yarn coated with PVC weighing not less than 9.0 oz./sq. yd.

   a. Mesh Color: As selected by Architect from manufacturer's full range.

2. Divider Curtain Flame-Resistance Ratings: Passes NFPA 701, inherently and permanently flame resistant.

   a. Permanently attach label to each fabric of curtain assembly indicating fabric is inherently and permanently flame resistant.

3. Configuration: "L" shape with straight bottom extending across stage opening and stacking along east wall.

C. Curtain Fabrication: Fused seams and the following:

1. Top Hem: Reinforce with triple thickness mesh for grommets.
2. Bottom Hem for Draw Curtains: Floor-length curtains with hems 2 inches above finished floor with proof coil chain in pocket.

D. Accessories:

1. Grommets: Manufacturer's standard size and spacing, for snaps or S-hooks.
2. Proof Coil Chain: No. 2/0, zinc plated, ASTM A 413/A 413M.

E. Divider Curtain Operator: Walk-draw track.

2.3 CURTAIN FABRICATION

A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on curtain not visible to audience. Provide vertical seams unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width.

1. Vertical Hems: Provide vertical hems not less than 2 inches wide, and not less than 4 inches wide at borders, valance, teasers, and tormentors, with not less than a 1-inch tuck, and machine sew with no selvage material visible from front of curtain. Sew open ends of hems closed.
2. Leading Edge Turnbacks: Provide turnbacks formed by folding back not less than 12 inches of face fabric, with not less than a 1-inch tuck, and secure by sewing turnbacks vertically.
3. Top Hems: Reinforce top hems by double-stitching 3-1/2-inch- wide, heavy jute webbing to top edge on back side of curtain with not less than 2 inches of face fabric turned under.
4. Pleats: Provide 50 percent fullness in curtains, exclusive of turnbacks and hems, by sewing additional material into 3-inch double-stitched box pleats sewn flat and spaced at 12 inches o.c. along top hem reinforcement.
5. Grommets: Brass, No. 3 or No. 4.

   a. Black Curtains: Provide brass or aluminum grommets with black finish.
   b. Pleated Curtains: Centered on each box pleat and 1 inch from corner of curtain; for snap hooks or S-hooks.

6. Bottom Hems: For curtains with fullness.

   a. For curtains that do not hang to the floor, provide hems not less than 3 inches deep with 3/4-inch weight tape. Sew open ends of hems closed.
   b. For floor-length curtains, provide hems not less than 6 inches deep with separate, interior, 100 percent cotton, heavy canvas chain pockets equipped with proof coil chain. Stitch chain pockets so chain rides 2 inches above finished bottom edge of curtain. Sew open ends of hems closed.

      1) Proof Coil Chain: Grade 30, No. 8, zinc plated, 3/16 inch, ASTM A 413/A 413M.

7. Velour Curtains: Fabricate with the fabric nap down.

B. Snap Hooks: Track manufacturer's standard heavy-duty hooks , attached to top hem with nylon strap secured by rivets.

C. Tie Lines: No. 4 or No. 4-1/2 cord or braided soft cotton tape, black or white to best match curtain; not less than 1/8 inch wide by 36 inches long, threaded through grommets.

2.4 ALUMINUM STAGE-DIVIDER CURTAIN TRACK

A. Aluminum Track: Fabricate of extruded aluminum; complying with ASTM B 221; alloy and temper recommended by manufacturer for strength and corrosion resistance; mill finish.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Automatic Devices Company; Rig-I-Flex #142 series.
b. H & H Specialties Inc.; 500 series.
c. Tru-Roll, Inc.; Tru-Roll Model No. 2300.

2. Provide track for bi-parting operation.
3. Provide approximately 46 feet of track in two 23'-0" sections

B. Curtain Rails: Double curtain capacity. Provide end stops for track rails.

C. Curtain Carriers: Standard carriers with a pair of nylon-tired ball-bearing wheels riveted parallel to plated-steel body. Equip carriers with rubber or neoprene bumpers and nylon glide strips to reduce noise, and heavy-duty, plated-steel swivel eye for attaching curtain snap or S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.

1. Master Curtain Carriers: One master carrier, for each leading curtain edge, with two pairs of nylon-tired ball-bearing wheels riveted parallel to plated-steel body.

D. Suspended Track: NPS 1-1/2 steel pipe stiffener for supporting both sections of suspended tracks.

E. Clamp and Bracket Hangers: Manufacturer's steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.

F. Track Lap Clamp: Metal to match track channel for attaching double-sectioned track at center overlap.

G. Walk-Along Manual Operation: Fabricate curtain track without cord, cable, pulleys, or floor block.

H. Provide 5-link trim chains (TC-2) for each carrier.

2.5 STEEL-CURTAIN TRACK

A. Steel Track: Fabricate of roll-formed, galvanized, commercial-quality, zinc-coated steel sheet; complying with ASTM A 653/A 653M; G60 coating designation with continuous bottom slot and with each half of track in one continuous piece.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Automatic Devices Company; Silent Steel 280 series.
b. H & H Specialties Inc.; 400 series.

2. Thickness: 0.079 inch.

B. Suspended Track: NPS 1-1/2 steel pipe stiffener for supporting both sections of suspended curved tracks.

C. Clamp and Bracket Hangers: Manufacturer's steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.

D. Track Lap Clamp: Metal to match track channel for attaching double-sectioned track at center overlap.

E. Heavy-Duty Track System: Equip track with heavy-duty components. Provide end stops for track.

1. Curtain Carriers: Standard carriers of plated steel with a pair of neoprene-tired ball-bearing wheels riveted parallel to body. Equip carriers with rubber or neoprene bumpers to reduce noise, and heavy-duty, plated-steel swivel eye and manufacturer's standard trim chain for attaching curtain snap or S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.

a. Master Curtain Carriers: One master carrier, for each leading curtain edge, of plated steel with two pairs of neoprene-tired ball-bearing wheels and with two line guides per carrier.

2. End Pulleys and Floor Block: One dead-end, single-wheel pulley; one live-end, double-wheel pulley; and one adjustable, floor block; each with not less than 5-inch molded-nylon- or glass-filled-nylon-tired ball-bearing sheaves enclosed in steel housings. Provide pulleys with steel housing finished to match track and with bracket for securing off-stage curtain end. Provide an adjustable floor block to maintain proper tension on operating line with steel housing painted black.

F. Manual Operation: Provide with cord operating line consisting of manufacturer's standard 3/8-inch- diameter, stretch-resistant operating cord consisting of braided synthetic-fiber jacket over solid, synthetic-fiber, linear filaments.

2.6 CURTAIN RIGGING

A. Curtain Battens: Fabricate battens from steel pipe with a minimum number of joints. As necessary for required lengths, connect pipe with a drive-fit pipe sleeve not less than 18 inches long, and secure with four flush rivets, plug welds, or another equally secure method. Shop-paint completed pipe battens with black paint and with a 1-inch- wide yellow stripe at the center of each.

1. Steel Pipe: ASTM A 53/A 53M, Grade A, standard weight (Schedule 40), black, NPS 1-1/2 nominal diameter unless otherwise indicated.

B. Supports, Clamps, and Anchors: Sheet steel in manufacturer's standard thicknesses, galvanized after fabrication according to ASTM A 153/A 153M, Class B.

C. Trim and Support Cable: 1/4-inch- diameter, 7x19 galvanized-steel cable with a breaking strength of 7000 lb. Provide fittings complying with cable manufacturer's written recommendations for size, number, and method of installation, including a drop-forged galvanized turnbuckle to allow for leveling.

D. Trim and Support Chain: Grade 80 hardened alloy steel chain rated for overhead lifting, ASTM A 391/A 391M.

E. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard corrosion-resistant units.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage-curtain work. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks and battens.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPERATION, DEMOLITION WORK

A. Remove all existing stage curtains.

B. Remove all existing manual winch operated rigging supporting stage lighting.

C. Remove remnants of divider rigging at front of stage to accommodate new stage divider track and curtains.

D. Remove mid-stage traveler track.

E. Dispose of existing rigging and curtains off-site.

3.3 INSTALLATION, GENERAL

A. Install stage-curtain system according to track manufacturer's and curtain fabricator's written instructions.

B. Where indicated, rebuild existing tracks to like new condition.

3.4 BATTEN INSTALLATION

A. Install battens by suspending at heights indicated with trim and support spaced to support load, but do not exceed 10 feet o.c.

1. Cable Trim and Support: Secure cables either directly to structures or to inserts, eye screws, or other devices that are secure and appropriate to substrate and that are not subject to deterioration or failure with age or elevated temperatures. Attach other cable end to pipe clamps with turnbuckles, housed or fixed with nuts after adjustment, to prevent loosening.
2. Chain Trim and Support: Secure chain with load-rated terminations.

3.5 TRACK INSTALLATION

A. Batten-Hung Tracks: Install track by suspending from pipe batten with manufacturer's track clamp hangers attached to batten pipe clamps at spacing, according to manufacturer's written instructions.

B. Spacing: Do not exceed the following dimensions between supports:

1. Heavy-Duty Track: 72 inches.
2. Medium-Duty Track: 48 inches.
3. Walk-Along Track: 48 inches. Provide additional supports at splices.

C. Install track for center-parting curtains with not less than 24-inch overlap of track sections at center, supported by special lap clamps. Provide 48-inch overlap for divider curtain track.

3.6 CURTAIN INSTALLATION

A. Track Hung: Secure curtains to track carriers with snap hooks.

B. Batten Hung: Secure curtains to pipe battens with ties.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain stage curtains and tracks.

3.8 CURTAIN SCHEDULE

Quantity	Description	Size HxW	% Fullness	Fabrics	Hardware
2	Stage Divider Curtain	18'-6" x 21' ea.	0	Vinyl Netting	Aluminum track and 1-1/2" pipe batten
1	Valance	5' x 38'	50	Synthetic Velour	Rebuild as needed
2	Main Traveler	16' x 21' ea.	50	Synthetic Velour	Rebuild track components and hangers
3	Borders	1 @ 5'-6" x 37' 1 @ 5'-6" x 36' 1 @ 5'-6" x 30'	50	Synthetic Velour Color: Black	Rebuild as necessary
2	Legs	17'-6" x 6' ea.	50	Synthetic Velour Color: Black	New 6' steel tracks and hangers
4	Side Travelers	17' x 6' ea.	50	Synthetic Velour Color: Black	Rebuild track components and hangers
2	Rear Traveler	16'-6" x 20' ea.	50	Synthetic Velour Color: Black	Rebuild track components and hangers

END OF SECTION 116143

SECTION 123553 – WOOD LABORATORY CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Wood laboratory casework.
2. Filler and closure panels.
3. Laboratory countertops.
4. Shelves.
5. Laboratory sinks.
6. Laboratory accessories.
7. Water, laboratory gas, and electrical service fittings.

B. Related Sections:

1. Division 06 Section "Rough Carpentry" for wood blocking for anchoring laboratory casework.

2. Division 06 “Interior Architectural Woodwork” for casework in spaces other than science rooms and prep rooms.
3. Division 09 Section "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring laboratory casework.
4. Division 09 Section "Resilient Base and Accessories" for resilient base applied to metal laboratory casework.
5. Division 11 Section "Laboratory Fume Hoods" for fume hoods.
6. Divisions 22 and 26 Sections for installing service fittings specified in this Section, including connecting service utilities.

1.3 DEFINITIONS

A. MDF: Medium-density fiberboard.

B. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and visible surfaces in open cabinets or behind glass doors.
1. Ends of cabinets indicated to be installed directly against and completely concealed by walls or other cabinets are defined as "concealed."

C. Semiexposed Surfaces of Casework: Surfaces behind opaque doors, such as cabinet interiors, shelves, and dividers; interiors and sides of drawers; and interior faces of doors. Tops of cabinets 78 inches or more above floor are defined as "semiexposed."

D. Concealed Surfaces of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

E. Hardwood Plywood: A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive and faced both front and back with hardwood veneers.

1.4 SUBMITTALS

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

B. Shop Drawings: For laboratory casework. Include plans, elevations, sections, details, and attachments to other work.

1. Indicate locations of hardware and keying of locks.
2. Indicate locations and types of service fittings.
3. Indicate locations of blocking and reinforcements required for installing laboratory casework.
4. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
5. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Samples for Initial Selection: For factory-applied finishes and other materials requiring color selection.

D. Samples for Verification: For each type of cabinet finish and each type of countertop material indicated, in manufacturer's standard sizes.

E. Product Test Reports for Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory casework with requirements of specified product standard.

F. Product Test Reports for Countertop Surface Material: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface materials with requirements specified for chemical and physical resistance.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that produces casework of types indicated for this Project that has been tested for compliance with SEFA 8.

B. Source Limitations: Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.

1. Obtain countertops, sinks, accessories, and service fittings from casework manufacturer.

C. Casework Product Standard: Comply with SEFA 8, "Laboratory Furniture - Casework, Shelving and Tables - Recommended Practices."

D. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by a testing and inspecting agency acceptable to authorities having jurisdiction.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility roughing-in and wet work are complete and dry, and temporary HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for support of laboratory casework.

B. Coordinate installation of laboratory casework with installation of fume hoods and other laboratory equipment.

1.9 EXTRA MATERIALS

A. Furnish complete touchup kit for each type and color of wood laboratory casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.

PART 2 - PRODUCTS

2.1 METAL CABINET MATERIALS

A. Metal: Cold-rolled, commercial steel (CS) sheet, complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.

2.2 WOOD CABINET MATERIALS

A. General:
1. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
2. Hardwood Plywood: HPVA HP-1, either veneer core or particleboard core, unless otherwise indicated.
3. MDF: ANSI A208.2, Grade 130.
4. Particleboard: ANSI A208.1, Grade M-2.
5. Hardboard: AHA A135.4, Class 1 Tempered.
6. Edgebanding for Wood-Veneered Construction: Nominal 1/8-inch- thick, solid wood of same species as face veneer.

B. Exposed Materials:

1. General: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.
2. Wood Species: Maple.
3. Plywood: Hardwood plywood with face veneer of species indicated, selected for compatible color and grain. Grade A exposed faces at least 1/50 inch thick, and Grade J crossbands. Provide backs of same species as faces.

   a. Face Veneer Cut: Plain sliced.

4. Solid Wood: Clear hardwood lumber of species indicated and selected for grain and color compatible with exposed hardwood plywood.

C. Semiexposed Materials:

1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of any species similar in color and grain to exposed solid wood.
2. Plywood: Hardwood plywood of any species similar in color and grain to exposed plywood. Grade B faces and Grade J crossbands. Provide backs of same species as faces.
3. Provide solid wood or hardwood plywood for semiexposed surfaces unless otherwise indicated.

D. Concealed Materials:

1. Solid Wood: Any species, with no defects affecting strength or utility.
2. Plywood: Hardwood plywood. Provide backs of same species as faces.
3. Particleboard.
4. MDF.
5. Hardboard.

2.3 AUXILIARY CABINET MATERIALS

A. Acid/Corrosive Storage-Cabinet Lining: 1/4-inch- thick, polyethylene, polypropylene, epoxy, or phenolic-composite lining material.

B. Glass for Glazed Doors: Clear tempered glass complying with ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.

2.4 COUNTERTOP, TABLE TOP, AND SINK MATERIALS

A. Epoxy: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish.

1. Physical Properties:

a. Flexural Strength: Not less than 12,000 psi.
b. Modulus of Elasticity: Not less than 2,000,000 psi.
c. Hardness (Rockwell M): Not less than 100.
d. Water Absorption (24 Hours): Not more than 0.02 percent.
e. Heat Distortion Point: Not less than 260 deg F.

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: Black.

4. Thickness: Not less than 1-inch.

2.5 WOOD CABINETS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Series 100 and Series 26050 Axis Table by Sheldon Laboratory Systems or comparable product by one of the following:
1. Fisher Hamilton L.L.C.
2. ALC Collegdale
3. Labscape
4. Campbell Rhea

B. Design: Reveal overlay with radiused edges.

1. Provide 1/8-inch reveals between doors and drawers that are adjacent.

C. Grain Direction:

1. Vertical on doors and drawer fronts.
2. Lengthwise on face frame members.
3. Vertical on end panels.
4. Side to side on bottoms and tops of units.
5. Vertical on knee-space panels.
6. Horizontal on aprons and table frames.

D. Veneer Matching:

1. None required; select and arrange veneers for compatible grain and color.

E. Construction: Provide wood-faced laboratory casework of the following minimum construction:

1. Bottoms of Base Cabinets and Tall Cabinets: 1/2-inch- thick hardwood plywood.
2. Tops and Bottoms of Wall Cabinets and Tops of Tall Cabinets: 1/2-inch- thick veneer-core hardwood plywood.
3. Ends of Cabinets: 3/4-inch- thick hardwood plywood.
4. Shelves: 1-inch- thick veneer-core hardwood plywood.
5. Base Cabinet Top Frames: 1-by-2-inch solid wood with mortise and tenon or doweled connections, glued and pinned or screwed.
6. Backs of Cabinets: 1/4-inch- thick, hardwood plywood where exposed, 1/4-inch- thick hardboard dadoed into sides, bottoms, and tops where not exposed.
7. Drawer Fronts: 3/4-inch- thick, hardwood plywood or solid hardwood.
8. Drawer Sides and Backs: 1/2-inch- thick, solid hardwood or hardwood plywood, with glued dovetail or multiple-dowel joints.
9. Drawer Bottoms: 1/4-inch- thick hardboard, glued and dadoed into front, back, and sides of drawers.
10. Doors: 3/4 inch thick, with particleboard or MDF cores and hardwood face veneers and crossbands.
11. Stiles and Rails of Glazed Doors 48 Inches High or Less: 3/4-inch- thick plywood with hardwood face veneers or solid wood.

F. Filler and Closure Panels: Provide where indicated and as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as adjacent exposed cabinet surfaces unless otherwise indicated.

G. Multi-Purpose Student Lab/Lecture Station: Student laboratory table shall have an electronically height adjustable work surface from 30" to 36". Provide one remote motor control per room. Sink shall be 22" x 15" I.D. All piping under sink is to be enclosed with removable panels that allow wheelchair accessibility. Include two (3) drawer mobile storage cabinets per table. Each laboratory table shall have four GFI duplex receptacles, gas fixtures, four clamp on upright rods with two cross arms and four connectors, and an upright rod assembly storage compartment.

2.6 WOOD FINISH

A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors, drawer fronts, and molded shapes with profile-edge sander. Sand after assembling for uniform smoothness at

least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.

B. Chemical-Resistant Finish: Apply laboratory casework manufacturer's standard chemical-resistant, transparent finish. Sand and wipe clean between coats. Topcoat(s) may be omitted on concealed surfaces.

1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.

2.7 HARDWARE

A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

B. Hinges: Epoxy-coated steel, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 for doors 36 inches high or less and 3 for doors more than 36 inches high.

C. Hinged Door and Drawer Pulls: Epoxy-coated steel back-mounted pulls. Provide 2 pulls for drawers more than 24 inches wide.

1. Design: Wire pulls.
2. Overall Size: 4-inches long.

D. Door Catches: Dual, self-aligning, permanent magnet catches. Provide 2 catches on doors.

E. Drawer Slides: Side mounted, epoxy-coated steel, self-closing; designed to prevent rebound when drawers are closed; complying with BHMA A156.9, Type B05091.

1. Provide Grade 1HD-100.

F. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately 1 by 2 inches, attached with screws or rivets. Provide on all drawers.

G. Locks for Wood Cabinets: Cam type, brass with chrome-plated finish; complying with BHMA A156.11, Type E07281.

1. Provide a minimum of two keys per lock and three master keys.
2. Provide on all drawers and doors.
3. Keying: Key each room alike with separate master for all rooms.

H. Adjustable Shelf Supports Cabinets: Manufacturers standard powder-coated steel shelf rests complying with BHMA A156.9.

2.8 COUNTERTOPS, TABLE TOPS , SHELVES AND SINKS

A. Countertops, General: Provide units with smooth surfaces in uniform plane free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1 inch, with continuous drip groove on underside 1/2 inch from edge.

B. Sinks, General: Provide sizes indicated.

1. Outlets: Provide with strainers and tailpieces, NPS 1-1/2, unless otherwise indicated.
2. Overflows: For each sink except cup sinks, provide overflow of standard beehive or open-top design with separate strainer. Height 2 inches less than sink depth. Provide in same material as strainer.

C. Epoxy Countertops Table Tops and Sinks:

1. Countertop Fabrication: Fabricate with factory cutouts for sinks, holes for service fittings and accessories, and with butt joints assembled with epoxy adhesive and concealed metal splines.

   a. Countertop Configuration: Flat, 1 inch thick, with beveled or rounded edge and corners, and with drip groove and integral coved or applied backsplash.
   b. Countertop Construction: Uniform throughout full thickness.

2. Table-Top Fabrication:
   a. Table-Top Configuration: Raised (marine) edge, 1-inch minimum thickness, with integral or applied raised edge having beveled edge and corners.

3. Sink Fabrication: Molded in 1 piece with smooth surfaces, coved corners, and bottom sloped to outlet; 1/2-inch minimum thickness.

   a. Size:
      1) In all prep rooms, 26-1/2" x 16-1/2" x 5-3/4" deep (outside dimensions).
      2) In all science classroom counters, 19-1/2" x 16-1/2" x 13" deep (outside dimensions) and 26-1/2" x 16-1/2" x 5-3/4" deep (outside dimensions), one of each.

   b. Provide with polypropylene strainers and tailpieces.
   c. Provide integral sinks in epoxy countertops, bonded to countertops with invisible joint line.

2.9 LABORATORY ACCESSORIES

A. Drying Racks: Polypropylene, epoxy, or phenolic-composite pegboards with removable polypropylene pegs and stainless-steel drip troughs with drain outlet.
   1. Size: 20" x 30".

B. Upright Rod Assembly and Metal Crossbar: Aluminum or stainless steel. Two vertical rods and 1 horizontal crossbar, 3/4 inch in diameter and 36 inches long, unless otherwise indicated; 2

flush socket receptacles and 2 crossbar clamps. Ends of vertical rods are tapered to fit receptacles; all other rod ends are rounded.

2.10 WATER AND LABORATORY GAS SERVICE FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Broen A/S.
2. Chicago Faucet Company (The); a Geberit company.
3. WaterSaver Faucet Co.

B. Service Fittings: Provide units that comply with SEFA 7, "Laboratory and Hospital Fixtures - Recommended Practices." Provide fittings complete with washers, locknuts, nipples, and other installation accessories. Include wall and deck flanges, escutcheons, handle extension rods, and similar items.

1. Provide units that comply with "Vandal-Resistant Faucets and Fixtures" recommendations in SEFA 7.

C. Materials: Fabricated from cast or forged red brass unless otherwise indicated.

D. Finish: Acid- and solvent-resistant powder coating complying with requirements in SEFA 7 for corrosion-resistant finishes.

1. Provide chemical-resistant powder coating in laboratory casework manufacturer's standard metallic brown, aluminum, white, or other color as approved by Architect.

E. Water Valves and Faucets: Provide units complying with ASME A112.18.1, with renewable seats, designed for working pressure up to 80 psig.

1. Goosenecks: Provide rigid gooseneck fabricated from ½-inch IPS Schedule 80 brass pipe with ½-inch IPS male inlet thread for connection to faucet body so as to be rigid.

2. Vacuum Breakers: Provide ASSE 1035 vacuum breakers on water fittings with serrated outlets.
3. Self-Closing Valves: Provide self-closing valves where indicated.

F. Ground-Key Cocks: Tapered core and handle of one-piece forged brass, ground and lapped, and held in place under constant spring pressure. Provide units designed for working pressure up to 40 psig, with serrated outlets.

G. Handles:
1. Provide lever-type handles for ground-key cocks. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
2. Provide wrist blade handle for water fixtures.

H. Service-Outlet Identification: Provide color-coded plastic discs with embossed identification, secured to each service-fitting handle to be tamper resistant. Comply with SEFA 7 for colors and embossed identification.

I. Provide the following types of fixtures:
   1. Sinks in counters: Hot and cold water.
   2. Multi-purpose student stations: Cold water and gas.
   3. Demonstration center: Hot and cold water, gas.

2.11 ELECTRICAL SERVICE FITTINGS

A. Service Fittings, General: Provide units complete with metal housings, receptacles, terminals, switches, pilot lights, device plates, accessories, and gaskets required for mounting on laboratory casework.

B. Receptacles: Comply with NEMA WD 1, NEMA WD 6, and UL 498. Duplex type, Configuration 5 20R.

   1. Receptacle Grade: Hospital grade unless otherwise indicated.
   2. Color of Receptacles: As selected by Architect unless otherwise indicated or required by NFPA 70.
   3. GFCI Receptacles: Straight blade, type. Comply with UL 943, Class A, Hospital grade, and include indicator light that is lighted when device is tripped.

C. Service Fittings, General: Provide units with metal housings and gaskets required for mounting on laboratory casework. Terminals, switches, pilot lights, and accessories are specified in Division 26 Section "Wiring Devices."

D. Recessed-Type Fittings: Provide with galvanized-steel boxes.

E. Finishes for Service-Fitting Components: Provide housings or boxes for pedestal- and line-type fittings with manufacturer's standard baked-on, chemical-resistant enamel in color as selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of laboratory casework.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CABINETS

A. Comply with installation requirements in SEFA 2.3. Install level, plumb, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

B. Base Cabinets: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.

1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches o.c. and at sides of cabinets with not less than 2 fasteners per side.

C. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches o.c.

D. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

E. Adjust laboratory casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

A. Comply with installation requirements in SEFA 2.3. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.

B. Field Jointing: Where possible, make in same manner as shop-made joints using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Prepare edges in shop for field-made joints.

1. Use concealed clamping devices for field-made joints in plastic-laminate countertops. Locate clamping devices within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.

C. Fastening:
1. Secure epoxy countertops to cabinets with epoxy cement, applied at each corner and along perimeter edges at not more than 48 inches o.c.

2. Where necessary to penetrate countertops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to countertop in chemical resistance, hardness, and appearance.

D. Provide required holes and cutouts for service fittings.

E. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

F. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF SINKS

A. Comply with installation requirements in SEFA 2.3.

B. Drop-in Installation of Epoxy Sinks: Rout groove in countertop to receive sink rim if not prepared in shop. Set sink in adhesive and fill remainder of groove with sealant or adhesive. Use procedures and products recommended by sink and countertop manufacturers. Remove excess adhesive and sealant while still wet and finish joint for neat appearance.

3.5 INSTALLATION OF LABORATORY ACCESSORIES

A. Install accessories according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions.

B. Securely fasten adjustable shelving supports and pegboards to partition framing, wood blocking, or reinforcements in partitions.

C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.

3.6 INSTALLATION OF SERVICE FITTINGS

A. Comply with requirements in Divisions 22 and 26 Sections for installing water and laboratory gas service fittings and electrical devices.

B. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings to laboratory casework unless otherwise indicated.

3.7 CLEANING AND PROTECTING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

B. Protect countertop surfaces during construction with 6-mil plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of 48 inches o.c.

3.8 ROOM SCHEDULE

A. Provide wood laboratory casework in the following rooms:
   1. A223, A224, A225, A226, A227, A228, A238, and A239.

END OF SECTION 123553

SECTION 124816 - ENTRANCE FLOOR GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes recessed foot grilles and frames.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for slab depression for recessed foot grilles and frames.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide foot grilles and frames capable of withstanding the following loads and stresses:
1. Wheel load of 1,500 lb per wheel.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for foot grilles and frames.

B. Shop Drawings: Show the following:

1. Divisions between grille sections.
2. Perimeter floor moldings.

C. Samples for Initial Selection: For each type of product involving color selection.

D. Samples for Verification: For each type of product indicated.

1. Foot Grille: 12-inch- square assembled sections.
2. Frame Members: 12-inch- long Sample of each type and color.

E. Maintenance Data: For foot grilles and frames to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain foot grilles and frames through one source from a single manufacturer.

B. Accessibility Requirements: Provide installed foot grilles that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and Sections 302 and 303 in ICC A117.1.

1.6 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate size and location of recesses in concrete to receive foot grilles and frames.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Mats, Inc.; Advanced Track with and embedded frame or a comparable product by one of the following:
1. Balco, Inc.
2. Cactus Mat Mfg. Co.
3. Crowder, K. N. Manufacturing, Inc.
4. C/S Group.
5. J. L. Industries, Inc.
6. Kadee Industries, Inc.
7. Pawling Corporation; Architectural Products Division.
8. Reese Enterprises, Inc.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B 221, Alloy 6061-T6 or Alloy 6063-T5, T6, or T52 as standard with manufacturer. Coat surface of frame in contact with cementitious materials with manufacturer's standard protective coating.

2.3 FOOT GRILLES

A. General: Provide manufacturer's standard foot-grille assemblies consisting of treads of type and profile indicated, interlocked or joined together by cross members, and with support legs (if any) and other components needed to produce a complete installation.

B. Aluminum Foot Grilles: Provide manufacturer's standard foot grilles with extruded members, top-surfaced tread rails, and as follows:

1. Tread Rails: Extruded-aluminum tread rails with extruded-aluminum frame.
2. Aluminum Finish: Mill.

3. Grille Size: As indicated.

C. Lockdown: Manufacturer's standard.

2.4 FRAMES

A. Provide manufacturer's standard frames of size and style for grille type, for permanent recessed installation in subfloor, complete with installation anchorages and accessories. Unless otherwise indicated, fabricate frame of same material and finish as grilles.

2.5 FABRICATION

A. Shop fabricate foot grilles to greatest extent possible in sizes as indicated. Unless otherwise indicated, provide each grille as a single unit; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in grilles are necessary, space symmetrically and away from normal traffic lanes.

B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Mill Finish: AA-M10 (Mechanical Finish: as fabricated); grind and buff as required to remove scratches, welding, or abrasions produced in fabrication process.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, size, minimum recess depth, and other conditions affecting installation of foot grilles and frames.

B. Examine roughing-in for drainage piping systems to verify actual locations of piping connections before foot grille and frame and drain pan installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed foot grilles and frames to comply with manufacturer's written instructions at locations indicated and with top of foot grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set foot-grille tops at height for most effective cleaning action. Coordinate top of foot-grille surfaces with doors that swing across grilles to provide clearance under door.

3.3 PROTECTION

A. After completing frame installations, provide temporary filler of plywood or fiberboard in foot-grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124816

SECTION 124940 - ROLLER SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes roller shades and motorized shade operators where indicated. Where shades are indicated, provide them at all exterior windows and elsewhere as shown.

B. Related Sections include the following:

1. Division 26 Sections for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized shade operation.

1.3 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.
2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.

1. Motorized Shade Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
2. Wiring Diagrams: Power, system, and control wiring.

C. Samples for Initial Selection: For each colored component of each type of shade indicated.

1. Include similar Samples of accessories involving color selection.

D. Product Certificates: For each type of roller shade, signed by product manufacturer.

E. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:

1. Methods for maintaining roller shades and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
3. Operating hardware.
4. Motorized shade operator.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain roller shades through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Product Standard: Provide roller shades complying with WCMA A 100.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 ROLLER SHADES

A. Basis-of-Design Product: Subject to compliance with requirements, provide MechoShade Systems, Inc.; ElectroShade or MechoShade as indicated or a comparable product by one of the following:

1. Draper Inc.
2. Hunter Douglas, Inc.; Hunter Douglas Window Fashions Division.
3. Levolor; Levolor-Kirsch Window Fashions; a Newell Rubbermaid Company.

D. Shade Band Material: PVC-coated polyester.

1. Fabric Width: 96 inches.
2. Pattern: Phifer Sheer Weave.
3. Colors: As selected by Architect from manufacturer's full range.
4. Material Openness Factor: 5 percent at ElectroShade locations, 15 percent at MechoShade locations.

E. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material.

F. Mounting Brackets: Galvanized or zinc-plated steel.

G. Pocket with Ceiling Slot Opening for ElectroShade: Six-sided box units for recessed installation; fabricated from formed-steel sheet, extruded aluminum, or wood; with a bottom consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or an openable, continuous metal access panel concealing rollers, brackets, and operating hardware and operators within; capacity for one per pocket.

H. Bottom Bar: Steel or extruded aluminum. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.

I. Mounting for MechoShade: Ceiling mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

J. Shade Operation: Manual; with continuous-loop bead-chain, clutch, and cord tensioner and bracket lift operator.

1. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
2. Loop Length: Length required to make operation convenient from floor level.
3. Bead Chain: Nickel-plated metal.

4. Operating Function: Stop and hold shade at any position in ascending or descending travel.

K. Shade Operation: Motorized operator.

2.2 ROLLER SHADE FABRICATION

A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Lifting Mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:

1. 1. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting roller, and operating hardware and for hardware position and shade mounting method indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

G. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range, unless otherwise indicated.

2.3 MOTORIZED ROLLER SHADE OPERATORS

A. General: Provide factory-assembled motorized shade operation systems designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated. Provide operation systems of size and capacity and with features, characteristics, and accessories suitable for Project conditions and recommended by shade manufacturer, complete with electric motors and factory-prewired motor controls, remote-control stations, remote-control devices, power disconnect switches, enclosures protecting controls and all operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor

controls to motors. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.

B. Comply with NFPA 70.

C. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6 with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

D. Electric Motors: UL-approved or -recognized, totally enclosed, insulated motor, complying with NEMA MG 1, with thermal-overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.

1. Service Factor: According to NEMA MG 1, unless otherwise indicated.
2. Motor Characteristics: Single phase, 110 V, 60 Hz.
3. Motor Mounting: Within manufacturer's standard roller enclosure.

E. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following devices for remote-control activation of shades:

1. Control Stations: Keyed, momentary-contact, three-position, switch-operated control station with open, close, and off functions. Provide two keys per station.

a. Color: White.

F. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop shade at fully raised and fully lowered positions.

G. Operating Function: Stop and hold shade at any position.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Connections: Connect motorized operators to building electrical system.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades. Refer to Division 1 Section Demonstration and Training."

END OF SECTION 124940

SECTION 133423.13 – PORTABLE AND MOBILE BUILDINGS

PART 1 – GENERAL

1010. Related Documents

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

1011. Summary of Work

Section includes refurbished modular classrooms.

The refurbished modular building to be provided will consist of approximately 16,500 square feet. The Contractor will supply, transport, erect and complete the building as described in the following specification. The modular classroom layouts indicated are generic in nature and not intended to prohibit individual manufacturer classroom layout variations.

All materials, equipment, devices, color, etc. will be manufacturers standard unless otherwise noted in these specifications.

Design loads for this facility are listed below. Local conditions may require loads to increase or decrease slightly.

Floor:	Live load: 40 p.s.f.
Corridor:	Live load: 80 p.s.f.
Roof:	Live load: 45 p.s.f.

01060. Regulatory Requirements

All construction and installation as specified in the following pages shall meet or exceed the State of Connecticut Building Codes, including but not limited to, ADA Standards and NFPA 101, Life Safety. The construction and installation shall be in compliance with Type 5B construction as defined in the 2003 IBC.

01330 Submittals

Shop Drawings: Include plans, elevations, sections, and details of all systems and construction. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Allow sufficient time in the construction schedule for CT DPW to perform code review of submitted documents.

01400 Quality Requirements

Manufacturer Qualifications: An experienced manufacturer with not less than five years experience with the manufacture of portable classrooms. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to:

William Scottsman
Modular Space/GE Capital
Triumph Modular

Installer Qualifications: The manufacturers own forces or an experienced installer approved by the manufacturer. At the completion of the installation, coordinate a final inspection by the DPW Code Unit.

01510. Temporary Utilities and Services

The contractor is responsible for connecting to existing utilities and paying any utility hook-up charges. The Owner will pay for use charges.

01910 Engineering Services

The contractor is responsible for providing signed and sealed third party drawings for the modular structure, inclusive of structural, electrical, plumbing and mechanical. The contractor will also provide utility (if required) foundation, connecting link, stair, ramp and canopy design/shop designs signed and sealed by a state licensed engineer.

SITEWORK

02010. Subsurface investigation

The contractor is responsible for interpreting the available geotechnical report and supplementing it with any additional information that the Contractor believes is necessary..

02660. Water Service

The contractor will be responsible to supply and install a water service to the modular building, including design, engineering, meter, backflow, pressure reducing valves, connection at riser(s), heat trace, insulate, test and sanitize system the complete system.

02700. Sanitary Service

The Contractor will design, engineer, supply and install a sanitary service from the source to the modular building including connections at the modular building and the source. The sanitary system will be a gravity flow system, requiring no mechanical systems to deliver the waste to the source.

02720. Surface & Subsurface Drainage

Ground: Surface drainage run-off is provided on site by existing grading.

02790 Communication Services

The Contractor will be responsible to extend the fire alarm service from the modular building to the monitoring source, including but not limited to, design, engineering, devices, wiring, connections, testing and fees.

Telephone service: The Contractor will provide a complete telephone system in the modular building and connection to the existing system, including design, devices, wiring, connections, testing and fees.

PA system: The Contractor will be responsible to extend the public address system from the modular building to the existing system, including but not limited to, design, devices, wiring, programming, connections, testing and fees.

Intercom system: The Contractor will be responsible to extend the public address system from the modular building to the existing system, including but not limited to, design, devices, wiring, programming, connections, testing and fees.

Computer system: The Contractor will be responsible to provide wiring and conduit for a LAN system from the modular building to the existing system.

CONCRETE

03100 Concrete Formwork

Footings: Poured in place concrete, size based on design loads and soil bearing capacity, 48” below grade to bottom of footing.

Piers: Poured and formed in place concrete; 16” x 16” square pier from footing to modular frame.

Stair pads: 4’ x 4’ x 4” concrete pad at the bottom of each set of stairs and ramps

03200 Concrete Reinforcement

Reinforcing: Provide reinforcing bars as required for design loads.

03250 Concrete Accessories

Anchoring: Provide steel plates at intervals along the perimeter piers for welding the frame to the foundation system as required by design loads.

METALS

05100 Structural Metal Framing

Steel frame: Perimeter design 12” jr. I beam and cross members @ 48” O.C.
Finish: Asphalt based black primer for all module chassis.
Undercarriage: Removable axles and hitches.

WOODS AND PLASTICS

06010 Wood framing

Floor joist:	2” x 6” S.P.F. #2 @ 16” O. C.
Roof trusses:	TPI 1 tapered @ 24” O.C.
Exterior wall studs:	2” x 6” stud grade @ 16” O. C.
Interior wall studs:	2” x 4” stud grade @ 16” O. C.
Columns:	Concealed interior support columns at intermediate locations as required for roof structure support.

06122 Plywood

Floor underlayment:	½” square edge.
Sub-floor:	5/8” T&G edge.
Roof:	5/8” CDX plywood

06124 Sheathing

Bottom board:	½” asphalt impregnated board.

06300 Exterior Stairs, Ramps & Platforms

Exterior stairs:	Pressure treated, with no open risers, sized accordingly.
Exterior HC ramp:	Pressure treated wood sized accordingly, pitch: 1” per foot.
Handrails:	Finished wood with metal brackets.
Treatments:	Ramps, stair treads and platforms to receive one (1) coat of non-slip plaint. Stair and ramp handrails to be sanded smooth and will receive two (2) coats of water seal treatment.

06400 Millwork

Adjustable Shelving:	3/4-inch thermoset decorative panel with PVC or polyester edge banding. 12” nominal depth. Where shelving is indicated, provide 3 adjustable shelves.

THERMAL AND MOISTURE PROTECTION

07200 Insulation

Floor:	6”, R-19 unfaced fiberglass batt.
Exterior wall:	6”, R-19 kraft faced fiberglass batt.
Interior wall:	3 ½”, R-11 unfaced fiberglass batt.
Roof:	6”, R-19 kraft faced fiberglass batt.

07460 Siding

Exterior siding:	SmartPanel - 7/16” engineered textured wood siding w/ vertical grooves 8” o.c.
Skirting:	Hardi-panel - 7/16” cementituous board
Fascias:	SmartPanel - 7/16” engineered textured wood siding with vertical grooves 8” o.c.

Finishes: Siding, fascia and skirting will receive one (1) coat of primer and two (2) coats of exterior latex paint. Color from manufacturer's standards.

07500 Membrane roofing

Roofing: Fully adhered EPDM membrane 45 mil roofing system. Color: black.

07710 Prefabricated Roof Specialties

Roof drainage: Aluminum gutters and downspouts installed at building perimeter as required for proper drainage. Downspouts are to discharge onto grade level. Color from manufacturer's standards.

DOORS AND WINDOWS

08110 Metal doors and Frames

Exterior doors: 3068 commercial grade insulated 18 gauge hollow metal door with 16 gauge knock-down metal frame and safety wire glass vision panel. Rated as required.
Interior doors: Classrooms: 3068 commercial grade 18 gauge hollow metal door with 16 gauge knock-down metal frame and safety glass vision panel. Rated as required.
Restrooms: 3068 commercial grade 18 gauge hollow metal door with 16 gauge knock-down metal frame. Rated as required.
Finish: Steel doors and frames will receive one (1) coat of primers and two (2) coats of finish enamel paint. Color from manufacturer's standard.

08630 Vinyl Windows

Exterior: Solid vinyl two-lite horizontal slider with insulated glass and insect screen, size: 48"x48". Color: white. Provide two per classroom and 7 in the corridor.

08710 Finish Hardware

Exterior doors: Entrance: Commercial grade lever set , hydraulic closer, 1 ½ pairs of ball bearing hinges, aluminum threshold, weather stripping and bottom sweep.
Exit: Commercial grade panic hardware with lever trim, hydraulic closure, 1 ½ pairs of ball bearing hinges, aluminum threshold, weather stripping and bottom sweep.
Interior doors:
Classroom: Commercial grade lever set (classroom function), hydraulic closer, 1 ½ pairs of ball bearing hinges and floor mounted door stop.
Restroom: Commercial grade lever set (passage function), hydraulic closer, 1 ½ pairs of ball bearing hinges and floor mounted door stop.
Door keying:
Exterior doors: Construction core.
Classrooms: Construction core.
Final keying by the Owner.

FINISHES

09120 Suspended Ceiling System

Suspended ceiling: Suspended ceiling system with 2” x 4: ceiling tile, non directional, in metal grid, ceiling height 8-0”. Color; white on white. Provide Class A or B materials per ASTM E 84.

09260 Gypsum Wallboard

Interior wall finish: Wall finish to be 5/8” vinyl gypsum, glued and nailed with matching color pins. Color from manufacture’s standard. Provide Class A materials per ASTM E 84.

09650 Resilient Flooring

Floor covering: 1/8” x 12” x 12” vinyl composition tile in restroom and janitor’s closet. Color from manufacturer’s standards.

09682 Carpet

Floor covering: 26 oz. level loop carpet with Class II rating per NFPA 253. Color from manufacturer’s standard. Provide in all spaces not receiving resilient flooring.

09683 Base Moldings

Base trim: 4” vinyl cove base. Color from manufacturer’s standards. Base shall be Class A, B or C per ASTM E 84.

SPECIALTIES

10100 Visual Display Boards

Marker board: 4’ x 10’ with tray and aluminum frame: one (1) per classroom. Installed at locations and heights directed by the customer.

Tack board: 4’ x 8’ burlap covered with aluminum frame; one (1) per classroom. Installed at locations and heights directed by the customer. Burlap fabric shall be Class A per ASTM E 84.

10426 Identifying Devices

Interior signage: Interior ADA identification signage. Provide room numbers for each classroom and provide toilet room signage with international symbol of accessibility.

105113 Metal Lockers

Double Tier Lockers: Manufacturers standard 15” W x 12” D x 36” H, knock down, steel, double tier lockers with continuous z-base, sloped top, interior hooks, and locks.

FURNISHINGS

12505 Blinds

Venetian Blinds 1” horizontal mini blinds install at each exterior window. Color: Alabaster.

12600 Furniture and Accessories

Coat rack: Wall mounted with 30 hooks, one per classroom.

MECHANICAL

15400 Plumbing

All fixtures, valves, cleanouts, piping, etc. and installation will be provided in accordance with state code requirements and type of assembly.

Supply pipe: Interior above grade to be Type “L” copper, sized accordingly.
Waste pipe: Schedule 40 PVC, sized accordingly. No hub, Cast iron or DWV Copper.
Water closets:
Handicap: China tank type, 1.6 flush, handicap water closet with lift seat.
Standard: China tank type, 1.6 gal flush, water closet with lift seat.
Urinal: Wall mounted china with flush valve.
Lavatories:
Handicap: Wall mounted china with wall carrier and handicap faucet.
Standard: Vanity or wall mounted china with single faucet.
Fountains:
Handicap: Electric wall mounted.
Standard: Electric wall mounted.
Service sink: Fiberglass, one piece mounted on legs with faucet.
Water heater: 10 gallon electric.
Insulation: All domestic cold water lines within the modular building will be insulated.

15440 Restroom Accessories

Provide the following toilet accessories inn accordance with Division 10, Section “Toilet, Bath and Laundry Accessories”:

Privacy Screens: Baked enamel steel, floor mounted by H.C.I., Craftsman or equal.
Toilet paper holder:
Soap dispenser:
Grab bars:

Mirrors: 18” W x 24” H stainless steel frame mirror.
Towel dispenser:

15500 Heating, Ventilating and Air Conditioning

Type:
Classrooms: -4 ton roof mounted electric/electric ac/htr units with economizers. Trane or equal.
OR
Classrooms: -4 ton wall mounted electric/electric ac/htr units with economizers. Marvair or equal.
Restroom/Utility Rooms: Electric wall or ceiling mounted fan forced heaters with integral thermostat.
Hallways: Electric wall or ceiling mounted fan forced heaters with integral thermostat.

	Ductwork:	Supply: 1” fiberglass. Return: 1” fiberglass.
	Diffusers:	Supply: 24” x 24” lay-in type. Return: Eggcrate.
	Thermostat:	Programmable
Dampers:	Volume Dampers: One (1) volume damper per supply diffuser.	

Fire Dampers: Located at all ductwork penetrations through rated construction.
Exhaust fan: 100 cfm, ceiling mounted. One (1) per restrooms and utility rooms.

DIVISION 16. ELECTRICAL

16120 Conductors

Power General Wiring: Romex - #12 minimum.

16140 Switches and Receptacles

Wall switches: 120v, 20 amp. Located as per code.
Receptacles: Interior: Duplex type: 20 amp with polarized parallel slots spaced per code and GFI receptacles in areas where required by code.
Exterior: Weatherproof GFI in crawl space for heat tracing as determined by Contractor.
Exterior: Weatherproof GFI installed on roof mounted as required by code.

16300 Distribution Equipment

Sub-panel: 120/208, 3 phase, 4 wire.

16500 Lighting

Interior: 2’ x 4’ fluorescent troffers with electronic ballast, T-8 lamps and standard acrylic lenses.
Exterior: 60 watt incandescent fixture with photocell at each entrance and exit.

16535 Emergency Lighting and Power

Emergency: Twin bulb emergency lights with battery backup located according to code.

Exit lights:	Exit lights with battery backup located according to code.
Remote head:	6 watt exterior wall mounted with battery backup installed at each exit.

16720 Alarm and Detection Systems

Fire alarm system:	Independent, zoned, noncoded system with manual and automatic alarm initiation, in accordance with all applicable NFPA regulations. Control panel and all components provided.

16730 Program Systems

Clocks:	Wall mounted, electrically operated. One (1) per classroom
Public address:	Wall/ceiling mounted speaker. One per classroom
Intercom system:	Wall speaker w/call station. One (1) per classroom

16740 Telecommunication Systems

Computer system:	Data jack and cabling. One (1) per classroom
Telephone systems:	Phone jack and cabling. One (1) per classroom

FINAL CLEANING

At completion of Phase 3, the Contractor will remove the portables from the site, including the removal of all foundations, footings, and utilities, both above ground and below ground. The site shall be left suitable for the completion of the work indicated in the Contract Documents.

END OF SECTION 133423.13

SECTION 142400 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes hydraulic passenger elevators.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
2. Division 04 Section "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry and for grouting elevator entrance frames installed in masonry walls.
3. Division 05 Section "Metal Fabrications" for the following:
   a. Attachment plates and angle brackets for supporting guide-rail brackets.
   b. Hoist beams.
   c. Structural-steel shapes for subsills.
   d. Pit ladders.
4. Division 09 Section "Resilient Tile Flooring" for finish flooring in elevator cars.
5. Division 26 Sections for electrical service for elevators to and including fused disconnect switches at machine room door.
6. Division 27 Section "Communications Horizontal Cabling" for telephone service for elevators.
7. Division 28 Section "Fire Detection and Alarm" for smoke detectors in elevator lobbies to initiate emergency recall operation and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation and for connection to elevator controllers.

1.3 DEFINITIONS

A. Definitions in ASME A17.1 apply to work of this Section.

B. Defective Elevator Work: Operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.4 SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for the following:

1. Car enclosures and hoistway entrances.
2. Operation, control, and signal systems.

B. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment and signals. Include large-scale layout of car control station. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

C. Samples for Initial Selection: For finishes involving color selection.

D. Samples for Verification: For exposed finishes of cars, hoistway doors and frames, and signal equipment; 3-inch- square Samples of sheet materials; and 4-inch lengths of running trim members.

E. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

F. Qualification Data: For Installer.

G. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

H. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

I. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain elevators through one source from a single manufacturer.

1. Provide major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cabs, and entrances, manufactured by a single manufacturer.

C. Regulatory Requirements: Comply with ASME A17.1 and elevator design requirements for earthquake loads in ASCE 7.
1. Design earthquake spectral response acceleration, short period (Sds) for Project is 0.294.
2. Project's seismic design category is C.

3. Elevator importance factor is 1.0.

D. Accessibility Requirements: Comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and 407 in ICC A117.1.

E. Fire-Rated Hoistway Entrance Assemblies: Door and frame 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 at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging.

B. Store materials, components, and equipment off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

1.7 COORDINATION

A. Coordinate installation of sleeves, block outs, and items that are embedded in concrete or masonry for elevator equipment. Furnish templates and installation instructions and deliver to Project site in time for installation.

B. Coordinate sequence of elevator installation with other work to avoid delaying the Work.

C. Coordinate locations and dimensions of other work relating to hydraulic elevators including pit ladders, sumps, and floor drains in pits; entrance subsills; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.

1.8 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective elevator work within specified warranty period.

1. Warranty Period: Eighteen months from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide one year's full maintenance service by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24-hour-per-day, 7-day-per-week emergency callback service.

    a. Response Time: Two hours or less.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. KONE Inc.
2. Otis Elevator Co.
3. Schindler Elevator Corp.
4. ThyssenKrupp Elevator.

2.2 SYSTEMS AND COMPONENTS

A. General: Provide manufacturer's standard elevator systems. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard preengineered elevator systems and as required for complete system.

B. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations. Provide either of the following:

1. Pump, with fan-cooled squirrel-cage induction motor, mounted on oil tank with vibration isolation mounts. Enclose pump in prime-painted steel enclosure lined with 1-inch-thick, glass-fiber insulation board.
2. Submersible pump, with submersible squirrel-cage induction motor, suspended inside oil tank from vibration isolation mounts.
3. Provide motor with solid-state starting.

C. Hydraulic Silencers: Provide hydraulic silencer containing pulsation-absorbing material in a blowout-proof housing at pump unit.

D. Piping: Provide size, type, and weight piping recommended by manufacturer, and provide flexible connectors to minimize sound and vibration transmissions from power unit.

E. Hydraulic Fluid: Elevator manufacturer's standard fluid with additives as needed to prevent oxidation of fluid, corrosion of cylinder and other components, and other adverse effects.

F. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is specified in another Section.

G. Car Frame and Platform: Welded steel units.

H. Guides: Provide either roller guides or sliding guides at top and bottom of car and counterweight frames. If sliding guides are used, provide guide-rail lubricators or polymer-coated, nonlubricated guides.

2.3 OPERATION SYSTEMS

A. General: Provide manufacturer's standard microprocessor operation system for each elevator as required to provide type of operation system indicated.

B. Single-Car Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated:
   1. Battery-Powered Lowering: When power fails, car is lowered to the lowest floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
   2. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors will begin closing.

2.4 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening devices with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.

2.5 FINISH MATERIALS

A. General: Provide the following materials for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel, Type B, pickled.

D. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

   1. Textured Stainless-Steel Sheet: Product with texture rolled into exposed surface.
      a. Metal surface is satin polished after rolling.

E. Stainless-Steel Bars: ASTM A 276, Type 304.

F. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

G. Aluminum Extrusions: ASTM B 221, Alloy 6063.

H. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications and Type BKV for panel backing.

2.6 CAR ENCLOSURES

A. General: Provide steel-framed car enclosures with nonremovable wall panels, with car roof, access doors, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1 on car tops where required by ASME A17.1.
2. Provide finished car including materials and finishes specified below.

B. Materials and Finishes: Provide manufacturer's standards, but not less than the following:

1. Subfloor: Underlayment grade, exterior plywood, 5/8-inch nominal thickness.
2. Floor Finish: Specified in a Division 09 Section.
3. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to manufacturer's standard honeycomb core with plastic-laminate panel backing and manufacturer's standard protective edge trim. Panels have a flame-spread index of 75 or less, when tested according to ASTM E 84. Plastic-laminate color, texture, and pattern as selected by Architect from elevator manufacturer's full range.
4. Fabricate car with recesses and cutouts for signal equipment.
5. Fabricate car door frame integrally with front wall of car.
6. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
7. Sight Guards: Provide sight guards on car doors.
8. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
9. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic.
10. Handrails: Manufacturer's standard handrails, of shape, metal, and finish indicated.

2.7 HOISTWAY ENTRANCES

A. General: Provide manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction.

B. Materials and Fabrication: Provide manufacturer's standards, but not less than the following:

1. Stainless-Steel Frames: Formed from stainless-steel sheet.
2. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet or by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.
3. Sight Guards: Provide sight guards on doors matching door edges.
4. Sills: Extruded metal, with grooved surface, 1/4 inch thick.
5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

2.8 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with LEDs.

B. Car Control Stations: Provide manufacturer's standard recessed or semirecessed car control stations. Mount in return panel adjacent to car door, unless otherwise indicated.

1. Mark buttons and switches with standard identification for required use or function that complies with ASME A17.1. Use both tactile symbols and Braille. Buttons shall be ¾ inch minimum in their smallest dimension.
2. Provide "No Smoking" sign matching car control station, either integral with car control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
3. Mount controls no higher than 48 inches AFF and complying with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)"

C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.

1. Include travel direction arrows if not provided in car control station.

E. Hall Push-Button Stations: Provide one hall push-button station at each landing with visual signals to indicate the call has been registered.

1. Mount units centered at 42" AFF.
2. Buttons shall be ¾" minimum in their smallest dimension.

F. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:

1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.

G. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

1. At manufacturer's option, audible signals may be placed on car.

H. Corridor Call Station Pictograph Signs: Provide signs matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire

elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station, unless otherwise indicated.

I. Signage on Hoistway Entrances: Provide 2 inch high raised Braille floor designations on both jambs of the elevator hoistway entrances and mount where indicated. A tactile star shall also be provided on both jambs at the main entry level. Signs shall match hall push-button stations with text and graphics according to ASME A17.1, appendix H.

2.9 ELEVATORS

A. Elevator Description:
1. Type: Holeless, beside-the-car, single-acting, cylinder.
2. Rated Load: 3000 lb.
3. Rated Speed: 100 fpm.
4. Operation System: Single automatic operation.
5. Auxiliary Operations:
   a. Battery-powered lowering.
6. Car Enclosures:
   a. Inside Width: 80 inches from side wall to side wall.
   b. Inside Depth: 65 inches from back wall to front wall (return panels).
   c. Inside Height: 88 inches to underside of ceiling.
   d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish with integral car door frames.
   e. Car Fixtures: Satin stainless steel, No. 4 finish.
   f. Side and Rear Wall Panels: Plastic laminate.
   g. Reveals: Satin stainless steel, No. 4 finish.
   h. Door Faces (Interior): Satin stainless steel, No. 4 finish.
   i. Door Sills: Aluminum, mill finish.
   j. Ceiling: Luminous ceiling.
   k. Handrails: .1-1/4 inches N.P.S. round, satin stainless steel, No. 4 finish, at rear of car.
   l. Floor prepared to receive resilient tile (specified in Division 09 Section "Resilient Tile Flooring").
7. Hoistway Entrances:
   a. Width: 42 inches.
   b. Height: 84 inches.
   c. Type: Single-speed side sliding.
   d. Fire-Protection Rating: 1 hour with 30-minute temperature rise of 450 deg F.
   e. Frames: Satin stainless steel, No. 4 finish.
   f. Doors: Satin stainless steel, No. 4 finish.
   g. Sills: Aluminum, mill finish.
8. Hall Fixtures: Satin stainless steel, No. 4 finish.
9. Additional Requirements:
   a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.

b. Provide blanket hooks in all cars and one complete set(s) of full-height protective blankets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to effectively prevent transmission of vibrations to structure and thereby eliminate sources of structure-borne noise from elevator system.

D. Install piping above the floor, where possible. Where not possible, install underground piping in Schedule 40 PVC pipe casing assembled with solvent-cemented fittings.

E. Lubricate operating parts of systems as recommended by manufacturers.

F. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

G. Leveling Tolerance: 1/4 inch, up or down, regardless of load and direction of travel.

H. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

I. Locate hall signal equipment for elevators as follows, unless otherwise indicated:
   1. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

3.4 PROTECTION

A. Temporary Use: Comply with the following requirements for each elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate elevator(s). Refer to Division 01 Section "Demonstration and Training."

B. Check operation of each elevator with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

C. Check operation of each elevator with Owner's personnel present not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

END OF SECTION 142400