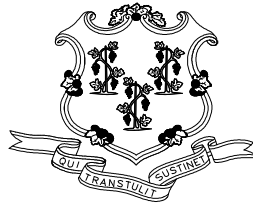


**PROJECT MANUAL
VOLUME 2 OF 3**

**Additions and Renovations to
Eli Whitney, Connecticut Technical High School**

Hamden, Connecticut

Project No.: BI-RT-837 – CMR



**State Of Connecticut
Department Of Construction Services
Bureau of Design and Construction
Donald J. DeFronzo - Acting Commissioner**

**Prepared By:
Antinozzi Associates, P.C.
271 Fairfield Ave
Bridgeport, Connecticut, 06604**

**June 18, 2012
CMR—Bid Documents Submission**

**Additions and Renovations to
 Eli Whitney, Connecticut Technical High School**

**Existing Address:
 71 Jones Road
 Hamden, Connecticut 06046**

**New Address:
 "XX" Fairview Avenue
 Hamden, CT 06046**

Project No.: BI-RT-837 -CMR

**Prepared By:
 Antinozzi Associates, P.C.
 271 Fairfield Avenue
 Bridgeport, Connecticut 06604**

Seals & Signatures



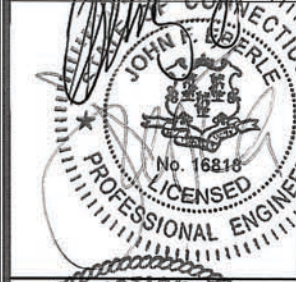
ANTINOZZI ASSOCIATES
 Print Consultant Name

(Print Consultant Name)



ALTIERI SEBOR WIEBER
 (Print Consultant Name)

(Print Consultant Name)



STANTEC CONSULTING
 (Print Consultant Name)

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THE DISALVO ERICSON
 GROUP
 (Print Consultant Name)

(Print Consultant Name)

REFER TO THE SEPARATE VOLUME OF DOCUMENTS ISSUED BY THE CMR (FUSCO CORPORATION) DETAILING THE PROJECT'S PROCUREMENT AND CONTRACTING REQUIREMENTS

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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-837.
- B. **Project Title:** Additions and Renovations to Eli Whitney Technical High School (THS).
- C. **Project Location:** Located in Hamden, 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. Renovations of an existing building of approximately **139,669** gross square feet, construction of additions of approximately **91,290** gross square feet, and demolition of **35,051** gross square feet.
 2. The building is new and shall be constructed of materials that include but are not limited to the following: The structure shall consist of **steel**. Exterior wall construction shall consist of **masonry & metal wall panels**. Roof construction shall consist of **metal deck**. Foundations shall consist of **concrete**. Interior finishes include **painted CMU, gypsum wallboard and ceramic wall tile**. Floor coverings include **vinyl composition tile, ceramic tile and carpet**. Ceilings shall be **lav-in acoustical panels and gypsum board**.
 4. 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 Construction Services, Code Unit.
- E. **Owner:**
1. **Owner's Name:** The Owner is the Department of Construction Services (DCS), State of Connecticut.
 2. **DCS Project Manager Name:** Natalina Raimondi.
 - a. **DCS Project Manager's Location:** The Project Manager is located in Room **460**, at 165 Capitol Avenue, Hartford, CT, 06106.
 - b. **Phone:** 860-713-5827;
 - c. **Fax:** 860-713-7261;
 - d. **Email(s):** natalina.raimondi@ct.gov.
 3. **Authority:** The DCS Project Manager is the only authorized representative for the Department of Construction Services 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. **Error! Not a valid link. Name:** The Connecticut State (User) Agency is **Department of Education**.
 2. **Agency Representative Name and Title:** **Al Richmond**. The Agency Representative's Title is **Consultant for Facilities Planning**.
 - a. **Agency Representative Location:** The Agency Representative is located at **State of CT-CTHS 25 Industrial Park Road, Middletown, Connecticut, 06457**.
 - b. **Phone:** 860-807-2181;
 - c. **Fax:** 860-807-2196;
 - d. **Email(s):** al.richmond@ct.gov.
 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 **Antinozzi Associates, P.C.** Representing the firm for this project is **David C. Ferris**.
 - a. **Architect's Location:** The Architect is located at **271 Fairfield Avenue, Bridgeport, CT 06604**.
 - b. **Phone: 203-377-1300;**
 - c. **Fax: 203-378-3002;**
 - d. **Email(s): dferris@antinozzi.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 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 Construction Services 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: Kevin Kane, Skanska USA**
 - a. **Owner's Representative Location:** The Owner's Representative is located at **6th Floor, 545 Long Wharf Drive New Haven, Connecticut, 06511**.
 - b. **Phone: 203-982-9506**
 - c. **E-Fax: 866-586-5449**
 - d. **Email(s): kevin.kane@skanska.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 things, 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 (CM):**
1. **Construction Manager's Name (CM): Brian Calvert, Fusco Corporation**
 - a. **Construction Manager's Firm's Location:** The Construction Manager is located at **555 Long Wharf Drive, New Haven, Connecticut**.
 - b. **Phone: 203-777-7451 x 2229**
 - c. **Fax: 203-782-0725**
 - d. **Email(s): bcalvert@fusco.com**
 2. **Authority:** Construction Manager is under direct Contract with the Department of Construction Services, 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 **Demolition and Asbestos & PCB Abatement;**
 - 2 **Site Construction, Landscaping, Site Utilities;**
 - 3 **Cast-in-Place Concrete, Architectural Precast Concrete;**
 - 4 **Masonry;**
 - 5 **Structural Steel, Miscellaneous Metals;**
 - 6 **Rough Carpentry, Architectural Woodwork, Laminate Clad Casework;**
 - 7 **Waterproofing, Insulation, Sprayed-on Fireproofing, Firestopping, Roofing, Sheet metal, and Joint Sealants;**
 - 8 **Doors and Frames, Overhead Doors, Aluminum Windows, Hardware, and Glazed Aluminum Curtain Wall;**
 - 9 **Drywall, Floor Coverings, Acoustical Ceilings, and Painting;**
 - 10 **Visual Display Boards, Toilet Compartments, Louvers and Vents, Wall Surface Protection Systems, Signage, Lockers, Fire Extinguishers, and Toilet Accessories;**
 - 11 **Projection Screens, Loading Deck Equipment, Dark Room Equipment, Laboratory Furnishings, Fume hoods, Fittings and Fixtures, and Equipment;**
 - 12 **Louver Blinds and Floor Mats;**
 - 13 **Elevator renovation; Wheel Chair Lifts**
 - 14 **Plumbing, Fire Protection, HVAC, and Controls;**
 - 15 **Electrical and Fire Alarm Systems; and**
 - 16 **Special Equipment.**
 - 17 **Commissioning and Maintenance**
- 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 UNDER OTHER CONTRACTS:

- A. **Separate Contract:** The Owner has awarded a separate contract for performance of certain construction operations at the site. The separate contract includes the following:
1. **Contract:** A separate contract has been awarded to **AAIS** to perform the following Work **Abatement of Hazardous Materials in Corridors and selected Classrooms and Storage Space.**
 2. **Contract:** A separate contract has been awarded to **Jun Kaneko Studio through the Art in Public Spaces Program administered by Connecticut Office of the Arts** to perform the following Work: **Installation of Art Work referenced in the Construction Documents.**
- C. Cooperate fully with separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this contract.

1.4 FUTURE WORK: Not Applicable.

1.5 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.
1. **Owner Occupancy:** Allow for Owner occupancy and use by the public of the existing facility.
 2. 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.
 3. 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 driveway designated by the Construction Manager. 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.
 4. The Construction Manager shall be responsible for keeping the premises clean and shall pick up rubbish and debris and promptly remove from site.
 5. 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.
 6. 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.
 7. The Construction Manager shall comply with local working hour restrictions, unless specifically approved otherwise in writing by the Owner.
 8. 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.

1.6 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.

1.7 PRODUCTS ORDERED IN ADVANCE:

- A. General:** The Owner has negotiated purchase orders with suppliers of material and equipment to be incorporated into the Work. The Owner has assigned these purchase orders to the Contractor. Costs for receiving handling and storage, and installation are included in the Guaranteed Maximum Price (GMP).
1. The Construction Manager's responsibilities are the same as if the Construction Manager negotiated the purchase orders. If necessary, the Construction Manager shall renegotiate purchase and execute final purchase-order agreements.
 2. A "Schedule of Products Ordered in Advance" is included at the end of this section.

1.8 OWNER-FURNISHED PRODUCTS:

- A.** The Owner may furnish various products such as Shop / Trade Equipment and/or 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.

1.9 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), Polychlorinated Biphenyls (PCB), and/or Lead Containing Material (LBP), the results are in **Section 00 30 00 Information Available**.
4. Tests have not been done for Work Involving "Products Containing Persistent Bioaccumulative Toxic Chemicals" (PBT's) such as Di-2-ethylhexyl Phthalate (DEHP) and Mercury, but Division 01 Section 01 35 16 "Alteration Project Procedures - CMR" states exposure limits and removal responsibility. If tests have been done for Work Involving "Products Containing Persistent Bioaccumulative Toxic Chemicals" (PBT's) such as 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. If Geotechnical Reports(s) have been prepared for this project they are in **Section 00 30 00 Information Available**. The Owner shall be responsible for the remediation and disposal of all Contaminated Soils when they are indicated in this report. The Construction Manager shall be responsible for the excavation, staging, loading, transportation, and disposal of the Contaminated Soils indicated in this report. See Division 1 Section 02 80 00, "Contaminated Materials Excavation, Staging, Loading, Transportation and Disposal" 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 a Contaminated Soils Report has been prepared for this Project it would be included in **Section 00 30 00 Information Available**. The Owner shall be responsible for the remediation and disposal of all Contaminated Soils when they are indicated in this report.
- ii. If the Construction Manager should encounter any material suspect or known to contain Contaminated Soils that was not previously identified in the Contaminated Soils Report and 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 Owner shall arrange for the remediation and disposal of all Contaminated Soils (if necessary) within a reasonable time period, i.e. within **seven (7)** Calendar Days.
- iii. 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 direct additional work outside of 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 Conferences:

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

C. 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. **utilization of maintaining at least one elevator in use at all times;**
 - e. **occupant access to the elevator during construction;**
 - f. **delivery access of materials, handicap access;**
 - g. **building egress, proposed pedestrian traffic flows in the interior and exterior of the building;**
 - h. **temporary access-ways;**
 - i. **office trailer and dumpster locations;**
 - j. **location of perimeter construction fencing and gates;**
 - k. **other protection measures around and in the building(s);**
 - l. **temporary partitions, proposed pedestrian traffic flows around and in each building;**
 - m. **proposed building access points;**
 - n. **proposed protection measures for trees, shrubs and plantings, interior access-ways;**
 - o. **coordination of activities that relate to building occupants and other field applied measure to protect and coordinate the work including any relocation of utilities.**
- E. Scope Review:**
1. Prior to signing Subcontracts, the Construction Manager will conduct a full Scope Review Meetings with each of the apparent 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 DCS 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.
- F. 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.
- G. 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.
- H. 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.
- I. Permits & Utility Connections:**
1. The Contractor shall be responsible for obtaining and paying all fees for the following permits
 - a. Hydrostatic Pressure Testing Wastewater

- b. Asbestos Disposal Authorization
 - c. Asbestos Abatement Notification
 - d. Demolition Notification Form
 - e. Certificate of Occupancy
 - f. Asbestos Abatement Inspection Report Request
 - g. Demolition Permit
 - h. Storm Water Pollution Control
2. The Contractor shall be responsible for obtaining and paying all fees associated with the following utilities
- a. Cable TV
 - b. Electric
 - c. Gas
 - d. Sewer
 - e. Telephone
 - f. Water

J. PMWeb Project Management:

1. The State of Connecticut Department of Construction Services (CTDCS) is using **PMWeb** as the project management collaborative software tool for this project.
 2. The Construction Manager is required to utilize **PMWeb** 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)** full PMWeb licenses to be utilized on the CT DCS PMWeb Hosted System from PSSGroup 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 CTDCS. 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 a minimum of two (2) of formal PMWeb training through PSSGroup for the Owner's Representative, Owner, and their representatives. Training will be conducted at the DCS Training Room at the State Office Building, at 165 Capitol Avenue, Hartford, CT 06106. The training shall be coordinated through the DCS Project Manager and DCS PMWeb Staff. 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 PSSGroup, for the PMWeb licenses and training at <http://www.pmweb.com> , **Phone:** (617) 207-7080, or **Fax:** (978) 246-0248.
 6. Connecticut Department of Construction Services (CTDCS)) 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 DCS Project Manager and the project specific email "file" address. The hard copy of the wet signature documents shall be transmitted as directed by the DCS 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 Construction Services (CTDCS) 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 CTDCS in accordance with this provision.

1.10 PROJECT PHASING:

A. Phasing Documents:

Refer to Phasing document issued by the Construction Manager (CMR) – Fusco Corporation in a separate volume of documents, which shall become part of the full set of Construction Documents for this project. In addition, the Phasing notes included in the Volume I drawings on Sheet PH-101, shall be used in conjunction with all the phasing drawings and notes.

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 01 Section 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 Allowances.
- 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 General Conditions of the Section 00 72 23 General Conditions Of The Contract For Construction For Construction Manager At Risk (CMR).
 3. 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 Contingency 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 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 General Conditions Of The Contract For Construction For Construction Manager At Risk (CMR).
4. 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. Definitions:

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 DCS 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 DCS 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.

1.5 UNIT PRICE 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. **UNIT PRICE:** 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.
2. **“EARTH”:** Is defined as excavation shall include removal of all materials other than ‘water’ and ‘rock’.
3. **“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).
4. **“ORIGINAL GRADE”:** Is defined as being the grade which exists at the time of Contract Award.
5. **“ROUGH GRADE”:** Is defined as being the completed surface of required excavations greater than 13’ in width.
6. **“MASS”:** Excavation is to be considered as an open area whose minimum horizontal dimensions exceed 13’.
7. **“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):** 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
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D. Unit Price Schedule - Miscellaneous:

1. Unit Price - Miscellaneous:

A.	MISCELLANEOUS Items	UNIT	\$ ADD	\$ DEDUCT
a.	Compacted Granular Fill – Furnished and Placed	C.Y.	16.00	12.80
b.	Rock line drilling (6 foot deep 3” dia. Holes @ 6” o/c)	L.F. (Horiz)	7.00	5.60
c.	Rock Pre-Splitting	L.F. (Horiz)	9.00	N/A
d.	¾” crushed stone furnished and placed	TON	20.00	N/A
e.	Un-reinforced Concrete (3000 PSI) formed and placed	C.Y.	175.00	N/A
1.	*Structural fill	C.Y.	26.60	21.28
2.	*Footing forms, contact area	S.F.C.A	10.62	8.50
3.	*Footing concrete, in place	C.Y.	228.00	182.40
4.	*Wall forms, contact area	S.F.C.A.	9.50	7.60
5.	*Wall concrete, in place	C.Y.	261.25	209.00
6.	*Reinforcing steel bars, in place	LBS	1.28	1.03
7.	*Structural steel, in place	LBS	1.38	1.10
8.	*Helica Piles, in place	L.F.	\$100.00	\$100.00
9.	*Measured Casing (At Geothermal Wells)	L.F.	\$16.00	\$14.00
10.	*Additional Water Discharge (> 50 GPM)	Ea. Well	\$3350.00	N/A

E. Unit Price Schedule - Alterations:

1. Unit Price - Alterations:

A.	ALTERATION ITEMS	UNIT	\$ ADD	\$ DEDUCT
a.	Roof Pressure Treated Blocking	L.F.	6.00	6.41
b.	Flashing	L.F.	6.00	4.80
c.	Roof Flashing	L.F.	15.00	20.00
d.	Structural Metal Deck	S.F.	2.75	2.19
e.	Masonry Repointing	S.F.	5.00	N/A
f.	Masonry Cleaning	S.F.	1.00	N/A
g.	Brick replacement	N/A	N/A	N/A
h.	2-1/2” Gypsum Roof Deck with integral form work	S.F.	8.00	N/A
j.	3” Tectum Roof Deck	S.F.	5.00	N/A
A.	ALTERATION ITEMS (Con’t)	UNIT	\$ ADD	\$ DEDUCT
h.	Roof Sheathing	S.F.	4.00	3.20

	i. Roof Drain Assemblies	EA	764.75	611.80
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2. Unit prices shall be negotiated if there is a change in scope of work.

F. Unit Price Schedule—Additional PCB Abatement

1. 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 are 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 of containment area) as described in these specifications, including installation of equipment used to create and maintain negative pressure.	EA	\$1,300.00
2	Containment Area – Set up of containment area (up to 400 square feet of containment area) as described in these specifications, without installation of equipment used to create and maintain negative pressure.	EA	\$1,100.00
3	PCB Bulk Product abatement with removal of non-porous metal building component and removal of 6” of adjacent porous brick (includes cleaning of non-porous metal building components scheduled to remain such as metal lintels, structural steel beams, etc.)	LF	\$25.00
4	PCB Bulk Product abatement with removal of non-porous metal building component and removal of 6” of adjacent porous block (includes cleaning of non-porous metal building components scheduled to remain such as metal lintels, structural steel beams, etc.)	LF	\$25.00
5	PCB Bulk Product abatement with removal of non-porous metal building component and removal of 12” of adjacent porous brick (includes cleaning of non-porous metal building components scheduled to remain such as metal lintels, structural steel beams, etc.)	LF	\$30.00
6	PCB Bulk Product abatement with removal of non-porous metal building component and removal of 12” of adjacent porous block (includes cleaning of non-porous metal building components scheduled to remain such as metal lintels, structural steel beams, etc.)	LF	\$30.00
7	PCB Bulk Product abatement with removal of non-porous metal building component and removal of 18” of adjacent porous brick (includes cleaning of non-porous metal building components scheduled to remain such as metal lintels, structural steel beams, etc.)	LF	\$35.00
8	PCB Bulk Product abatement with removal of non-porous	LF	\$35.00

	metal building component and removal of 18” of adjacent porous block (includes cleaning of non-porous metal building components scheduled to remain such as metal lintels, structural steel beams, etc.)		
9	CT Regulated Waste abatement with removal of nonporous metal building component and cleaning of adjacent porous building materials	LF	\$20.00
10	Removal of 3” of adjacent porous brick	LF	\$2.50
11	Removal of 3” of adjacent porous brick	LF	\$2.50
12	Removal of 6” of adjacent porous brick	LF	\$5.00
13	Removal of 6” of adjacent porous brick	LF	\$5.00

G. Unit Price Schedule—Additional PCB Soil Remediation

1. 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	Removal of 1 ton of PCB contaminated soil (includes excavation, transportation, and disposal)	Ton	\$400.00

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 20 00 - CMR

Error! Not a valid link.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 Section 01 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



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 **CTDPW Project No.:** _____
 Department of Public Works **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: <input type="checkbox"/> Substitute: <input type="checkbox"/> Model No.: _____			
<i>See attached data for both specified and proposed products as required by Article 15 General Conditions.</i>			
Data attached:	Drawings: <input type="checkbox"/>	Product Data: <input type="checkbox"/>	Reports: <input type="checkbox"/> Samples: <input type="checkbox"/>
	Tests: <input type="checkbox"/>	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 <input type="checkbox"/>	Yes <input type="checkbox"/>	<i>If yes attach explanation.</i>
Will proposed substitution increase Contract Time?	No <input type="checkbox"/>	Yes <input type="checkbox"/>	<i>by number of Days</i> _____
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: <input type="checkbox"/> CA /OR: <input type="checkbox"/>			

Consultant's Review – This Substitution Request is:		Request Received on (Date): _____
<input type="checkbox"/> Approved:	<i>(Submittals in accordance with Div. 01 General Requirements, Section 01 33 00 Submittal Procedures.)</i>	
<input type="checkbox"/> Approved as Noted:	<i>(Submittals in accordance with Div. 01 General Requirements, Section 01 33 00 Submittal Procedures.)</i>	
<input type="checkbox"/> Rejected:	Use Specified Materials.	
<input type="checkbox"/> Rejected:	Request Not Received Within Specified Time Period - Use Specified Materials.	
Reviewed Issued By: _____		
	(Typed Name)	(Signature) _____ (Date) _____
CONSULTANT Send copies to: DPW PM: <input type="checkbox"/> CA /OR: <input type="checkbox"/> Chief Architect <input type="checkbox"/> Chief Engineer <input type="checkbox"/>		

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 DCS 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"** Forms 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".
 - 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" .
 - 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 Construction Services, 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 DCS 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 DCS PM.
 - c. Comply with Architect and DCS 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 DCS 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 DCS 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 DCS 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 DCS PM and authorities having jurisdictions. If unsatisfactory conditions exist notify the Architect and DCS 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.
20. Inspection and Testing Requirements
21. Recording Requirements
22. Protection Procedures
23. Indoor Air Quality Management
24. Noise Management Procedures

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.
24. Indoor Air Quality Management
25. Noise Management Procedures

- 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.**
- p. **Indoor Air Quality Management**
- q. **Noise Management Procedures**

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 its 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 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** as the scheduling software system for use on this Project. **PM Web Project Planner** will be the Information Management Software system used for 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 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 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 be 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):
$$\frac{\text{Contract Time (Calendar Days)}}{365} \text{ multiplied by } 7 \text{ equals } \text{Weather Days Allowance (Calendar Days)}$$
 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 DCS PM and Construction Manager shall meet after receipt of Preliminary Schedule to review and make necessary adjustments. Construction Manager shall submit a revised 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 DCS 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 DCS PM shall be submitted within **five (5)** days of the Construction Manager's receipt of the Architect and DCS 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 DCS 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 DCS 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 DCS PM comments. Subsequent follow-up meetings and resubmissions may continue until the Architect and DCS 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 DCS 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 DCS 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

Error! Not a valid link.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. 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.
 - c. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
 - d. The Architect reserves the right to reject incomplete submitted packages.
 4. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for re-submittals.
 - a. Allow **fourteen (14)** Calendar Days for initial review. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. Allow **fourteen (14)** Calendar Days for reprocessing each submittal.
 - d. 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 **three (3) hard copies and one (1) electronic copy** 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** 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** 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.
16. Indoor Air Quality inspections / Issues / Complaints / Response Actions
17. Noise Impact Inspection / Issues / Complaints / Response Action

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)** electronic copy and **three (3)** 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 DCS 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 DCS 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
<p>STATE FIRE MARSHALS (SFM): Deputy State Fire Marshal 1111 Country Club Road, PO Box 2794 Middletown, CT 06457 Tel: (860) 685-8350</p>	<p>DCS Codes Unit State Office Building - DCS 165 Capitol Avenue Room 280 Hartford, CT 06106 Ira Henowitz (860) 713 5708 or Joseph Cassidy (860) 713-5705</p>

- B. Before the shop drawings are submitted to SIC or Code (either SFM or DCS), the A/E and/or the A/E fire protection consultant must review the sprinkler design for compliance with the code and DCS requirements. SIC review comments will be addressed to the DCS Project Manager. The A/E is responsible for changes that result from the SIC and/or Code (SFM or DCS) 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 **three (3) hard copies and one (1) electronic copy** of each required submittal; submit **five (5)** copies where required for maintenance manuals. The Architect will retain **one (1), the Engineer will retain one (1) if applicable**, 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 19 "Selective Structure Demolition" for demolition of selected portions of the building for alterations.
 - 5. Division 02 Section 02 42 93 "Building Deconstruction" for deconstruction 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.

2.2 SALVAGEABLE MATERIALS

- 1. The Construction Manager shall be responsible for removing the following salvageable items from premises and transporting as designated by Owner at a location within 10 miles of the project Site; or storing said items for reinstallation on the project,
- 2. **Equipment:**
 - a) All Air Conditioning Window Units
 - b) All TV Monitors and Brackets
 - c) Designated Food Service Equipment
 - d) Designated Trade / Shop Equipment
- 3. **Art / Plaques:**
 - 1. All Dedication/ Memorial Plaques and Monuments
- A. The Construction Manager shall notify the Owner's Representative in writing **seven (7)** days prior to removing all salvageable items from the existing alteration project location and unloading all salvageable

items as **designated** and storing items in the appropriate location as directed by the **Owner's Representative**.

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 Lead Containing Material (LBP):

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 **Section 00 30 00 Available Information**. 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 including structural steel materials, affecting performance of the Work. The structural steel was not tested for lead prior to bidding. However, lead based primer may exist on the structural steel, due to the age of the existing building. All Contractors shall take the appropriate precautions as prescribed in current law or State Statute, when handling structural steel or other related modifications in any way.
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. The Owner is responsible for abating all ACM that is visible and accessible. This is to be accomplished through a separate project prior to the start of the renovation project. In demolition projects, every attempt should be made by the Owner to remove all ACM.
2. 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.
3. 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 this Project Manual. 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 **NOT** 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 DCS 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";
 - c. **Crane Critical Lift Plan:** "O, A";
 - d. **Proof of qualification for Crane Operators;** 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. **Crane Reports;**
 - d. **Regulatory Citations and Violations;**
 - e. **Gas Protection.**
 - 3. **Certificates:**
 - a. **Confined Space Entry Permit;**
 - b. **Hot work permit;**
 - c. **License Certificates.**
 - d. **Certificate of Compliance – Crane**

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 half (1/2) times to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The Contractor Quality Control (QC) person **cannot be the SSHO on this project, even though the QC has safety inspection responsibilities as part of the QC duties.** 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 **four (4)** areas of competency: **Excavation; Scaffolding; Fall protection; Hazardous energy; Confined space; Health hazard recognition, evaluation and control of chemical, physical and biological agents; Personal protective equipment and clothing to include selection, use and maintenance.**

C. **Certified Safety Professional (CSP) and/or Certified Industrial Hygienist (CIH):**

Provide a **Certified Safety Professional (CSP) or Certified Industrial Hygienist (CIH)** at the work site to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The **CSP or CIH** shall be the safety and occupational health "competent person" as defined by this section. **The CSP and/or CIH shall have no other duties than safety and occupational health management, inspections, and/or industrial hygiene.]**

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 **production and quality control** 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.

[2. Certified Safety Professional (CSP), Certified Industrial Hygienist (CIH), Associate Safety Professional (ASP), Certified Safety Trained Supervisor (STS), and/or Certified Construction Health & Safety Technician (CHST):

- a. Perform safety and occupational health management, surveillance, inspections, and safety enforcement for the project.
- b. Perform as the safety and occupational health "competent person" as defined by this section.
- c. Be on-site **at all times** whenever work or testing is being performed.
- d. Conduct and document safety inspections.
- e. Shall have no other duties other than safety and occupational health management, inspections, and enforcement on this contract.

If the **CSP, CIH, ASP, STS, or CHST** is appointed as the SSHO all duties of that position shall also be performed.

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 DCS 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 DCS 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 DCS 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 DCS 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 DCS 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(s)** 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 to include **type of construction equipment used, Personal Protective Equipment (PPE) used, etc.** 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, SHALL 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-isocyanates, 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.**

b. Steep-Sloped Roofs: Work on steep-sloped roofs requires a personal fall arrest system, guardrails with toe-boards, or safety nets. This requirement also includes residential or housing type construction.

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.** Existing 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, **ASME B30.3** for construction tower cranes, and **ASME B30.8** for floating cranes and floating derricks.
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** (610 mm) 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** (30.5 m) if parallel within **5 feet** (1.5 m) 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 "latest applicable State Codes and Regulations" and 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. 2005 Connecticut State Building Code with 2009 Connecticut Supplement.
 2. 2003 International Building Code including 2005 & 2009 Connecticut Supplements.
 3. 2003 International Existing Building Code including 2005 & 2009 Connecticut Supplements.

4. 2003 International Mechanical Code including 2005 & 2009 Connecticut Supplements.
 5. 2003 International Plumbing Code including 2005 & 2009 Connecticut Supplements.
 6. 2003 International Energy Conservation Code including 2005 & 2009 Connecticut Supplements.
 7. 2005 National Electric Code NFPA 70 including 2005 & 2009 Connecticut Supplements.
 8. 2005 Connecticut Fire Safety Code with 2009 Connecticut Supplement..
 9. ICC/ANSI A117.1-Accessible and Usable Buildings and Facilities.
 10. 2010 ADA Standard for Accessible Design.
 11. OSHA 29 CFR Part 1910 Occupational Safety and Health Regulations/1999.
 12. 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. **Deliver samples to testing laboratories.**
 6. **Provide an approved design mix proposed for use for material mixes that require control by the testing agency.**
 7. **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 Construction Services 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 Construction Services 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 Construction Services 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 Construction Services 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 **or Owner's Representative**.
 - 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

Error! Not a valid link.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 "Testing, Adjusting and Balancing for HVAC" for additional requirements for baseline testing for IAQ.
 3. Division 23 "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 Division 23 "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 Certification Documentation Submittals:**
1. Construction Indoor Air Quality (IAQ) Management Plan (During Construction) Credit:

- a. Construction IAQ management plan.
 - b. Letter confirming if the permanently installed air handling equipment was used during construction.
 - c. Product data for temporary filtration media. Indicate manufacturer, model number, MERV rating, and location of installed media.
 - d. Letter confirming that each filtration media was replaced prior to final occupancy.
 - e. Product data for filtration media to be used during occupancy. Indicate manufacturer, model number, MERV rating, and location of media.
 - f. Construction Documentation: **Six (6)** photographs at **three (3)** different occasions during construction along with a brief description of the SMACNA approach employed, document implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.
- 2. Construction Indoor Air Quality (IAQ) Management Plan (Before Occupancy) Credit:**
- a. Signed letter confirming the approach taken by the project (pre-occupancy flush-out; flush-out with early occupancy flush-out or IAQ testing).
 - b. 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.
 - c. Product data for filtration media used during flush-out and during occupancy.
 - d. A narrative describing the building's IAQ testing process and results including the dates when testing was started and completed.
 - e. 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

- 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 major section of 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] [buildings] 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) Credit:
1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total air volume of 14000 cu ft of outdoor air per sq ft of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60 percent.
 2. If building occupancy is to occur before completion of the flush-out, deliver a minimum of 3500 cu ft of outdoor air per sq ft of floor area to the space. Once the space is occupied, ventilate it at a minimum rate of 0.30 cfm/sq ft of outside air or the design minimum outside air rate determined in accordance with Sections 4 through 7 of ASHRAE 62.1 or applicable local code, whichever is more stringent. During each day of the flush-out period, begin ventilation a minimum of three (3) hours prior to occupancy and continue during occupancy. Maintain these conditions until a total of 14000 cu ft/sq ft of outside air has been delivered to the space.
 3. 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 [and the LEED for New Construction Version 2.2 Reference Guide].

3.2 INDEPENDENT MATERIALS TESTING

- A.** Materials That Must Be Tested: Test materials listed below that are proposed for use on this project for permanent, in-place Indoor Air Quality performance in accordance with requirements of these specifications. Results shall be furnished to the Architect. Materials meeting the criteria for independent testing are as follows:

1. Field applied paint systems on appropriate substrate. Paint primers and intermediate coats (if used) should be applied with a typical drying time allowed between coats (not to exceed **seven (7)** days).
 2. Carpet including the manufacturer's recommended adhesive. The carpet will be applied to the appropriate concrete flooring per manufacturer's instructions so that the testing is of the "carpet assembly."
 3. Acoustical ceiling tile.
 4. Fireproofing material applied to appropriate substrate.
- B. Materials for Testing:** Only test representative samples of actual products selected for use on this project. Tests of products generically and/or technically similar but produced by a manufacturer other than that of the product selected for use on this project is invalid.
- C. Materials Testing Parameters:**
1. Wrap each material to be tested in air tight covering for shipment direct from the factory to the testing laboratory to avoid contamination in transit. Unwrap material or apply material to substrate if material is wet-applied, such as paint or adhesive materials) in the testing lab.
 2. Emissions Testing: Perform all testing in accordance with ASTM D5116. Report results in accordance with Section ii of referenced ASTM Standard. Report in terms of emission rates at a minimum of three (3) distinct time intervals (**e.g., one (1) hour, 24 hours, 72 hours**) that will be modeled by the Architect to predict maximum indoor air concentrations and to assist the Construction Manager in determining suitability of products or materials. Assumptions that will be used for the Architect's model are given below for information.
 3. Table 3.2 summarizes required product testing.

Table 3.2 PRODUCT EMISSION TESTING

PRODUCT ASSEMBLY TO BE TESTED	TVOC (per ASTM)	PM (per NIOSH)
Wall paint on appropriate substrate, including any primer coat	Yes	No
Carpet including adhesive and concrete flooring	Yes	No
Acoustical Ceiling Tile	No	Yes
Fireproofing material on appropriate substrate	No	Yes

- D. Model Assumptions Used for Predicting Indoor Air Concentrations:** The model will assume the standard room enclosure as 10' long x 10' wide x 9' high. Each product tested will be modeled separately to provide information on the particular product. The model will assume a ventilation rate of one (1) air change per hour.
1. **Field Applied Paint Systems:** Test fully cured samples of each complete paint system including primers, intermediate coats (if used), and finish coats. The model assumes application to all four (4) walls and one-half of ceiling of model standard room enclosure.
 2. **Carpet and Adhesive Assembly:** Assumes application to entire 10 x 10 ft floor surface of model standard room enclosure.
 3. **Acoustical Ceiling Tile:** Assumes application to entire 10 x 10 ft ceiling surface of model standard room enclosure.
 4. **Fireproofing:** Assumes application to entire 10 x 10 ft area above the ceiling surface of model standard room enclosure.
- E. Materials Test Reports:** Submit test reports to the Architect. The report shall include the information outlined in Section 11 of ASTM D5116.
- F. Product/Material Evaluation:** All products/materials shown by testing to comply with emissions limits and other criteria specified in this section will be approved for use on this project subject to compliance with all other specified requirements of the Project Manual. Products/materials shown by model to exceed specified emission limits shall be discussed, test results interpreted, and a determination made as to alternative product uses or selections.

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 DCS 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 DCS 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:** The Agency will allow the toilets located in **[Insert]** for Construction Manager's use. If others are needed, 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 Division 33 – Utilities - Stormwater Pollution Control.
 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.

2. 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. Steam from the Agency's lines shall be metered and paid for by the Contractor at a price approved by the Agency and Owner. 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.
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 DCS 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 DCS/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:**
1. The contractor shall assume responsibility for the maintenance and execution of the measures contained in the Storm Water Pollution Control Plan (SWPCP) included in the bid documents and submitted to the Connecticut Department of Environmental Protection (CTDEP) - "General Permit for the Discharge of Storm water and Dewatering Wastewaters from Construction Activities"; conform to the permit requirements.
 2. The contractor shall review and sign (including all subcontractors) the SWPCP in the contract documents and return to the engineer no later than 35 days prior to initiation of any construction activity. Any applicable filing fees associated with filing the SWPCP shall be paid for by the contractor. The signed SWPCP along with applicable fees will be submitted to the CTDEP by the engineer. A copy of the signed SWPCP shall be retained by the contractor and shall be at the site during construction.

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 DCS 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, the Owner, and the Architects/Engineers; **(1) one double-wide trailer 24' x 60' including connector.** The trailer shall be in "new condition" as determined by the Owner's Representative. **The trailer shall have a minimum of three (3) offices (minimum 150 square feet each), a main meeting area (conference room), a central space for file and drawing storage, 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.
 3. The Construction Manager shall provide the following furniture for the Owner and Owner's Representative's Field Office Trailer., which will remain his property. The furniture may be used but shall be in good condition as judged by the Owner's Representative and DCS 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. **(3) Three** lockable, double-pedestal, office desks, each with an executive chair.
 - c. **(4) Four** plan tables.
 - d. **(2) Two** plan racks.
 - e. **(20) Twenty** conference chairs and a conference table (approx. 5'x12').
 - f. **(4) Four** side tables (approx. 3'x5').
 - g. **(4) Four** 4'x6' wall mounted, cork display boards.
 - h. **(2) Two** 3'x4' wall mounted, white, wipe-off board, with markers.
 - i. **(8) Eight** file cabinets (lockable four drawer legal size).
 - j. **(4) Four** bookshelves w/10 L.F. of 12" wide shelving each.
 - k. **(4) Four** large capacity waste receptacles.
 - l. **(1) One** wireless G compatible switch / router equivalent to the Linksys WRT54g Broadband router compatible/connected to internet connection with minimum Cable modem Service provided by CMR.
 - m. **(4) Four** telephones with telephone lines and voice mail and **(1) one** telephone line dedicated for Fax function of Copier/Printer/Scanner/Fax equipment.
 - n. **(4) Four** data lines (dedicated to Computer use) with High Speed Internet Connection, minimum cable modem service.
 - o. **(1) One Laptop Computer-** Model: HP EliteBook 2560p Small Form Laptop, Processor: Intel Core i5 2.6 GHZ, Memory: 4 GB DDR3 1 DIMM, Hardrive: 320GB SATA 7200RPM, MultiMedia Device: DVD+RW/DVD-RAM, Network: Gigabit Ethernet, Wireless: 802.11 a/b/g/n, Webcam: Integrated 720p HD, Graphic Card: Intel HD Graphics 3000, Display: 12.5 inches, Max Resolution: 1366 x 768, Operating System: Win 7 Pro, Warranty: HP Care Pack Services Next Biz Day Support - 3 yrs, (docking station for computer, AutoCAD reading program as AutoDesk DWG TrueView, Microsoft Office2003 Professional sp2 (or newer version), Primavera P-6 (latest version), McAfee Enterprise Virus Scan, (1) Viewsonic VA2231wm-LED 22" Class Widescreen LED Backlit Monitor - 1920 x 1080, 16:9, 1000000:1 Dynamic, 1000:1 Native, 5ms, DVI, VGA, Energy Star. All software provided shall be compatible versions with license and certificate of authenticity

(1) One Laptop Computer- Model: HP 8560P, Processor: Intel Core i5 2.6 GHz, Memory: 4 GB DDR3 PC3-10600, Hard Drive: 320GB Serial ATA 7200 RPM, Multimedia Device: DVD+RW/DVD-RAM, Network: Gigabit Ethernet, Wireless: 802.11 a/b/g/n, Webcam: Integrated 720p HD, Graphic Card: AMD Radeon HD, Display: 15.6 in, Max Resolution: 1600 x 900, Operating System: Win 7 Pro, Warranty: HP Care Pack Services Next Biz Day Support - 3 yrs, docking station for computer, AutoCAD reading program as AutoDesk DWG TrueView, Microsoft Office2003 Professional sp2 (or newer version), Primavera P-6 (latest version), McAfee Enterprise Virus Scan, (1) Viewsonic VA2231wm-LED 22" Class Widescreen LED Backlit Monitor - 1920 x 1080, 16:9, 10000000:1 Dynamic, 1000:1 Native, 5ms, DVI, VGA, Energy Star. All software provided shall be compatible versions with license and certificate of authenticity

(2) Two Desktop Computers

Model: HP Compaq Elite 8200, Processor: Intel Quad Core i5-2400 3.1GHz, Memory: 4GB PC3-10600 1 DIMM (32GB Max), Hard Drive: 250GB 7200RPM SATA, Multimedia Device: DVD+RW/DVD-RAM, Network: Intel 82579LM - Gigabit Ethernet Graphic Card: Intel HD Graphics 2000, Max Resolution: 2048 x 1600 Analog, 2560x1600 Digital, Operating System: Win 7 Pro Warranty: HP Care Pack Services Next Biz Day Support - 3 yrs, AutoCAD reading program as AutoDesk DWG TrueView, Microsoft Office2003 Professional sp2 (or newer version), Primavera P-6 (latest version), McAfee Enterprise Virus Scan, (1) Viewsonic VA2231wm-LED 22" Class Widescreen LED Backlit Monitor - 1920 x 1080, 16:9, 10000000:1 Dynamic, 1000:1 Native, 5ms, DVI, VGA, Energy Star or equal.

(1) One 70" Interactive Whiteboard Display

Model: Sharp PN-L702B or similar and cables to connect to scanner/copier & (2) two remote port connections

- p. **(2) Two B&W Printer-** Model: HP LaserJet Enterprise P3015dn Printer: Specs: Printer - B/W - duplex - laser - Legal - 1200 dpi x 1200 dpi - up to 42 ppm - capacity: 600 sheets - USB, 1000Base-T, with (2) hub connections, and supplies approved by Owner.
 - q. **(1) One Network capable Copier/Printer/Scanner/Fax Machine:** Ricoh Aficio MP 5001 with fax option, automatic stapling and finishing tray (s) or equal and supplies for the machine, approved by the owner. Include dedicated telephone line for fax function.
 - r. **(1) One color Printer-** Model: HP Color LaserJet Enterprise CP5525n, Specs: Printer - color - laser - SRA3 - 600 dpi x 600 dpi - up to 30 ppm (mono) / up to 30 ppm (color) - capacity: 850 sheets - USB, 1000Base-T, with (2) hub connections, and supplies approved by Owner.
 - s. **(1) One Digital Camera -** Model: Sony Cyber-shot DSC-W570:, Specs: Digital camera - compact - 16.1 Mpix - optical zoom: 5 x - supported memory: MS Duo, SD, MS PRO Duo, SDXC, MS PRO Duo Mark2, SDHC, MS PRO-HG Duo or equal and 1 GB memory card.
 - t. **(2) Two** battery operated wall clocks.
 - u. Window blinds.
 - v. **(1) One** mailbox.
4. The Construction Manager shall provide the following furniture for the Architects/Engineers' office within the Owner's Representative, Owner, and Architects/Engineers' Trailer, which will remain his property. Approximate size of Architects/Engineers' office is to be 26' x 12'. The furniture may be used but shall be in good condition as judged by the Owner's Representative and DCS PM.
- w. 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.
 - x. **(1) One** lockable, double-pedestal, office desks, each with an executive chair.
 - y. **(1) One** plan tables.
 - z. **(1) One** plan rack (supporting 10 clamps).
 - aa. **(1) One** 4'x6' wall mounted, cork display boards.
 - bb. **(2) Two** 4'x4' wall mounted, white, wipe-off board, with markers.
 - cc. **(2) Two** file cabinets (lockable four drawer letter size).
 - dd. **(1) One** bookshelves w/10 L.F. of 12" wide shelving each.
 - ee. **(1) One** large capacity waste receptacles.

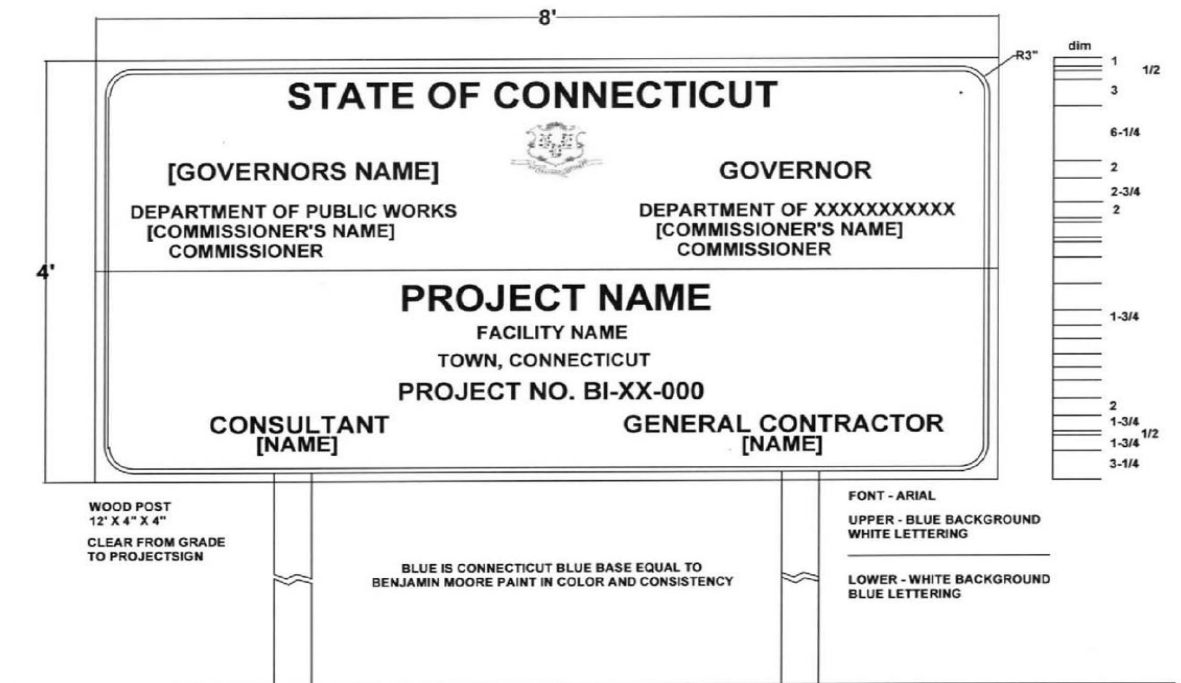
- ff. (1) One telephone with telephone line, call waiting, and voice mail.
- gg. (2) Two data lines (dedicated to computer use) with high-speed Internet connection (minimum of DSL or cable modem service).
- hh. (1) One Computer, with a 19" 1280 x 768 @72Hz Analog/ digital displays, Quad Core Core Intel Xeon W3565 3.2 GHz 4.8GT/s, 12GB DDR3 ECC SD RAM Memory 1333MHz, 16X DVD+/-RW Data, 320GB SATA 3.0Gb/s, USB Keyboard and 2 button Mouse, , the computers shall have a DVD CD RW Combo drive, 1GB nVIDIA Quadro 600, sound card, integrated Intel 10/100/1GB/wireless NIC, USB ports, external powered speakers, each CD—ROM restore software, including but not limited to, Windows 7 Professional No Media 64-bit Fixed, AutoCAD 2012, Microsoft Office Professional 2010, 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.
 - ii. (1) Lap Top Computer – Model: HP 8560P, Processor: Intel Core i5 2.6 GHz, Memory: 4 GB DDR3 PC3-10600, Hard Drive: 320GB Serial ATA 7200 RPM, Multimedia Device: DVD+RW/DVD-RAM, Network: Gigabit Ethernet, Wireless: 802.11 a/b/g/n, Webcam: Integrated 720p HD, Graphic Card: AMD Radeon HD, Display: 15.6 in, Max Resolution: 1600 x 900, Operating System: Win 7 Pro, Warranty: HP Care Pack Services Next Biz Day Support - 3 yrs, docking station for computer, AutoCAD 2012, Microsoft Office 2010 Professional, Primavera P-6 (latest version), McAfee Enterprise Virus Scan, (1) Viewsonic VA2231wm-LED 22" Class Widescreen LED Backlit Monitor - 1920 x 1080, 16:9, 10000000:1 Dynamic, 1000:1 Native, 5ms, DVI, VGA, Energy Star. All software provided shall be compatible versions with license and certificate of authenticity
 - jj. Window blinds.
 - kk. (1) One mailbox.
- 3. When the Construction Manager supplies the trailer(s) they shall equip each trailer with (1) one 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, DCS 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 Partitions:** Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by **Owner / User** from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
 2. Construct dustproof partitions with two layers of 6-mil (0.14-mm) polyethylene sheet on each side. Cover floor with two layers of 6-mil (0.14-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant treated plywood.
 3. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.
 4. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 5. Insulate partitions to control noise transmission to occupied areas.
 6. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 7. Protect air-handling equipment.
 8. Provide walk-off mats at each entrance through temporary partition.
- H. Temporary Fire Protection:** Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
- I. 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.
- J. 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.
- K. 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:**



- L. **Temporary Exterior Lighting:** Install exterior yard and sign lights so signs are visible when Work is being performed.

M. **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.

- N. Temporary Environmental Controls:** Construction Manager is to provide the following controls identified below, and as detailed or described elsewhere in the project manual or on contract drawings.
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.** (construction and demolition). All Contractors are required to employ noise control methods, including but not limited to newer and quieter equipment and tools, use of mufflers, and scheduling noisy work on 2nd shift; during normal school operating hours. Also All Contractors shall adhere to the Noise Management Plan required throughout the construction site for this project.
 4. **Erosion and Sediment Control:** Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to **erosion- and sedimentation-control Drawings and specifications.**
 5. **Pollution Control.**
 6. **Traffic Control.**
- O. Stairs:** Until permanent stairs are available, provide temporary stairs where ladders are not adequate and where shown on Phasing Drawings. Cover finished permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.
- P. Temporary Environmental Controls (Dust and Indoor Air Quality Control):** Contractor is to provide the following controls.
1. Contractor shall provide an on-Site person who will be responsible for implementing, inspecting, and documenting all Contractor activities related to control of dust, dirt, and indoor air quality in accordance with the Indoor Air Quality Management Plan prepared pursuant to the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) publication entitled "Indoor Air Quality Guidelines for Occupied Buildings Under Construction.
 2. Provide a written Indoor Air Quality and Noise Management During Construction plans for protection of indoor air quality, and the building occupant's acoustic comfort, for each specific construction phase, to the Construction Administrator at least 30 days prior to initiation of that construction phase.
 3. Contractor shall respond to all complaints consistently and expeditiously. Upon receipt or notification of a dust or indoor air quality complaint from the Construction Administrator, the Contractor shall promptly evaluate the conditions at the complainant's location during activities representative of the offending operation. The complainant response evaluation shall be immediately submitted to the Construction Administrator. In the event that the conditions result in unacceptable nuisance conditions, the Contractor shall immediately use appropriate methods and materials to alleviate the nuisance conditions.
 4. The contractor will be responsive to the concerns expressed by school representatives and the Construction Administrator, as well as to complaints from the school community. All appropriate efforts shall be made to coordinate dusty or other problematic operations in a manner so as to minimize disruptive impacts on school operations.
 5. Utilize practices to maintain and protect the indoor air quality that are consistent with the guidelines set forth in the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) publication entitle "*Indoor Air Quality Guidelines for Occupied Buildings Under Construction.*" Practices may include, but not limited to, isolation of HVAC systems, isolation and ventilation of work areas, construction of temporary barriers, and regular inspections of work areas.
 6. The Contractor is responsible for control of dust and indoor air quality, as it may be affected by the Work, at all times during Contract, 24 hours a day, 7 days a week, including nonworking hours, weekends, and holidays.
 7. The Contractor shall utilize dust control methods as necessary during the course of the work. Dust control methods may include the following:
 - a. Wet suppression shall be used to provide temporary control of dust. Several applications per day may be necessary to control dust depending upon meteorological conditions and work activity. The Contractor shall apply wet suppression on a routine basis as necessary or

directed by the Engineer to control dust. Care should be taken not to over-apply water and create mud.

- (1.) Wet suppression consists of the application of water or a wetting agent in solution with water. Ensure wetting agent is not used on plantable soils.
 - (2.) Wet suppression equipment shall consist of sprinkler pipelines, tanks, tank trucks, or other devices capable of providing regulated flow, uniform spray, and positive shut-off.
- b. Provide windscreens and wind barriers in locations where they would be effective in minimizing wind erosion and spread of dust. The Contractor shall keep windscreens and barriers in good repair for the life of the Contract.
- c. The use of petroleum products for dust suppression is not permitted.
- d. Vehicle speeds within the construction site should not exceed 5mph to minimize dust emissions. Post signs along all on-site truck routes and at all entrances indicating a speed limit of 5 mph.
- e. Use the following methods as necessary as necessary to control dust on public roadways.
- (1.) Vehicles leaving the construction site shall have no mud and dirt on the vehicle body or wheels. Gravel cover shall be applied to soil (unpaved) surfaces where they will be regularly traveled at egress and ingress routes from/to work sites. Wheels shall be cleaned as necessary before leaving sites to control tracking.
 - (2.) Haul truck cargo areas shall be securely covered during material transport on public roadways. Trucks shall have tight fitting tail gates that can be secured in the closed position.
 - (3.) Vehicle mud and dirt carryout, material spills, and soil washout onto public roadways and walkways and other paved areas shall be cleaned up immediately.
 - (4.) All public roadways and walkways affected by work of this contract shall be cleaned up daily. A wet spray street sweeper shall be used on paved roadways. Dry powder sweeping is prohibited.
- f. Use the following methods as necessary to control earthwork dust:
- (1.) During batch drop operations (i.e., earthwork with front-end loader, clamshell bucket, or backhoe) the free drop height of excavated or aggregate material shall be reduced as practical to minimize the generation of dust. Drop from high elevations shall be contained in chutes with the bottom end sealed to ensure dust is not released.
 - (2.) To prevent spills during transport, freeboard space shall be maintained between the material load and the top of the truck cargo bed rail.
 - (3.) Spoil transfer by conveyor belts shall occur in fully enclosed space.
- g. Use the following methods as necessary to control stockpile dust:
- (1.) Wet suppression without wetting agent during active stockpile load-in, load-out, and maintenance activities.
 - (2.) Soil stabilizers applied to the surface of inactive stockpiles.
 - (3.) Plastic tarps on stockpiles, secured with sandbags or an equivalent method to prevent the cover from being dislodged by the wind. Repair or replace covers whenever damaged or dislodged.
- h. Use the following methods as necessary to control demolition and construction dust and other airborne contaminants:

- (1.) Contractor shall ensure that dust does not enter any HVAC systems. HVAC systems shall be deactivated and/or isolated from other work areas. Openings to HVAC systems in work areas shall be sealed with a minimum of one secured sheet of 6 mil polyethylene sheeting.
- (2.) Demolition/construction work shall be segregated from adjacent occupied areas of the building by sturdy air tight barriers. Dust control barriers will consist of wood framing and plywood where needed for large openings. Dust control barriers shall be maintained in good condition.
- (3.) Contractor shall maintain negative air pressure in interior Work areas at all times to supplement interior dust control barriers as needed to prevent migration of contaminants from work areas into other areas of the building. Negative air filtration devices shall be vented to the outside atmosphere.
- (4.) Contractor shall thoroughly clean work areas using a HEPA vacuum and wet methods to remove dust and debris and shall ensure other sources of impact to indoor air quality have been removed prior to removal of temporary barriers.
- (5.) Closed chutes shall be used for the handling of debris. Dropping or throwing of debris is prohibited. Use chutes to transport materials from buildings down to dumpster and cover dumpsters when not in use.
- (6.) Debris shall not be stockpiled. Debris shall be removed promptly from the site.
- (7.) During transport of debris, the truck cargo area shall be securely covered.

Q. Noise Mitigation Plan. Every reasonable effort shall be made to minimize the noise impact of construction activities. Mitigation measures will include:

1. Instituting a proactive program to ensure compliance with the User - Department of Education (DOE) noise limit requirements.
2. "No idling" signs shall be posted at all loading/delivery and pick-up/drop-off areas and at surface parking spaces. Trucks may not idle on site for more than 5 minutes unless their operation is dependent on the vehicle running.
3. Locating noisy equipment as far as possible from sensitive areas.
4. All fencing will include a fabric screen to aid in dust and noise abatement.
5. Identifying and maintaining truck routes to minimize traffic and noise throughout the Project.
6. Replacing specific construction techniques by less noisy ones where feasible (e.g., using vibration pile driving instead of impact driving, if practical).
7. Maintaining muffling enclosures on continuously running equipment, such as air compressors and welding generators.
8. Mandating that all equipment have the proper sound attenuation devices.
9. Selecting quieter alternative items of equipment when possible (e.g. electric instead of diesel-powered equipment).
10. Scheduling equipment operations to maintain relatively uniform noise levels, when some noise is unavoidable.
11. Respecting the testing periods established as part of the Division 01 – Summary of Work Specifications. The Contractors shall not perform work during these periods that will generate disturbing noise.
12. Work shall be performed as to prevent nuisance noise conditions that are preventable (e.g., un-maintained equipment, brake squeal, act.).
13. Work activities that generate unavoidable excessive noise will be included in the two-week look ahead schedule.
14. The Construction Manager shall conduct base line and periodic testing of activities on the site for compliance of the 86 DBA at 50 feet (at fence or building line). The Construction Manager shall utilize a hand held device to monitor readings. These readings will be tracked

in a log book. This requirement does not apply to the pile driving or blasting (if necessary) operations. An independent protocol will be developed to mitigate the effects of these noisy operations as much as possible.

- a. *Pile Driving Noise Mitigation – The piles will be vibrated to the greatest extent possible. The piles will then be driven to completion. Driving of the piles will be coordinated with local School Administration (User) in advance. The construction schedule is not expected to be adjusted to accommodate this activity.*

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 **driveways** located **around the school building** will not be used during time periods when the school children are arriving and being dismissed. No access to the Gate will be allowed:

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 to coincide with the **School** Schedule.

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. **Product Emission Rate Standards:** Test to ASTM D5116 for maximum indoor air concentration levels.
 - 1. **Formaldehyde:**
 - a. 0.03 parts per million where no other requirements are specified.
 - b. 0.005 parts per million where products are specified as formaldehyde free.
 - 2. **Total VOC Emissions for Carpet Tile, Adhesives, and Sealers:** 0.05 mg/m² per hour.
 - 3. **4 Phenyl Cyclohexene (4-PC) Particulate Emissions for Carpet:** One (1) part per billion.
 - 4. **Total Particulate Emission Rate Levels:** 50 ug/m³.
 - 5. **Primary and Secondary Regulated Pollutants:** Conform to USEPA, Code of Federal Regulations, Title 40, Part 50 National Air Ambient Air Quality Standard. Refer to EPA Web Site <http://www.epa.gov/epahome/rules.html#codified>.
 - 6. **Other Pollutants Not Listed:** Not greater than 1/10 of Threshold Limit Value - Time Weighted Average (TLV-TWA) industrial workplace standard.
- B. **Architectural Coatings - Volatile Organic Compound (VOC) Content Limits:** Conform to US Environmental Protection Agency (EPA) Federal Register 48886/Vol. 63, No.176 Friday, September 11, 1998/ Rules and Regulations. Refer to EPA Web Site: <http://www.epa.gov/ttn/atw/eparules.html>.
- C. 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.
- D. 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.
- E. Protect construction materials from contamination and pollution from contact with construction dust, debris, fumes, solvents, and other environmentally polluting materials.
- F. 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 "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 "Testing for IAQ, Baseline IAQ, & Materials - CMR."
 - 3. Division 01 Section 01 57 30 "Indoor Environmental Control - CMR."
 - 4. Division 23 "Testing, Adjusting and Balancing for HVAC - CMR" for additional requirements for baseline testing for IAQ. – CMR.
 - 5. Division 23 "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 occupants and users in existing or completed sections of the building from undue health risks during construction.
 - 2. Protect workers on the site from undue health risks during construction
 - 3. 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 **Notice of Award** 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, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total air volume of 14000 cu ft of outdoor air per sq ft of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60 percent.
 - 3. If building occupancy is to occur before completion of the flush-out, deliver a minimum of 3500 cu ft of outdoor air per sq ft of floor area to the space. Once the space is occupied, ventilate it at a minimum rate of 0.30 cfm/sq ft of outside air or the design minimum outside air rate determined in accordance with Sections 4 through 7 of ASHRAE 62.1 or applicable local code, whichever is more stringent. During each day of the flush-out period, begin ventilation a minimum of three (3) hours prior to occupancy and continue during occupancy. Maintain these conditions until a total of 14000 cu ft/sq ft of outside air has been delivered to the space.
- 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 Architect'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 Section 01 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 42 16 "**Building Demolition**" for deconstruction of selected portions of the building for alterations.
 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. Salvage for resale or donation.
 4. Recycling.
 5. 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 **Architect and 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 **Architect and 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 DCS 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 DCS 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 DCS 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. Division 01 Section 01 81 13 "Sustainable Design Requirements - CMR" specifies requirements for submittals related to green building certification.

I recommend adding the following reference to Section 01 91 00 Commissioning and the coordinate G.C.

6. Division 01 Section 01 91 00 "Commissioning – CMR" specifies requirements for submittals related Commissioning.
7. 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.
- B. **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.

C. 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 ~~two (2)~~ **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 ~~three (3)~~ **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 [video tape] [DVD] for the use of maintenance training for the facility. Each [video tape] [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 [video tape] [DVD].
2. The Construction Manager is responsible for this production. This [video tape] [DVD] will be provided to the Owner's Representative at the same time as the delivery of the other maintenance material.
3. The [video tape] [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 for each Phase. 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.

Item No.		Specification Product/Warranty
1.	DIV 03	Floor hardener: 5 year, material and workmanship.
2.	DIV 05	Expansion Joint Covers: 5 year material & workmanship.
3.	DIV 07	Single-Ply Membrane Roofing, Base Flashing and Insulation: 10 year unlimited, materials and installation, and; 15 year material and workmanship, and; 2 year Construction Manager's warranty for installation.
4.	DIV 07	Built Up Roofing (BUR), Base Flashing, and Insulation: 20 year material and workmanship, and; 2 Construction Manager's warranty for installation.
5.	DIV 07	Metal Roofing and Siding: 20 year against rupture, cracks or perforation due to corrosion, and; 20 year for fluorocarbon finish (if used) against peeling, blistering, fading and chalking as limited by industry standards, Plus; 10 year weathertightness warranty by Construction Manager's installer.
6.	DIV 07	Copper Roofing: 10 year against rupture, cracks or perforation due to corrosion and including materials and workmanship.
7.	DIV 07	Vents and Hatches: 5 year product and installation, including weathertightness.
8.	DIV 07	Waterproofing: 5 year material and workmanship.
9.	DIV 07	Water Repellent: The term offered for the Specific product.
10.	DIV 07	Exterior Expansion Joint Covers: 5 year material and workmanship, including weathertightness.
11.	DIV 07	Wood Shingles (roofing, siding): 10 year for material and workmanship.
12.	DIV 07	Exterior - Interior Caulking and Sealants: 5 year, material and workmanship.
13.	DIV 07	Metal Flashing and Sheet Metal: 3 year, material and workmanship.
14.	DIV 07	Asphalt Roof Shingles: 25 year, material pro-rated.
15.	DIV 07	Asphalt Roof Shingles Installation: 15 year, workmanship, pro-rated.
16.	DIV 08	Solid Wood Core and Mineral Core doors: Lifetime for interior doors. 5 year for exterior doors.
17.	DIV 08	Overhead Doors (coiling or sectional): 5 year material and workmanship.
18.	DIV 08	Skylights: 5 Year product and installation, including weathertightness.
19.	DIV 08	Closers, Locksets, Exit Bolts: Longest term offered by manufacturer for grade/class of particular item, material and workmanship.
20.	DIV 08	Insulating glass: 10 year against failure of hermetic seal, interpane dusting, or misting including replacement of unit.
21.	DIV 08	Windows: 5 year material and workmanship including weathertightness.
22.	DIV 08	Laminated Glass: 10 year against delamination.
23.	DIV 08	Storefront/Curtain Wall: 5 year material and workmanship (insulating glass separate).

			Air and water infiltration and strength to specified AAMA designation.
24.	DIV 09	Carpet: 10 3	year wear and color fastness, and; year installation.
25.	DIV 10	Operable Partitions: 5	Years, material, and workmanship.
26.	DIV 10	Mirrors: 15	years against silver spoilage.
27.	DIV 14	Elevators and Wheelchair Lifts: 18	months for material, workmanship, and installation.
28.	DIV 22	Electric Heating Cable: 10	years, material, and installation.
29.	DIV 22	Water Softener: 10	years, material, and installation.
30.	DIV 22	Instantaneous Heat Exchangers: 1	year, material, and installation.
30.	DIV 22	Instantaneous Heat Exchangers: 1	year, material, and installation.
31.	DIV 23	Fuel Storage Tank: 30	years, material, and installation.
32.	DIV 23	Compressors and Pumps: 5	years, material and installation,
33.	DIV 26	Dimming Controls: 8	years, material and installation,
34.	DIV 26	Switchboards and Panels: 5	years, material and installation,
35.	DIV 26	Engine Generators: 10	years, material and installation,
36.	DIV 26	Uninterruptable Power Supply: 3	years, material and installation,
37.	DIV 26	Emergency Lighting Batteries: 10	years, material and installation,
38.	DIV 26	Lighting Ballasts: 5	years, material and installation,
39.	DIV 32	Plant Material, Turf and Grasses: 12	months, material and installation, and growth.

G. Submit certification that finish materials are fire rated as specified.

H. Form of Guarantees and Warranties:

Commissioner
Department of Construction Services
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 Construction Services, 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

SECTION 01 91 00 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.01 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.
- B. Section 01 31 00 Project Management and Coordination - CMR specifies procedures for coordinating the Commissioning Process.
- C. Section 01 33 00 "Submittal Procedures - CMR" specifies procedures for submittal of Product Data and Quality Assurance Submittals.

1.02 SUMMARY

- A. This section includes requirements for commissioning during the construction phase, functional testing phase and the building turnover phase. Includes requirements for all specified and associated systems, subsystems and equipment. The intent of this section is to specify the commissioning responsibilities of the Contractor, HVAC Subcontractor, TAB Subcontractor, Automated Temperature Controls Subcontractor, Plumbing Subcontractor, Electrical Subcontractor and the Fire Protection Subcontractor. The Contractor will assure participation and cooperation of his subcontractors as required for the commissioning process. The Commissioning Authority for this project will be hired by the Owner.
- B. The Commissioning Authority is not responsible for construction means, methods, coordination between trades, job safety or any other related management function on the job site.

1.03 DEFINITIONS

- A. Architect: Includes Architect identified in the Contract for Construction between Owner and Contractor.
- B. Automated temperature controls (ATC): building management system and components providing automated control of related environmental and/or process systems and equipment.
- C. Basis of Design (BoD): A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- D. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- E. Contractor: The prime Contractor identified in the Contract for Construction between Owner and Contractor.
- F. Construction Checkout Documents / Pre-Functional Checklists: The CxA will produce pre-functional checklists that can be used by the Contractor / Subcontractors prior to the start of functional testing. These checklists are tools to help the Contractor and Subcontractors verify that the installation complies with the Contract Documents. Any deficiencies that are found can then be corrected early in the process when the Contractors are fully mobilized on the site. The pre-functional checklists will be created for all equipment included in the scope of the commissioning process.
- G. Commissioning Authority (referred to herein as the CxA): The individual or group responsible for executing the commissioning process.
- H. Engineering Professionals: Includes the Engineers identified in the Contract for Construction between Owner and Contractor, responsible for design of HVAC, plumbing, fire protection, electrical, communications, controls for HVAC systems and other related systems.

- I. Mock-up (system or component): A system, or component of a system, that is constructed ahead of other similar pieces of equipment that allows the commissioning agent and the installing contractors the ability to evaluate the installation. It allows early testing of system / equipment applications, user interfaces, component interaction techniques and check out of the building automation logic.
- J. Owner's Project Requirements (OPR): A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- K. Subcontractor: Individual contractors responsible to the Contractor for installation of specific systems to be commissioned.
- L. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.
- M. Testing, Adjusting, and Balancing (TAB): Testing, adjusting and balancing of air and water systems, subsystems, equipment and components as required per the contract documents.

1.04 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
- B. Members Appointed by Owner or Owner representative:
 - 1. The CxA: Owner or Owner representative has engaged the CxA under a separate contract.
 - 2. Representatives of the Owner or Owner representative including facility users and operation and maintenance personnel.
 - 3. Architect and engineering design professionals.

1.05 OWNER'S or OWNER'S REPRESENTATIVES RESPONSIBILITIES

- A. Provide the OPR and BoD documentation for use in developing the commissioning plan, checklists and testing plans, operation and maintenance training plan, and a systems manual.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities, including but not limited to, the following:
 - 1. Coordination and testing meetings.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration of operation of systems, subsystems and equipment.
 - 4. Review system performance and recent building history approximately 10 months into the 12 month warranty period with the CxA.

1.06 COMMISSIONING RESPONSIBILITIES

- A. The responsibilities of various parties in the commissioning process are provided in this section. It is noted that the services for the Owners Project Manager, Architect, HVAC mechanical and electrical designers/engineers, and Commissioning Authority are not provided for in this contract. That is, the Contractor is not responsible for providing their services. Their responsibilities are listed here to clarify the commissioning process.
- B. All Parties:
 - 1. Follow the Commissioning Plan: (The commissioning plan is an informational document that clarifies how the commissioning process shall proceed. This plan is developed by the Commissioning Authority and outlines the responsibilities of the Commissioning Authority, Owner as well as what services will be required of the Design Team, Contractor and their subcontractors. This document fully describes the processes that will be used to carry out commissioning.)
 - 2. Attend commissioning scoping meeting and additional meetings, as necessary.

C. Architect / Engineer - Construction and Acceptance Phase:

1. The owner manages the Commissioning Authority contract.
2. Attend the commissioning scoping meeting and selected commissioning team meetings.
3. Perform normal submittal review, construction observation as contracted.
4. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
5. Provide the Commissioning Authority with a copy of all bulletins, sketches, RFI's, addenda and any project document updates to help keep the commissioning plan up to date.

D. Commissioning Authority - Construction and Acceptance Phase:

1. The Commissioning Authority is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The Commissioning Authority may assist with problem solving, non-conformance or deficiencies but, ultimately, that responsibility resides with the CMR and the A/E. The primary role of the Commissioning Authority is to develop and coordinate the testing plan manual, to observe and document performance – which systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, checkout and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the Commissioning Authority.
2. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
3. Coordinate the commissioning work and, with the Contractor, ensure that commissioning activities are being scheduled into the master schedule.
4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
6. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute pre-functional tests and checklists.
9. Overview the development of an enhanced start-up and initial systems checkout plan with Subs.
10. Perform site visits to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
11. Witnessing the cleaning, flushing and chemical treatment of the hydronic systems prior to balancing.
12. Witnessing any ductwork pressure testing and cleaning.
13. Verify pre-functional tests and checklist completion by reviewing pre-functional checklist reports and by selected site observation and spot-checking.
14. Verify systems startup by reviewing start-up reports and by selected site observation.
15. Review Testing Adjustment and Balancing execution plan and sample report.
16. Verify air and water systems balancing by reviewing completed reports and by selected site observation.
17. Write the functional performance test procedures for equipment and systems.
18. Coordinate, witness and approve “mock-up” installations of systems and equipment as defined in this division, section 3.3.
19. Analyze any functional performance trend logs and monitoring data to verify performance.
20. Coordinate witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
21. Maintain a master deficiency and resolution log and a separate testing record. Provide the Contractor with written progress reports and test results with recommended actions.
22. Oversee the training of the Owner's operating personnel.
23. Review of equipment warranties.
24. Review and approve the preparation of the O&M manuals (one master set).
25. Development of a systems training manual.
26. Provide a final commissioning report.
27. Organize and perform seasonal or deferred testing of equipment and systems.
28. Organize and perform review of systems and equipment prior to 12-month project warranty period.

E. Project Manager – Owner’s Representative - Construction and Acceptance Phase:

1. Facilitate the coordination of the commissioning work by the Commissioning Authority, and, with the Contractor to ensure that commissioning activities are being scheduled into the master schedule by the Contractor well in advance.
2. Review the final Commissioning Plan.
3. Attend a commissioning scoping meeting and other commissioning team meetings.
4. Perform the normal review of contractor submittals.
5. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the Commissioning Authority.
6. Review the functional performance test procedures submitted by the Commissioning Authority, prior to testing.
7. When necessary, observe and witness pre-functional checklists, startup and functional testing of selected equipment.
8. Review commissioning progress and deficiency reports (Commissioning Portal) and respond to issues assigned.
9. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
10. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the Commissioning Authority to facilitate the commissioning process.
11. Arrange for facility operating and maintenance personnel to attend various field commissioning activities including equipment & system “mock-ups” and field training sessions.

F. Construction Manager - Construction and Acceptance Phase:

1. 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:
 - a. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - b. Provide the CxA with a detailed and accurate construction schedule updated on a monthly basis. Coordinate scheduling of commissioning activities with the CxA and include them in the construction schedule.
 - c. Provide a schedule for equipment submittals, installation manual submittals, operation and maintenance data submittals, equipment start-up, and testing to CxA for incorporation into the commissioning plan. Update schedule on a monthly basis throughout the construction period.
 - d. Provide CxA with copies of all approved change orders or other modifications impacting construction when approved.
 - e. Participate in construction phase coordination meetings.
 - f. Participate in commissioning inspections.
 - g. Ensure accurate completion of construction checkout documents for all systems to be commissioned prior to verification site visits by the CxA.
 - h. Certify readiness of systems to be commissioned prior to functional performance testing.
 - i. Participate in functional performance testing of systems to be commissioned.
 - j. Resolving issues identified during commissioning and coordinating correction of deficiencies. Ensure responses to open issues within two weeks of being posted via online tracking database (Commissioning Portal).
 - k. Participate in operation and maintenance planning and verification.
 - l. Participate in operation and maintenance training sessions.
 - m. Participate in final review of equipment and systems and participate in final acceptance meeting.
 - n. Certify the work is complete and systems are operational according to the contract documents, including calibration of controls and any instrumentation.
 - o. Coordinate subcontractor commissioning activities.
 - p. Review and approve final commissioning documentation.
 - q. Assist in coordinating the Subcontractors, as needed, to perform testing of systems and equipment as it relates to project phasing.
 - r. Assist in coordinating the Subcontractors, as needed, to perform deferred or opposite seasonal testing of systems and equipment.
 - s. Assist in coordinating the Subcontractors to resolve issues discovered during the system performance review prior to the 12-month project warranty period.
 - t. Coordinate and arrange for mock-up systems and equipment as defined in this section 3.3.

G. Subcontractors shall assign representatives with the expertise and the authority to act on behalf of the entity responsible for installation of systems to be commissioned who shall participate in and perform commissioning team activities including, but not limited to, the following:

1. Provide a schedule for equipment submittals, installation manual submittals, operation and maintenance data submittals, equipment start-up, and testing to CxA for incorporation into the commissioning plan. Update schedule on a monthly basis throughout the construction period.
2. Participate in construction phase coordination meetings.
3. Provide information to the CxA for developing construction phase commissioning plan including, but not limited to:
 - a. Schedule as mentioned above.
 - b. Equipment submittals.
 - c. Installation manual submittals.
 - d. Operation and maintenance information submittals.
4. Complete construction checkout documents for all systems to be commissioned.
5. Provide all necessary assistance and work associated with the completeness and installation of “mock-up” equipment as defined in this section 3.3.
6. Maintain updated Project Record Documents for periodic review by the CxA and submit final record documents at project completion.
7. Certify readiness of systems to be commissioned prior to functional performance testing.
8. Participate in functional performance testing of systems to be commissioned.
9. Participate in test procedures meeting.
10. 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.
11. Participate in operation and maintenance planning, documentation and verification.
12. Resolving issues identified during commissioning and coordinating correction of deficiencies. Ensure responses to open issues within two weeks of being posted via online tracking database (Commissioning Portal).
13. Participate in training sessions for Owner’s operation and maintenance personnel.
14. Participate in final review at acceptance meeting.
15. Participate, as needed, in performing deferred or opposite seasonal testing of systems and equipment.

1.07 COMMISSIONING DOCUMENTATION

- A. Commissioning Plan: A document, prepared by the CxA, that outlines the schedule, allocation of resources and documentation requirements of the commissioning process, including but not limited to, the following:
1. Plan for delivery and review of submittals, systems manuals and other documents and reports. Identification of the relationship of these documents to other functions and a description of submittals that are required to support the commissioning processes. Submittal dates include the latest date approved submittals must be received without adversely affecting commissioning.
 2. Overview of the organization, layout and content of commissioning documentation and a description of documents to be provided along with identification of responsible parties.
 3. Identification of systems and equipment to be commissioned.
 4. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
 5. Identification of items that must be completed before the next operation can proceed.
 6. Description of responsibilities of commissioning team members.
 7. Description of observations to be made.
 8. Description of requirements for operation and maintenance training, including required training materials.
 9. Description of expected performance for systems, subsystems, equipment and controls.
 10. Requirements for documenting changes on a continuous basis to appear in the project record documents.
 11. Process and schedule for completing construction checklists for systems to be commissioned,
 12. Step by step procedures for testing systems, subsystems and equipment with descriptions for methods of verifying relevant data, recording the results obtained and listing parties involved in performing and verifying tests.
- B. Construction Checkout Documents / Pre-functional Checklists: The CxA shall develop construction checklists for each system to be commissioned including interfaces with the ATC system, safeties, and interlocks. Separate entries will be provided for each item to be checked. Construction checklists will be completed by the installing Subcontractor and verified by the Contractor and CxA. Space will be provided for sign off of installing Subcontractor, Contractor and CxA. Each checklist will include, but not limited to, the following:
1. Name and identification code of each item being checked.

2. Verification of each item including verification of all required data and construction practices listed in the construction checklists. This list outlines all work necessary to be completed prior to the start of functional testing for the particular system, subsystem and equipment.
 3. Notation of any equipment or installation that deviates from approved submittals or the construction documents.
 4. Name(s) of personnel involved with verification and dates on which verification activities and construction checklists were completed.
- C. Witness systems, assemblies, equipment, and component startup.
- D. Hydronic Start-up Documents: Documentation that narrates the flushing, cleaning, chemical treatment, pressure testing and air bleeding of any associated hydronic systems, assemblies, equipment, and component start-up. Documentation should identify individuals present who witnessed said testing.
- E. 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.
- F. 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.
- G. 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.
- H. 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.
- I. Corrective Action Documents: CxA will document corrective action taken for systems and equipment that fail tests including required modifications to systems and equipment and revisions to test procedures. Retest and final results will also be documented.
1. Issues Log or Commissioning Notice: CxA prepares and maintains an issues log that describes design, installation and performance issues that are at variance with the OPR, BoD and contract documents. Identification and tracking of issues as they are encountered, documenting the status of unresolved and resolved issues. Issues log is shared with members of the Design/Construction/Commissioning team via an internet portal which is maintained by the CxA.
 - a. BVH Commissioning Portal: The CxA Commissioning Portal is an on-line issue tracking database developed by BVH Integrated Services, Inc. The Portal is used by the CxA to track issues and assign responsibility for corrective action. All members of the Commissioning Team will be given access to the Portal to respond to issues and / or

deficiencies. Open issues will be sorted by the individual trades. Once the Contractor / Subcontractor(s) have made any necessary corrections they will update their specific issues on line for re-verification by the commissioning provider.

- J. Systems Training Manual: CxA shall develop a systems training manual for the operation and maintenance personnel that includes the intended operation of the systems and equipment listed as well as document setpoints and schedules. It should be noted that the Systems Training Manual does not in any way replace the Subcontractor / vendor training nor does it relieve Subcontractor(s) of their responsibilities as outlined in other divisions within the contract documents.

1.08 SUBMITTALS BY CONTRACTOR

- A. Information listed below shall be submitted with the product and system product literature and shop drawing submittals for review and approval by the Owner, Architect, Engineering Professionals and the CxA. This information will be used to confirm the product compliance with the Contract Documents and to establish detailed commissioning requirements and procedures. The information shall be specific to each system to be commissioned and shall be inclusive of all related systems, equipment and components.

1. Manufacturer cut sheets and product literature and shop drawings in accordance with the requirements of other divisions.
2. Manufacturer's detailed installation and start-up requirements including equipment checklists for each piece of equipment.
3. Operation instructions.
4. Manufacturer's recommended maintenance and troubleshooting procedures.
5. Warranty and owners obligations to maintain warranty.
6. Detailed product data for each piece of equipment including part load capacities, electrical components and requirements, etc. (As appropriate)
7. Manufacture's certified test reports on each piece of equipment.
8. Performance curves for each piece of equipment being submitted. (As appropriate)
9. Coordination and Record Drawings.
10. Logic flow diagrams for control systems sequences of operation. Include detailed sections of the Sequence of Operations for related function groups.
11. Interpret function groups for clarity.
12. Indicate initial setpoints, reset schedules, sensor locations, etc.

- B. Operation and Maintenance Manuals:

1. The Contractor shall develop the Operation and Maintenance manuals in accordance with the requirements indicated in Division 01 and 18.
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

1.09 QUALITY ASSURANCE

- A. Operations and Maintenance Training Instructor Qualifications: Equipment training shall be provided by a factory authorized technical representatives, experienced in training, operation and maintenance procedures for installed systems, subsystems and equipment.

1.10 COORDINATION

- A. Coordination Meetings: CxA shall conduct periodic coordination meetings of the commissioning team to review progress on the commissioning plan, to discuss scheduling conflicts and to discuss upcoming commissioning process activities.

- B. Pretesting Meetings: CxA shall conduct pretest meetings of the commissioning team to review start-up reports, pretest verification results, testing procedures, testing personnel and instrumentation requirements and manufacturer's authorized service representative services for each system, subsystem, equipment and component to be tested.
- C. Testing Coordination: CxA shall coordinate sequence of testing activities to accommodate required quality assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and verification.
- D. Manufacturer's Field Services: CxA shall coordinate services with the help of the Contractor/Subcontractor of manufacturer's field services.

1.11 SYSTEMS TO BE COMMISSIONED

- A. The following systems to be provided with functional testing procedures shall include, but are not limited to, the following systems.
 - 1. All Air handling units including the associated heating and cooling coils and all DDC controls associated with the air handling and distribution equipment.
 - 2. All humidifiers
 - 3. All general and kitchen hood exhaust fans
 - 4. All lab fume hoods and bio-safety cabinets
 - 5. Lab piping systems, lab gases, lab vacuum pump and air compressor
 - 6. Lab control system
 - 7. All return fans
 - 8. All variable air volume (VAV) terminal units and associated reheat coils
 - 9. All lab terminal units (supply and exhaust) and associated reheat coils
 - 10. Chillers and all associated chilled water and condenser water pumps, etc.
 - 11. Cooling towers
 - 12. Chilled water distribution systems
 - 13. Boiler, combustion air fan, and all associated pumps, tanks, condensate pumps, etc.
 - 14. All heat exchangers and associated pressure relief valves (PRVs)
 - 15. All unit heaters, cabinet unit heaters, etc.
 - 16. All computer room air conditioning units and associated split system condensers
 - 17. The building automation and Direct Digital Controls and system interlocks
 - 18. Emergency generator and associated transfer panels
 - 19. Fire protection systems and equipment; fire alarm system interfaces with HVAC systems
 - 20. Security systems
 - 21. Telecommunications systems

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT

- A. All standard testing equipment required to perform start-up and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested.
- B. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerance specified in this Section. The Contractor(s) instrumentation shall meet the following standards:
 - 1. Be of sufficient quality and accuracy to test and/or measure system performance within the tolerances required to determine adequate performance.
 - 2. Be calibrated on the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument being used.
 - 3. Be maintained in good repair and operating condition throughout the duration of use on this project.
 - 4. Be recalibrated / repaired if dropped and/or damaged in any way since last calibrated.

PART 3 - EXECUTION

3.01 TESTING PREPARATION

A. Prerequisites for Testing:

1. Certify that systems to be commissioned have been completed, calibrated and manufacturer start-ups (where required) are complete. Verify systems to be commissioned are operating according to the OPR, BoD, and the contract documents and the Certificates of Readiness are signed and submitted.
2. Certify that building instrumentation and automated temperature controls associated with the systems to be commissioned have been completed and calibrated and are operating according to the OPR, BoD, and the contract documents and that preset set points have been recorded.
3. Certify that TAB procedures have been completed and that TAB reports have been submitted, discrepancies corrected and corrective work approved.
4. Test systems and intersystem performance after approval of construction checklists for systems, subsystems, and equipment.
5. Set systems, subsystems, and equipment into operating mode to be tested (i.e. normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power and alarm conditions.)
6. Verify each operating cycle after it has been running for a specified period and is operating in a steady state condition.
7. Inspect and verify the position of each device and interlock identified on checklists. Sign off each item as acceptable or failed. Repeat this test for each operating cycle that applies to system being tested.
8. Check safety cutouts, alarms and interlocks with smoke control and life safety systems during each mode of operation.
9. Update checklists or data sheet after a deficiency is observed and corrected.
10. Verify equipment interface with monitoring and control system and TAB criteria including the following:
 - a. Supply and return flow rated for variable flow and constant volume systems in each operational mode, including maximum and minimum flow capacity.
 - b. Operation of terminal units in both heating and cooling cycles.
 - c. Minimum outdoor air intake in each operational mode and at minimum and maximum airflows.
 - d. Building pressurization.
 - e. Total exhaust airflows and total outdoor air intake.
 - f. Operation of indoor air quality monitoring systems.
11. Verify proper responses of monitoring and control systems controllers and sensors to include the following:
 - a. For each controller or sensor, record the indicated monitoring and control system reading and the test instrument reading. If the initial test indicates that the test reading is outside of the control range of the installed device, check calibration of the installed device and adjust as required. Retest malfunctioning devices and record results on checklist or data sheet.
 - b. Report deficiencies and prepare an issues log entry.
12. Verify that construction checkout of systems to be commissioned has been completed and approved. CxA shall verify construction checkout and start-up including requirements specified in individual Division Sections and equipment manufacturer's recommendations.

B. Testing Instrumentation: Install measuring instruments and logging devices to record test data for the required test period. Instrumentation shall monitor and record full range of operating conditions and shall allow for calculation of total capacity of system for each mode of operation. Operational modes may include the following:

1. Occupied and unoccupied
2. Full load and minimum flow
3. Maximum flow and minimum flow
4. Warm up and cool down
5. Economizer cycle
6. Emergency power supply
7. Life safety alarm modes
8. Temporary upset of system operation
9. Partial occupancy conditions
10. Special cycles

3.02 START-UP, CONSTRUCTION CHECKLISTS AND INITIAL CHECKOUT

- A. The following procedures apply to all equipment to be commissioned.
- B. General: Each piece of equipment receives full construction checkout. No sampling strategies are used. The construction checkout protocol for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system. Before any system start-ups begin, the Contractor(s) shall conduct a final installation verification audit for their work. The Contractor shall be responsible for completion of all work including change orders and punch list items to the Owner's / CxA satisfaction. This visual check of the various systems to be commissioned shall verify that all components are properly installed. The following items as a minimum shall be observed, but not be limited to, check of:
1. Air Distribution Systems:
 - a. Mounting and support of equipment.
 - b. Noise, vibration, air and water leaks.
 - c. Air filtration, presence and operation of dampers, diffusers, grilles, fire dampers and access doors.
 - d. Presence of thermostats and other adjustable temperature control devices.
 - e. Presence of smoke sensors and other safety devices.
 - f. Instrumentation, gauges, thermometers and flow measuring devices.
 - g. Access to equipment and filters.
 - h. Insulation of ductwork is complete.
 - i. Ductwork is sealed.
 - j. Power available to equipment.
 - k. Temperature controls are complete.
 - l. Air and water balancing is complete and a hand written report available.
 2. Heating and Cooling Systems Equipment and Piping:
 - a. Service access is acceptable.
 - b. Proper cycling.
 - c. Excessive noise, vibration or leaks.
 - d. Presence of safety devices and controls.
 - e. Proper identification of all piping, valves, starters and equipment.
 - f. Pressure testing and flushing of systems.
 - g. Power available to equipment.
 - h. Temperature controls are complete.
 - i. Equipment start-up and checkout by the manufacturer's representatives are complete.
 - j. Air and water balancing is complete and a hand written report available.
 3. Fire Protection System and Equipment:
 - a. Service access is acceptable.
 - b. Proper cycling.
 - c. Excessive noise, vibration or leaks.
 - d. Presence of safety devices and controls.
 - e. Proper identification of all piping, valves, starters and equipment.
 - f. Pressure testing and flushing of systems.
 - g. Power available to equipment.
 - h. Equipment start-up and checkout by the manufacturer's representatives are complete.
 - i. Emergency power complete and in place.
 5. Building Electrical System and Equipment:
 - a. Service access is acceptable to all devices.
 - b. Presence of safety devices and controls.
 - c. Proper identification of all starters, switches and equipment.
 - d. Power available to equipment.
 - e. Equipment start-up and checkout by the manufacturer's representatives are complete.

- C. If any work is found incomplete, incorrect, or non-functional, the Contractor shall correct the deficiency before system start-up work proceeds.
- D. Contractor shall provide a full start-up plan for each system to be commissioned including all subsystems, equipment and components which shall at a minimum include the following documentation:
 - 1. Construction Check-out Documents
 - 2. Manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
 - 3. Manufacturer's normally used field checkout sheets.
- E. Construction Checkout Documents / Pre Functional Checklists
 - 1. Job specific prefunctional checklists will be provided by the CxA along with additional minimum testing and demonstration requirements as set forth by the Owner.
- F. Sensor Calibration:
 - 1. Calibration of all sensors shall be included as part of the construction checklists performed by the Contractors.

3.03 FUNCTIONAL PERFORMANCE TESTING

- A. This sub section applies to commissioning functional performance testing for all Divisions.
- B. Objectives and Scope:
 - 1. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and function of the systems.
 - 2. In general, each system to be commissioned should be operated through all modes of operation where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall be tested.
- C. The responsible subcontractor or his/her designee executes the performance of the construction checkout, start-up, and checkout. When checking off construction checklists, signatures may be required of other subcontractors for verification of completion of their work.
- D. The CxA shall observe, at minimum, the procedures for each piece of primary equipment.
- E. For lower level components of equipment, (i.e. VAV boxes, sensors, controllers), the CxA shall observe 10% of the construction checkout and start-up procedures.
- F. The subcontractors shall execute start-up and provide the CxA with a signed and dated copy of the completed start-up and construction checklists.
- G. Only individuals that have a direct knowledge and witness that a line item task on the construction checklist was actually performed shall initial or check that item off.
- H. Test Methods:
 - 1. Mock-Up Systems
 - a. "Mock-Up" equipment and systems are to be completed in all respects and readied for functional testing prior to building completion. These systems are as follows:
 - 1) Typical Air Handling Unit
 - 2) Typical Variable Air Volume Boxes (VAVs)

- b. "Mock-up" equipment is defined as systems and equipment that are in sufficient quantities where early detection of system deficiencies will help to reduce future rejection of equipment. The equipment "mock-up" will establish a level of quality of the equipment installation and its operation. This proactive approach will reduce future installation and operational errors of repetitive equipment.
- c. "Mock-up" equipment will be reviewed and approved by the Engineer, CA, and Owner's Representative
- d. "Mock-up" equipment will be deemed readied for testing and approval as defined below:

1) Air Handling Unit

- a) Manufacturer start-up completed and report submitted
 - b) Supply and Return fans are operating
 - c) Associated VFD is operational
 - d) Discharge and Return Ducts to unit completed, sealed, and insulated
 - e) Piping to coils for unit is completed per detail
 - f) Piping is insulated
 - g) Equipment identification installed
 - h) Pipe and Duct identification completed
 - i) Valve Tags installed
 - j) Final filters installed
 - k) All Gages and Thermometers installed
 - l) Condensate pans trapped and piped to floor drain
 - m) VAV boxes downstream under control to at least allow BMS command to open.
- e. Automatic Temperature Controls installed, functioning, and reporting to the BAS, including all associated sensors and airflow measuring devices

1) Variable Air Volume Boxes (VAV)

- a. Piping to VAV reheat coil is completed as per detail. Pipe Identification and valve tagging completed
 - b. Primary and secondary air ducts are completed, sealed, and insulated
 - c. All diffusers served by VAV are installed with proper flex runs to limit any air velocity noise.
 - d. Diffusers are proportionally balanced
 - e. Unit supports in place
 - f. Automatic Temperature Controls installed, functioning, and reporting to the BAS, including all associated sensing devices.
- f. CM is responsible to schedule and provide all necessary time and personnel to achieve the "mock-up" installations. CM will coordinate this effort with the CA and Owners Representative for acceptance.

- 2. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's graphic trend log capabilities.
- 3. Tests shall be performed using design conditions whenever possible and where required.
- 4. Set-up:
 - a. Each function and test shall be performed under conditions that simulate actual conditions to the closest practical approximation.
 - b. The Contractor executing the test shall provide all necessary materials, system modifications, etc. to produce the flows, pressures, temperatures, etc. necessary to execute the test under specified conditions.
 - c. At completion of the test, the Contractor shall return all affected building equipment and systems to their pre-test condition.
 - d. Functional performance testing will commence as systems are brought to substantial completion and will be done on a system by system basis. The results of these tests will be documented and submitted to the Owner for final system acceptance. The Commissioning Authority shall attain this objective by developing individual systems testing protocols which, when implemented by the trade Contractor, will allow the Commissioning Authority to observe, evaluate, identify deficiencies, recommend modifications, adjust, and document the systems and systems equipment performance over a range of load and functional levels. Functional performance testing as a minimum will be performed on the following systems:

5. Air Distribution Systems:

- a. The Testing and Balancing Contractor (TAB) shall demonstrate total airflow at each piece of air handling equipment at simulated full cooling, heating and/or max/min or fresh (outside) air.
- b. Spot checks of approximately 50% of air outlets shall be made. The Commissioning Authority shall select outlets and the air balancer shall demonstrate a reading of that outlet. Where appropriate, the thermostat shall be adjusted to simulate full cooling, full heating, etc.
- c. The Testing and Balancing Contractor (TAB) shall demonstrate proper room static pressure with respect to the adjacent space(s).
- d. Observe motor HP draw at selected fan motors.
- e. Discrepancies between the balancing report and spot check results shall be dealt with to correct all deficiencies. In the event that significant deficiencies are detected, the entire balancing procedure shall be repeated.
 - 1) Any noted drafts or noisy air distribution devices shall be evaluated and corrective action taken.
 - 2) The Testing and Balancing Contractor (TAB) shall verify the proper calibration of temperature, pressure and safety devices as installed on the various pieces of mechanical equipment. The Testing and Balancing Contractor (TAB) shall assist the Commissioning Authority in the proper setting of all temperature, pressure and safety devices.
 - 3) Any balancing related problems identified during the functional testing procedures shall be addressed and corrected.

6. Hydronic Systems:

- a. The Testing and Balancing Contractor shall demonstrate total water flows at each pump, air handler, chiller and terminal heating equipment.
- b. Spot checks of approximately 50% of hydronic terminals shall be made. The CxA shall select terminals and the balancer shall demonstrate a reading at the equipment via the flow control device or by using an ultrasonic device.
- c. Discrepancies between the balancing report and actual testing results shall be dealt with to correct all deficiencies. In the event that significant deficiencies are detected, the entire balancing procedure shall be repeated.
- d. Assist in verifying the calibration and operation of any flow meters and differential pressure sensors.
- e. Assist in verifying the calibration and operation of any temperature sensors.
- f. Any balancing related problems identified during the functional testing procedures shall be addressed and corrected.

7. Exhaust Systems:

- a. The Testing and Balancing Contractor (TAB) shall demonstrate total airflow at each exhaust fan system.
- b. Spot checks of approximately 50% of air outlets shall be made. The Commissioning Authority shall select outlets and the air balancer shall demonstrate a reading of that outlet.
- c. The Testing and Balancing Contractor (TAB) shall demonstrate proper room static pressure with respect to the adjacent space(s).
- d. Observe motor HP draw at selected fan motors.
- e. Discrepancies between the balancing report and spot check results shall be dealt with to correct all deficiencies. In the event that significant deficiencies are detected, the entire balancing procedure shall be repeated.
- f. Any noted drafts or noisy air distribution devices shall be evaluated and corrective action taken.
- g. Any balancing related problems identified during the functional testing procedures shall be addressed and corrected.

8. Automatic Temperature Controls (ATC):

- a. ATC Contractor shall demonstrate the proper operation of the temperature control sequences for each air handling systems, variable air volume boxes, boilers, chillers, pumps, exhaust and terminal heating/cooling equipment as listed in 1.11 of this Section.
- b. ATC Contractor shall demonstrate the proper sequences as they apply to the equipment listed in 1.11 of this Section: This includes but not limited to the following:
 - 1) Occupied/unoccupied time sequences.
 - 2) Night setback/night set-up features.
 - 3) Morning warm-up sequences.
 - 4) Air-side economizers.

- 5) Proper control of steam boilers and associated equipment such as deaerator, boiler feed pumps, condensing economizer system and combustion air.
- 6) Proper control of discharge air temperature from air handling equipment including reset temperature sequences.
- 7) Heating hot water discharge temperature control to the building systems including hot water reset.
- 8) Proper staging and control of the heat exchangers.
- 9) Lead/lag operation of the various pumps.
- 10) Control of hot water freeze pumps.
- 11) Proper control and discharge temperatures from the reheat coils.
- 12) Operation and control of the fan coils and unit heaters.
- 13) Proper operation and control of the chillers and cooling towers.
- 14) Run standby operation of pumps.
- 15) Proper operation and control of any energy recovery systems.
- 16) Proper control of the refrigerant alarm exhaust fans
- 17) Proper annunciation of building alarms including fail safe controls and proper shut down of equipment.
- 18) Proper control of all air handling equipment with respect to air volume.
- 19) Demonstrate any terminal box operation for 30 consecutive days (24 / 7) without a system problem. Shall include temperature and humidity (where applicable) and recording of same.
- 20) Calibration of all temperature pressure and safety devices.
- 21) Proper display of all ATC graphics.
- 22) Control of all automatic control valves and dampers.
- 23) Assist in calibration of all airflow stations.

9. Electrical Systems:

- a. Demonstrate proper operation of all building lighting control systems and occupancy sensors.
- b. Demonstrate proper operation of the emergency generator and transfer switches.
- c. Installing contractors for Security Systems and Telecommunications shall demonstrate to commissioning agent that all devices and main equipment function as defined in the project specification.

10. Coordination and Scheduling:

- a. Scheduling is the responsibility of the Contractor. Commissioning activities shall be scheduled through the Contractor. The Contractor shall be responsible for integrating functional performance testing and commissioning requirements into the master activity schedule.
- b. The subcontractors shall provide sufficient notice to the CxA regarding their completion schedule for the construction checklists and start-up of all equipment and systems. The CxA shall direct, witness and document the functional testing of all equipment and systems.
- c. Subcontractors are responsible for execution of all tests.
- d. Functional testing is conducted after construction checklists and start-up has been satisfactorily completed. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems.
- e. The Contractor shall verify completeness of the building envelope, perimeter and interior items which affect proper operation and control of HVAC, Plumbing, Fire Protection and electrical equipment and systems.
- f. The air and water balancing is completed and debugged before functional testing of air and water related equipment or systems.
- g. Testing proceeds from components to subsystems to systems.
- h. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

11. Problem Solving:

- a. The CxA will recommend solutions to problems found, however the burden of responsibilities to solve, correct and retest problems rests with the Contractor, Subcontractor, Architect and Engineering Professionals.

12. Trend Logs:

- a. Upon completion of successful functional performance testing, contractor shall submit graphic trend logs to CxA.
- b. Submit graphic trend log for each piece of controlled equipment for each controlled parameter.

- c. Trend logs shall demonstrate successful performance for a seven day period unless the controlled process requires a longer timeline.
- d. Trend log color printouts shall be submitted demonstrating successful seasonal performance.
- e. Trend logs shall be established for all energy and water consumption monitoring points. Trends shall record data on 15-minute intervals and accumulate daily, weekly, monthly, annual and year-to-date totals. All data and totals shall be stored for review by the CxA and Owner with commonly available viewing software.
- f. Trend logs shall be color graphic with legend submitted to the CxA in printout.

3.04 SEASONAL/DEFERRED TESTING

- A. The purpose of seasonal (opposite season) functional testing is to evaluate the performance of selected equipment during design weather conditions that may not have been available during the initial functional testing. Ideally cooling equipment needs to be functionally tested under hot, humid summer conditions to ensure proper operation in accordance with design specifications. The same is true for heating hot water and steam systems which require colder, winter climates.
- B. The functional testing performed during seasonal testing will adhere to the guidelines listed above in item 3.3 in this section.
- C. Unforeseen Deferred Tests. If the CMR determines that any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and Functional Testing may be delayed upon approval of the DCS PM. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.
- D. Any deficiencies will be documented and submitted to the Contractor and correction of these items will be the responsibility of the respective Subcontractors.

3.05 POST OCCUPANCY/WARRANTY REVIEW

- A. The purpose of a post occupancy/warranty review is to review the building systems and equipment prior to warranty expiration. The post occupancy/warranty review will take place approximately two months prior to the 18-month project warranty period. The facilities operating staff will be interviewed to discuss any issues discovered during the previous month's operation of the facility (concerning previously commissioned equipment). The building control system and equipment will be inspected to identify any deficiencies.
- B. Any warranty related deficiencies will be documented and submitted to the Contractor and correction of these items will be the responsibility of the respective Subcontractors.

3.06 DOCUMENTATION, NON-COMFORMANCE AND APPROVAL OF TESTS

- A. Documentation:
 - 1. The CxA will witness and document the results of functional performance tests using the specific procedural forms developed for that purpose.
 - 2. Reports will include measured data, data sheets and a comprehensive summary describing the operation of systems at the time of testing.
 - 3. Data sheets for each controller verifying proper operation of the control system, the system it serves, the service it provides and its location will be provided.
- B. Non- Conformance:
 - 1. The CxA will record the results of the functional testing on the procedure or test form.
 - 2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
 - 3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owner.
 - 4. Should a deficiency be identified during checkout, start-up or testing, the CxA will discuss the issue with the responsible subcontractor. When there is no dispute on the deficiency and the subcontractor accepts responsibility to correct it.

- a. The CxA documents the deficiency and the subcontractor's response and intentions and they go on to another test or sequence.
 - b. After a system performance testing is complete, the CxA submits the noncompliance issues on the internet portal.
5. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
- a. The deficiency shall be documented on the BVH portal with the subcontractor's response and the item shall be tagged for the Engineer / Architect to review and comment for resolution.
6. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the Owner.
7. The CxA documents the resolution process.
8. Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.
9. If it is determined that the system is constructed according to the Contract Documents, Owner will decide whether modifications required to bring the performance of the system to the OPR and BoD documents shall be implemented or if tests will be accepted as submitted. If corrective Work is performed, Owner will decide if tests shall be repeated and a revised report submitted.
10. Cost of Retesting.
- a. The cost for the subcontractor to re-perform a construction check-out or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs proposed shall be negotiated with the appropriate party.
 - b. The time for the CxA to direct any retesting required because a specific construction checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be negotiated with the appropriate party, who may choose to recover costs from the party responsible for executing the faulty test.
 - c. Failure Due to Manufacturer Defect:
 - 1) If 10% or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CxA. In such case, the subcontractor shall provide the following:
 - a) Within one week of notification from the Contractor, the subcontractor or manufacturer's representative shall examine all other identical units making a record of the findings.
 - b) The findings shall be provided by the CxA within two weeks of the original notice.
 - c) Within two weeks of the original notification, the Contractor, subcontractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals.
 - 2) The proposed solutions shall significantly exceed the specification requirements of the original installation.
 - 3) The Owner and Design Team will determine whether a replacement of all identical units or a repair is acceptable.
 - 4) Two examples of the proposed solution will be installed by the subcontractor and the subcontractor will be allowed to test the installations for up to one week, upon which the Owner and Design Team will decide whether to accept the solution.
 - 5) Upon Acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
 - a) Approval: The CxA notes each satisfactorily demonstrated function on the test form. The CxA recommends acceptance of each test using a standard form.
 - b) Deferred Testing:
 - 1) If tests cannot be completed because of a deficiency outside the scope of the subcontractor responsible for installation of the System to be Commissioned, the deficiency shall be documented

and reported. Deficiencies shall be resolved and corrected by appropriate parties and test rescheduled.

- (2) If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed, documented, and additional tests scheduled.

3.07 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

A. The Contractor shall be responsible for coordination, scheduling and completing operations and maintenance training for the Owners designated personnel on all Systems to be Commissioned. Training shall comply with Divisions 01 and 18.

1. Training materials shall be submitted for review and approval of the CxA well in advance of training.
2. Trainer qualifications and certifications shall be submitted for review and approval of the CxA well in advance of training.
3. Each subcontractor responsible for training will submit a written training plan to the CxA for review and approval prior to training. The plan will include field orientation during installation, classroom instruction and field training after the completion of installation and cover the following elements:
 - a. Equipment (included in training)
 - b. Intended audience
 - c. Location of training
 - d. Objectives
 - e. Subjects covered (description, duration of discussion, special methods, etc.)
 - f. Duration of training on each subject.
 - g. Instructor for each subject
 - h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
 - i. Instructor and qualifications
4. For the primary equipment, the Controls subcontractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
5. Subcontractors shall provide all qualified personnel, including manufacturer representatives, for equipment and system training.

B. The CxA will verify and approve the content and adequacy of the training of Owner personnel for systems to be commissioned.

1. Training rigor: to be established by Owner & CxA
2. In addition to these general requirements, the specific training requirements for Owner personnel are specified in Division 01.

C. Training Planning Meeting: Before operation and maintenance training, CxA shall convene a training planning meeting to include Owner's operation and maintenance personnel, each Contractor, and subcontractors. In addition to requirements specified in other Divisions, perform the following:

1. Review the OPR and BoD.
 - a. Review installed systems, subsystems, and equipment.
 - b. Review instructor qualifications
 - c. Review instructional methods and procedures.
 - d. Review training module outlines and contents.
 - e. Review course materials (including operation and maintenance manuals.
 - f. Verify and discuss locations and other facilities required for instruction.
 - g. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
 - h. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

3.08 EXCLUSIONS

A. The Commissioning Authority is not responsible for construction means, methods, coordination between trades, job safety or any other related management function on the job site.

- B. The Contractor and Subcontractors will provide all technician services requiring tools or the use of tools to functionally test, adjust or otherwise bring equipment into a fully operational state. It is required by this specification that the person to represent the Automated temperature control system shall be the person who wrote the control programming. The CxA shall observe technicians as they complete testing, and may make minor adjustments, but shall not perform construction or technician services.

END OF SECTION

SECTION 02 01 00 - SITE PREPARATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract including General and Supplementary Conditions, and General Requirements apply to the work specified in this Section.

1.2 SECTION INCLUDES

- A. Work Included: Providing all Site Preparation as shown on the Drawings, and as specified, including, but not necessarily limited to the following:
 - 1. Review of existing conditions and subsurface data.
 - 2. Maintain existing fencing and provide and install new construction fence as necessary in locations as directed by the Owner and Engineer.
 - 3. Provide and install project signs as directed by the Owner and Engineer.
 - 4. Provide West Nile Virus protection measures as indicated and as directed by the Owner and Engineer.

1.3 EXISTING CONDITIONS - It shall be the obligation of each bidder to satisfy himself by examination of the site that the existing conditions, elevation grades, and improvements shown are accurate. No claim for extra compensation for inaccuracies of existing conditions will be allowed.

1.4 ADDITIONAL INFORMATION - Upon award of contract, the Contractor may make their own subsurface and site investigations to substantiate existing subsurface soil conditions.

1.5 JOB CONDITIONS

- A. Contact Call Before You Dig services for Connecticut (1.800.922.4455) to locate underground utilities prior to commencing site preparation operations.
- B. No areas under construction shall be left accessible to pedestrians at any time. The Contractor shall take all necessary steps, as requested or approved by the Engineer, to secure the site. When making water, storm drainage or any other utility connections, the Contractor is responsible for securing work areas which occur outside of the proposed construction fence line for the entire time construction is taking place.

- C. For construction access to the site, the Contractor shall use entrances shown on the Drawings for access and egress to the site. All damage to pavement and grounds to remain caused by vehicular access to the site shall be repaired at the Contractor's expense to the satisfaction of the Engineer and the Owner.
- D. The Contractor is responsible for protecting all survey monuments, benchmarks and property boundary pins within the contract limits shown. The Contractor shall locate, maintain, raise, lower, or remove and replace to suit the new field conditions or if damaged by Contractor's operations. State and municipal requirements and specifications for monument location and installation must be followed.
- E. Peripheral areas outside of the staging areas shown on the Drawings shall not be disturbed or used for storing or stockpiling materials without prior approval of the Owner and Engineer.
- F. Stockpiles shall be maintained in accordance with State of Connecticut DEP best management practices.

PART 2 PRODUCTS

2.1 CONSTRUCTION FENCE

- A. Chain-Link Fencing: Minimum two (2) inch, 0.148 inch thick, galvanized steel, chain-link fabric fencing; minimum six (6) feet high with galvanized steel pipe posts; minimum 2-3/8 inch OD line posts and 2-7/8 inch OD corner and pull posts, with 1-5/8 inch OD top rails.

2.2 TEMPORARY SIGNS

- A. Prepare temporary signs to provide directional information to construction personnel and visitors. Sign material and sizes to be approved by Owner.
 - 1. Finish: Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer. Colors to be selected by Owner and Engineer.
 - 2. Engage an experienced sign painter to apply graphics for temporary directional and informational signs. Comply with Owners/Engineers direction for text content, style of lettering and design layout.
 - 3. Posts: pressure-treated 4"x4" posts or galvanized steel posts, minimum 4'0" depth burial or other sign attachments as approved by Owner and Engineer.

PART 3 EXECUTION

3.1 CONSTRUCTION FENCE

- A. Review all limits of construction fencing and barriers with the Engineer and Owner prior to installation. No work shall commence until all construction fencing is in place. Fencing shall be provided and maintained as necessary and as directed by the Engineer throughout the duration of the Contract.
- B. Chain Link Fencing
 - 1. Post Burial Depth: Spacing of posts 10'-0" max o.c. Set post depth or anchor fence post as directed or in a manner approved by the Engineer and Owner.
 - 2. Fencing Fabric: attach to fence posts and framing per manufacturer's recommendations.
- C. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.
- D. Gates: Install fence with lockable entrance gates. Locate gates as directed or in locations approved by the Engineer and Owner.
 - 1. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner and Engineer with one set of keys each.
- E. Remove fencing upon completion of the Contract, or as directed.
- F. Additional Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.
 - 1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch thick exterior plywood.

3.2 TEMPORARY SIGNS

- A. Install temporary directional/information signs as directed by Owner and Engineer.
- B. Maintain signs throughout construction; remove at completion of Work.

3.3 DISPOSAL

- A. All waste material shall be disposed of legally off site.
- B. No burning or burying on-site will be allowed.

3.4 WEST NILE VIRUS PROTECTION MEASURES: Care shall be taken to prevent the ponding or pooling of standing water-on the ground, in buckets, on top of barrels, in tarps, etc. at all times within the contract limit line and areas designated for construction outside the contract limit line for the duration of the construction contract. Areas of pooled or ponded water shall be immediately drained.

END OF SECTION

SECTION 02 41 13 - SITE CLEARING, SITE DEMOLITION AND REMOVALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 1 General Requirements and Specific Requirements, apply to this Section.

1.2 SECTION INCLUDES

- A. Clearing and grubbing of tree stumps, shrubs, brush and other plant material as indicated on the Drawings and directed by the Landscape Architect.
- B. Site demolition and removals as indicated on the Drawings.

1.3 RELATED SECTIONS

- A. Section 31 25 00 - Sediment and Erosion Control
- B. Section 02 01 00 - Site Preparation
- C. Section 31 14 00 - Strip and Stockpile Existing Topsoil

1.4 PROJECT CONDITIONS AND PROTECTION

- A. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from the authorities having jurisdiction.
- B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
 - 1. Protect site improvements on adjoining properties and on Owner's property that are to remain.
 - 2. Restore damaged improvements to their original condition, as acceptable to property owners.
- C. Review and verify all limits of items to be removed with the Owner and Engineer prior to commencing clearing and grubbing operations.

- D. Inspection: Verify existing condition of all plant material scheduled for clearing and grubbing removal. Do not proceed with any work that will result with unsafe conditions causing a continuing or permanent hazard. Ascertain that all work scheduled for clearing and grubbing can be safely accomplished in a proper time period.
- E. Benchmarks: Protect all survey monuments, benchmarks, and property boundary pins. Replace if destroyed by Contractor's operations at no cost to the Owner. Contractor to provide temporary offsets to benchmarks during clearing & grubbing and construction and provide new monuments as part of this construction.
- F. Permits/Fees: Coordinate with appropriate utility companies and pay any disconnect fees and permits as necessary.
- G. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated or directed.
- H. Provide 48 hours notice prior to conducting any site clearing and grubbing operation.
- I. Contact Call Before You Dig Services (1-800-922-4455) prior to commencing any clearing and grubbing operations.
- J. The Contractor shall acquaint himself with the located utilities. Protect all utilities designated to remain within the area of the work. Any damage to existing facilities by reason of the performance of the work under this Contract will be the Contractor's responsibility and repaired at his expense in conformance with the applicable utility company and/or municipal requirements. Maintain existing systems in operation as required during installation of new work.
- K. Time: For the duration of the work.

1.5 EXISTING SERVICES

- A. General: Indicated locations are approximate. Contractor is responsible for determining exact locations before commencing Work.

PART 2 - PRODUCTS

- 2.1 EQUIPMENT: As selected by the Contractor.

PART 3 - EXECUTION

3.1 SITE CLEARING

- A. General: Remove tree stumps, shrubs, grass, and other vegetation, site furniture, asphalt and concrete surfaces, concrete curbs and fences, stone and gravel, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated on the plans. Removal includes digging out and off-site disposal of stumps and roots and concrete foundations.
- B. Clearing and Grubbing: Clear site of shrubs, and other vegetation, except for those indicated to be left standing.
 - 1. Completely remove stumps, roots, and other debris protruding through ground surface.
 - 2. Fill depressions caused by clearing and grubbing operations with suitable material, unless further excavation or earthwork is indicated.
 - a. Place fill material in horizontal layers not exceeding 6 inches (150 mm) loose depth, and thoroughly compact each layer to a density equal to adjacent original ground or as required for new improvements. Topsoil in field areas shall be placed in accordance with Section 31 23 16 - Earthwork.
 - b. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

3.2 PAVEMENT REMOVAL

- A. Demolish and remove from the site all bituminous concrete pavement, recycled bituminous parking lot pavement and concrete pavement/curbs as indicated to be removed on the Drawings. Sawcut pavement and curbing limits as required.

3.3 DISPOSAL OF WASTE MATERIALS

- A. Prior to beginning any construction activities at the site, the Contractor shall submit the proposed off-site disposal location to the Engineer for review and written approval.
- B. Burning is not permitted on Owner's property.
- C. Remove waste materials and unsuitable or excess topsoil from Owner's property to approved location.

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- D. Removal of underground tank shall be in conformance with all local, State and Federal Regulations (including but not limited to CTDEEP and USEPA). This shall include but shall not be limited to required UST sampling and analytical methods, appropriate closure procedures, and post removal sampling and testing requirements by the CTDEEP. If contaminated soil, contaminated ground water, or free product as a liquid or vapor is observed on site or is detected by sample analysis, the Contractor shall contact the CTDEEP immediately. Contractor shall review all pertinent project documents, including Environmental Site Assessment – Phase I, geotechnical and other environmental studies/information relating to the existing tank removal. See section 003000 for additional available project information.

END OF SECTION

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Demolition and removal of selected portions of a building or structure.
- 2. Demolition and removal of selected site elements.
- 3. Repair procedures for selective demolition operations.

- B. Related Sections include the following:

- 1. Division 1 Section "Summary" for use of the premises and phasing requirements.
- 2. Division 1 Section "Contract Considerations" for restrictions on use of the premises due to Owner or tenant occupancy.
- 3. Division 1 Section "Photographic Documentation" for preconstruction photographs taken before selective demolition.
- 4. Division 1 Section "Temporary Facilities & Controls" for temporary construction and environmental-protection measures for selective demolition operations.
- 5. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
- 6. Division 2 Section "Building Demolition" for demolition of entire buildings, structures, and site improvements.
- 7. Division 2 Section "Site Demolition" for site clearing and removal of above-and below grade improvements.
- 8. Division 23 Sections for demolishing, cutting, patching, or relocating mechanical items.
- 9. Division 26 Sections for demolishing, cutting, patching, or relocating electrical items.

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 Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

- D. 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. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
- B. 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. Coordinate with Owner's Representative, who will establish special procedures for removal and salvage.

1.5 SUBMITTALS

- A. 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.
- B. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- C. Stamped shoring layout drawings prepared by the General Contractor's Professional Engineer, indicating location, method and design loads for the temporary shoring system utilized.
- D. 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.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Locations of 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.
- E. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- F. Predemolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

- G. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- H. Demolition Permit: Submit copy of Demolition Permit obtained from local Building Department. Contractor shall obtain and pay all fees associated with permit at no additional costs to the owner.

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. Professional Engineer Qualifications: Current Professional Engineer's License valid in the State of Connecticut.
- 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.
- E. Indoor Air Quality Requirements: Follow guidelines set forth in the Sheet Metal and Air Conditioning Contractors National Association's publication entitled "Indoor Air Quality Guidelines for Occupied Buildings Under Construction".
- F. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.7 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. Provide not less than 72 hours' notice to Construction Administrator of activities that will affect Owner's operations.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
 - 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

- D. Hazardous Materials: Hazardous materials are present in building 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 will not be 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.

1.8 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.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 2. Use materials whose installed performance equals or surpasses that of existing materials.

- B. Comply with material and installation requirements specified in individual Specification Sections.

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 the 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. Professional Engineer shall develop shoring layout plan for all temporary shoring and supervise the General Contractor's implementation of that plan. See paragraph 1.5 for submittal requirements.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Construction Administrator and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
 - 1. Provide at least 72 hours' notice to Construction Administrator if shutdown of service is required during changeover.
- C. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

- A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- B. Pest Control: Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during selective demolition operations.
- C. 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. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Construction Administrator and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
 - 2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.

3. Protect existing site improvements, appurtenances, and landscaping to remain.
 4. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
- D. 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.
- E. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating and cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
- F. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
- G. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction 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 POLLUTION CONTROLS
- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding and pollution.
 2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.5 SELECTIVE DEMOLITION

- 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 portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.
10. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.

- B. Existing Facilities: Comply with Construction Administrator's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.

- C. Removed and Salvaged Items: Comply with the following:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

- D. Removed and Reinstalled Items: Comply with the following:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 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.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Construction Administrator, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- F. 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.
- G. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- H. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- I. 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.
- J. Roofing: Remove no more existing roofing than can be covered in one day by new roofing. Refer to applicable Division 7 Section for new roofing requirements.
- K. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.
- 3.6 PATCHING AND REPAIRS
- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Patching: Comply with Division 1 Section "Cutting and Patching."
- C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

- E. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - 2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
 - 3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

- F. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.8 SELECTIVE DEMOLITION SCHEDULE

- A. Scope of Selective Demolition is indicated on the Drawings.

END OF SECTION

SECTION 02 42 16 - BUILDING DEMOLITION

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. Demolition and removal of buildings and structures.
 - 2. Demolition and removal of site improvements adjacent to a building or structure to be demolished.
 - 3. Removing below-grade construction.
 - 4. Disconnecting, capping or sealing, and removing site utilities.
- B. Related Sections include the following:
 - 1. Division 1 Section "Summary" for use of the premises and phasing requirements.
 - 2. Division 1 Section "Work Restrictions" for restrictions on use of the premises due to Owner or tenant occupancy of adjacent structures.
 - 3. Division 1 Section "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
 - 4. Division 1 Section "Temporary Facilities and Controls" for temporary construction, protection facilities, and environmental-protection measures for building demolition operations.
 - 5. Division 2 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of building demolition.
 - 6. Division 15 Sections for demolishing or relocating site mechanical items.
 - 7. Division 16 Sections for demolishing or relocating site electrical items.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Division 2 Section "Earthwork."

2.2 DEMOLITION, GENERAL

- A. General: Demolish existing buildings and structures and site improvements completely. The underground storage tank removal shall be performed in acquaintance with USEPA and Connecticut DEP regulations. Procedures for such removal may be found in Section 02 41 13.

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 fire watch and portable fire-suppression devices during flame-cutting operations.
 2. Maintain adequate ventilation when using cutting torches.
 3. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Demolition Permits: General Contractor is responsible for obtaining and paying for all demolition permits. Submit a copy of the permit to the owner prior to start of demolition work.

2.3 MECHANICAL DEMOLITION

- A. Remove buildings and structures and site improvements intact when permitted by authorities having jurisdiction.
- B. 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.
- C. Remove debris from elevated portions 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 or dust generation.
- D. Structural Steel: Do not use flame-cutting torches unless otherwise authorized by authorities having jurisdiction.
- E. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
1. Remove below-grade construction, including basements, foundation walls, and footings, completely.
 2. All areas to be backfilled as required per other Division 2 specification requirements.
- F. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.
1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
 2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

2.4 SURVEY FOR HAZARDOUS MATERIAL

- A. Work Involving Asbestos Containing Material (ACM):
1. The Contractor is responsible for abating all ACM that was not removed by the owner as per the Asbestos Survey and Report. All asbestos abatement work shall be performed in accordance with specification Division 2 Section “Asbestos Abatement”.
 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. Under no circumstance shall this information be the sole means used by the Contractor for determining the extent of asbestos. The Contractor shall be responsible for verification of all field conditions affecting performance of the Work.
 3. The results of testing are contained herein, reference Division 1 Section – “Alteration Project Procedures” and Division 2 Section – “Asbestos Abatement” for more information on Work involving ACM.
- B. Work Involving Lead Containing Material (LBP):
1. This facility was constructed prior to 1978 and is likely to have painted surfaces containing lead-based paint. The Contractor shall conduct all demolition and removal Work, specified in the technical sections of this specification, in conformance with the regulations as specified in Division 1 Section - Alteration Project Procedures.
 2. Testing for lead-based paint (LBP) has been conducted at the facility scheduled for renovation, demolition, reconstruction, alteration, remodeling, or repair. The Results of the LBP testing are for information purposes only. Under no circumstance shall this information be the sole means used by the Contractor for determining the extent of LBP. The Contractor shall be responsible for verification of all field conditions affecting performance of the Work.
- C. Work Involving Polychlorinated Biphenyl Material (PCB):
1. The Contractor is responsible for abating all PCB as per the PCB Survey, Report, and Drawings. All PCB abatement work shall be performed in accordance with specification Division 02 Sections “**Removal and Disposal of Polychlorinated Biphenyls (PCBS), and Removal & Disposal of Polychlorinated Biphenyl (PCB) Contaminated Soils**”.
 2. Testing for PCB’s has been conducted at the facility scheduled for renovation, demolition, reconstruction, alteration, remodeling, or repair. Results of the PCB testing are for information purposes only. Under no circumstance shall this information be the sole means used by the Contractor for determining the extent of PCB’s. The Contractor shall be responsible for verification of all field conditions affecting performance of the Work.
 3. The results of testing are contained herein, reference Division 01 Section – “Alteration Project Procedures” and Division 02 Sections – “**Removal and Disposal of Polychlorinated Biphenyls (PCBS), and Removal & Disposal of Polychlorinated Biphenyl (PCB) Contaminated Soils**” for more information on Work involving PCB’s.

The results of testing are contained herein, reference Division 1 Section - Alteration Project Procedures for more information on Work involving LBP.

END OF SECTION 02 42 16

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

CONNECTICUT GENERAL STATUTES

- Chapter 446k, Water Pollution Control, Sections 22a-463 through 469

PUBLICATIONS

- Drawings and General Provisions of Contract
- “Self-Implementing Cleanup Plan, Eli Whitney Technical High School” prepared by TRC Environmental Corporation, June 2011 (**PCB Site Remedial Plan**).
- Section 028433 Removal and Disposal of Polychlorinated Biphenyls

1.2 DESCRIPTION

The project SITE encompasses sections of the Eli Whitney Technical High School (Whitney Tech) located at 71 Jones Road in Hamden, 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 Construction Services (DCS) 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 and/or surface cover adjacent to the building with total PCB concentrations ≥ 1 mg/kg contaminated by PCB containing caulk and/or glazing classified as an EPA PCB Bulk Product Waste and/or a Connecticut Department of Energy and Environment (CTDEEP) Regulated Waste.

This section includes requirements for excavating and handling PCB contaminated soil and/or surface cover from the proposed surface soil/cover remediation areas as shown on the Contract Drawings and described in the PCB Site Remedial Plan. In general, these locations include grass covered areas along the western exterior wall of Wing D.

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.

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, surface cover, 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, Eli Whitney Technical High School”, Prepared by TRC, June 2011.

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 Construction Services 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 and/or surface cover 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/surface cover 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/surface cover is placed following excavation and prior to loading into a waste storage container. At no time will the Contractor create *an 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 excavated soil/surface cover prior to off-site 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.

1.3.15 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 e-mail correspondence between the Department of Construction Services 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.

1.4 SUBMITTALS

Prior to performing the excavation work, the Contractor shall submit:

1.4.1 Key Personnel and Contractor Requirements

The following must be provided to the Owner, OR, and the PCB Engineer within seven (7) days after execution of the Contract.

As related to the PCB soil remediation, 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 Remediation Contractor.

Current certification of employees' 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 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/surface cover 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 PROTECTION

1.7.1 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 the Owner's/PCB Engineer's records. The Contractor shall verify the location of all utilities shown on the Contract Drawings or identified during utility mark-outs. The Contractor shall also coordinate the identification of underground utilities with the CMR.

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.

1.7.2 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.

1.7.3 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 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 soil/surface cover 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 erosion and sediment control in conformance with the CTDEEP Erosion and Sediment Control Pocket Guide and any relevant Specification Sections.

3.1.3 Waste Storage Areas

If the Contractor chooses to store excavated soil/surface cover 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 and grubbing, if necessary, would consist of the removal of low lying vegetation such as bushes and/or shrubs.

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 be responsible for providing temporary water 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 may be provided by the DCS from an approved fire hydrant or other suitable source at no extra charge to the Contractor. Dust Control measures employed by the Contractor shall be coordinated with the CMR.

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 soil/surface cover 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 soil/surface cover from the edge farthest away from the edge where hauling vehicles will approach the Contaminant Zone. Contaminated soil/surface cover 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/surface cover across other contaminated or clean areas. The loose or excess soil/surface cover shall be removed from the bucket within the active excavation area prior to moving the soil/surface cover to the hauling vehicles. The Contractor shall be solely responsible for the cost of excavating, handling, storage, testing and disposal of soil/surface cover 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/surface cover 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.

3.4 EXCAVATION COMPLETION

Each excavation shall be considered complete after sufficient verification samples have been collected by the PCB Engineer and analyzed and determined to meet remedial action levels as defined in the PCB Site Remediation Plan. Verification samples shall be collected and analytical data reviewed by the PCB Engineer. Samples shall be analyzed using EPA Methods 3540 and 8082. If the remedial action level is exceeded, the Contractor shall be instructed to excavate additional material as instructed by the PCB Engineer. All excavation activities are further described in the PCB Site Remedial Plan.

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.

Soil excavations shall be backfilled with certified clean soil. Backfill soils shall be obtained from a known borrow source and shall be analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), Extractable Total Petroleum Hydrocarbons (ETPH), CT RSR Metals (total and SPLP concentrations), pesticides, herbicides and PCBs (total and SPLP concentrations). Analytical results shall be compared to the CTDEEP Remediation Standard Regulations (RSR) Residential Direct Exposure Criteria (RES DEC) and GA Pollutant Mobility Criteria (PMC) standards. The Contractor shall supply test sample data to the PCB Engineer for review and approval prior to beginning excavation/backfill activities. Soils shall be placed and compacted in 12-inch lifts.

3.5 MEASUREMENT AND PAYMENT

The Contractor's cost proposal shall be based on the following criteria:

3.5.1 Method of Measurement

PCB Soil Remediation. Payment for the complete excavation, transportation, and disposal of all PCB Soils shall be based on a lump sum price. No measurement will be made for the remediation of PCB contaminated soils in this Section. The completed work shall be paid as a lump sum. The lump sum bid price for PCB soil remediation shall include the specialty services of the Remediation Contractor including: labor, materials, equipment, including supplying and placing free draining material backfill for the excavation, staging, loading, decontamination, insurance, permits, notifications, submittals, personal protection equipment, utility costs, incidentals, fees and labor incidental to the excavation of PCB contaminated soils, including close out documentation, and restoration of disturbed surfaces in accordance with these Technical Specifications and to the satisfaction of the PCB Engineer..

The lump sum price for the remediation of all PCB contaminated soils shall also include providing adequate containers for storage of PCB wastes until they are removed from the site and the transport to, and disposal of these materials at a TSCA-permitted facility. Payment for PCB Soil Remediation waste disposal shall be made when the Remediation Contractor submits manifests signed by the receiving facility documenting the mass of waste disposed and the Certificates of Disposal provided by the waste disposal facility for each manifested load to the PCB Engineer. Once the manifest and Certificate of Disposal have been received, the Owner shall make payment to the Remediation Contractor.

No extra payment shall be made for decontamination, dust control, site preparation, site restoration or waste disposal areas. The cost for these items shall be included in the lump sum base bid for PCB Soil Remediation.

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.

Payment for PCB Remediation Waste disposal shall be made when the Remediation Contractor submits manifests signed by the receiving facility documenting the mass of waste disposed and the Certificates of Disposal provided by the waste disposal facility for each manifested load to the PCB Engineer. Once the manifest and Certificate of Disposal have been received, the Owner shall make payment to the Remediation Contractor.

3.5.2 Unit Price Schedule - Additional or Reduced PCB Soil Remediation

The unit price schedule can be found in Specification Section 01 20 00 Contract Considerations and 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.

END OF SECTION 026123

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. Refer to Miscellaneous Hazardous Materials Inventory appended to the Project Manual. Removal work includes the following materials:
 - 1. Materials containing lead.
 - 2. Fluorescent lamps.
 - 3. Fluorescent light fixtures
 - 4. Lead-acid electrolyte batteries.
 - 5. Mercury
 - 6. PCB and Non-PCB ballasts.
 - 7. HID lamps.
 - 8. Petroleum in compressors and hydraulics.
 - 9. Air conditioning units

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
 - 3. Lamps

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.
 - f. Submit a plan for the removal and disposal of hazardous materials to ensure compliance with applicable regulations.

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 MATERIAL CONTAINING LEAD

- A. 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 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. The contractor is encouraged to recycle metals resulting from removal work to the maximum extent possible.
- B. Testing for lead-based paint has been conducted at the facility scheduled for renovation, demolition, reconstruction, alteration, remodeling, or repair. Results of LBP testing are attached as an Appendix to this specification. Under no circumstances shall this information be the sole means used by the

Contractor for determining the extent of LBP. The Contractor shall be responsible for verification of all field conditions affecting performance of the work.

C. 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. 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 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.**

3.4 LEAD-ACID BATTERY ELECTROLYTE

- A. Dispose of batteries containing lead-acid electrolytes in accordance with all applicable regulations governing hazardous waste disposal.

3.5 MERCURY

- A. The Design Consultant will identify thermostats, switches, gauges and miscellaneous equipment containing mercury. The Contractor is responsible for removal and disposal of these items. Waste generated by this process shall be recycled or disposed of in accordance with applicable regulations.

3.6 LIGHT BULBS AND BALLASTS

- A. Furnish labor, materials, services, and equipment necessary for the removal of PCB containing light ballasts and mercury-containing fluorescent lamps in accordance with local, state, and federal regulations. Do not expose PCB's to open flames or other high temperature sources since toxic decomposition by-products may be produced. Do not break mercury-containing fluorescent lamps.
- B. Ensure the work operations or processes involving PCB or PCB-contaminated materials are conducted in accordance with 40 CFR 761, 40 CFR 262, 40 CFR 263, and the applicable requirements of this section, including but not limited to:
1. Obtaining suitable PCB and mercury-containing lamp storage sites.
 2. Notifying Owner prior to commencing the operation
 3. Reporting leaks and spills to the Construction Administrator.
 4. Cleaning up spills.
 5. Inspection PCB and PCB-contaminated items and waste containers for leaks and forwarding copies of inspection reports to the Construction Administrator
 6. Maintaining inspection, inventory, and spill records

- C. PCB Spills – Immediately report PCB spills to the Construction Administrator.
- D. PCB Spill Control Area – Rope off an area around the edges of a PCB leak or spill and post a “PCB Spill Authorized Personnel Only” caution sign. Immediately transfer leaking items to a drip pan or other container.
- E. PCB Spill Cleanup – 40 CFR 761, subpart G. Initiate cleanup of spills as soon as possible, but no later than within 24 hours of its discovery. Mop up the liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as solid PCB waste.
- F. Records and Certification – document the cleanup with records of decontamination in accordance with 40 CFR 761, Section 125, requirements for PCB Spill Cleanup. Provide test results of cleanup and certification of decontamination.
- G. Ballasts – As ballasts are removed from the lighting fixture, inspect label on ballast. Ballasts without a “NO PCB” label shall be assumed to contain PCB’s and containerized and disposed of as required under paragraphs I-O. Establish whether the “NO PCB” labeled ballasts contain diethylhexyl phthalate (DEHP) either by test or by checking with the ballast manufacturer indicated on the label. If the ballasts do not contain PCB’s or DEHP, then handle, store, and dispose of the ballasts as Connecticut regulated oil waste. If the ballasts do contain DEHP, dispose of them as hazardous material in accordance with Federal, State, and local regulations. As a basis of bid, assume ballasts with “NO PCB” labels will be disposed of as Connecticut regulated oil waste.
- H. Lighting Lamps – Remove lighting tubes/lamps from the lighting fixture and carefully pack into appropriate containers.
- I. Storage Containers for PCB’s – 49 CFR 178. Store PCB in containers approved by DOT for PCB.
- J. Storage Container for lamps – store mercury-containing lamps in appropriate DOT containers. The boxes shall be stored and labeled for transport in accordance with 40 CFR 273.
- K. Labeling of Waste Containers – Label with the following:
 - 1. Date the item was placed in storage and the name of the activity/building.
 - 2. “Caution – Contains PCB”, conforming to 40 CFR 761, CFR Subpart C. Affix labels to PCB waste containers.
 - 3. Label mercury-containing lamp waste in accordance with 40 CFR 273. Affix labels to all lighting waste containers.
- L. Dispose of ballasts and light tubes off State property in accordance with EPA, DOT and local regulations at a permitted site.

- M. Identification Number – Obtain a small quantity hazardous waste generator ID number from the State of Connecticut DEP for the site..

- N. Transporter Certification – Comply with disposal and transportation requirements outlined in 40 CFR 761 and 40 CFR 263. Before transporting the PCB waste, sign and date the manifest acknowledging acceptance of the PCB waste from the State. Return a signed copy to the Construction Administrator before leaving the job site. Ensure that the manifest accompanies the PCB waste at all times. Submit transporter certification of notification to EPA of their PCB waste activities (EPA Form 7710-53).

- O. Certificate of Disposal - Certificate for the ballasts and tubes disposed of shall include:
 - 1. The identity of the disposal facility, by name, address, and EPA identification number.
 - 2. The identity of the waste affected by the Certificate of Disposal including reference to the manifest number for the shipment.
 - 3. A statement certifying the fact of disposal of the identified waste, including the date(s) of disposal, and identifying the disposal process used.
 - 4. A certification as defined in 40 CFR 761.

END OF SECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Coordinate asbestos abatement with the work described 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 contract.
- 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. **No asbestos removal activities are permitted during regular school hours.** 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.
- D. The project includes removal of the following asbestos-containing materials: vinyl floor tile and mastic; thermal systems insulation; glue daubs (from ceiling tile and behind chalkboards); exterior masonry wall sections with embedded asbestos-containing waterproofing felt/tar; cementitious composite flooring treatment (“Asbestolith”); cementitious board (“Transite”); sink undercoating/pan sealant; roof flashings, window caulk/glazing; dampproofing on foundation walls.
- 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.
- I. For areas where ceiling demolition is specified, remove and properly dispose of all fluorescent lighting affixed to and/or resting on the ceiling. All fluorescent lamps are presumed to contain hazardous levels of mercury. Lamps shall be removed from fixtures intact and sent to a permitted facility for recycling as mercury-containing hazardous waste. PCB Contaminated light fixtures shall be disposed of as PCB waste. Properly dispose of fluorescent light ballasts containing PCB and non-PCB dielectric fluid.

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-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 Critical Barrier - Barrier 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 Work Area

side to prevent unauthorized access or air flow.

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.

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, location of strategic air sampling locations, 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 (1000 x PEL)	Full facepiece supplied air respirator operated in pressure demand mode.
Greater than 100 f/cc (>1000 x PEL) or	Full facepiece supplied air respirator operated in

unknown concentration
equipped with an auxiliary

pressure demand mode,
positive pressure self-
contained breathing
apparatus.

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- 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 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.
- C. The abatement contractor shall provide the documentation included in paragraph 1.6.C to the Asbestos Project Designer at least 30 days prior to start of asbestos removal activities in each work area for submission in DPH SIS requests. 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.

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.

- D. Following removal of ACM and non-ACM resilient flooring, perform flash patching (up to 3/8" thickness) of all floor areas where necessary to fill cracks and holes and level spot depressions. Make floors ready for new finishes. Submit product data to the Construction Administrator for approval prior to installation.

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 after 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. **PLEASE REFER TO THE PCB DRAWINGS THAT INDICATE WHICH CAULKS/GLAZINGS MAY CONTAIN PCB AS WELL – THE PCB DRAWINGS**

ARE ATTACHED TO THIS SPECIFICATION.

- 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. Some 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.
- B. Where required openings described in the paragraph above intersect wall construction with embedded asbestos-containing membrane, the work shall be conducted as non-friable asbestos removal. If section of building is not being demolished in its entirety then a barrier wall consisting of two layers of reinforced poly shall be place just inside the building area from where the required walls are to be demolished.
- 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. Specific locations of this material are depicted on the Contract Drawings. Conduct removal of the flooring in these areas as asbestos abatement. ACM cementitious flooring is present at various depths in areas where it has been applied.
- B. Contractor is responsible for restoration and leveling of floor slabs after removal of ACM cementitious flooring. Coordinate with the work of other sections.

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-332a-12. 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:

Pre-	During	Post-
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Abatement Activity	Abatement	Abatement	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

PART 1 GENERAL

1.1 Scope.

- A. The work specified herein shall be the removal of asbestos-containing roofing materials by persons who are knowledgeable, qualified, licensed, and trained in the removal, treatment, handling, and disposal of asbestos-containing roofing material, and the subsequent cleaning of the affected environment. The Contractor shall have a Competent Person in control on the job site with authority to take prompt corrective measures at all times during roofing removal 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 contract.
- B. The State will retain the services of a Project Monitor for protection of its interests and those using the building. Area air sampling and a visual inspection to ensure proper clean up of the work area will be conducted as deemed necessary.
- C. Deviations from this Specification require the written approval of the State of Connecticut.

1.2 Description of Work

- A. The Contractor shall supply all labor, materials, equipment, services, insurance (with specific coverage for asbestos), and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations and these specifications.
- B. The Contractor shall remove and dispose of the asbestos-containing roofing material documented on the attached asbestos roofing inspection report.

1.3 Definitions

- A. **AGENCY** - The authoritative force, usually at the state level, or their representative.
- B. **ASBESTOS-CONTAINING MATERIAL (ACM)** - Any material containing more than one percent asbestos.
- C. **COMPETENT PERSON** - In addition to the definition in 29 CFR 1926.32(f), one who is in the workplace 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 meets the criteria of EPA's Model Accreditation Plan (40 CFR Part 763) for Supervisor, or its equivalent.
- D. **HIGH-EFFICIENCY PARTICULATE AIR (HEPA)** A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles 0.3 microns in diameter.

- E. LEAK-TIGHT - Solids or liquids cannot escape or spill out. It also means dust-tight.
- F. REGULATED AREA - Area established by the Competent Person to demarcate areas where airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the Permissible Exposure Limit.
- G. NON-FRIABLE REGULATED ASBESTOS -CONTAINING MATERIAL – means any material containing more than 1 percent asbestos as determined using the method specified in appendix A, subpart F, 40 CFR part 763, section I, Polarized Light Microscopy, that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.
- H. REGULATED ASBESTOS -CONTAINING MATERIAL (RACM) – means (a) Friable asbestos material, (b) Category I nonfriable ACM that has become friable, (c) Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II nonfriable 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 regulated by this subpart.

1.4 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 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, 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

1.5 Submittals and Notices

- A. Prior to commencement of asbestos abatement work, submit to the A/E and Construction Coordinator and receive approval and/or acknowledgment of following:
 - 1. State notifications (when applicable).
 - 2. Asbestos worker medical clearance to wear a respirator documentation
 - 3. Asbestos worker & Competent Person training documentation
 - 4. Asbestos worker respiratory fit testing documentation
- B. Within 35 days following the date the asbestos waste trailer leaves the job site, submit to the A/E and DPW Construction Coordinator:
 - 1. Waste shipment record for disposal of asbestos roofing material.

1.6 Personnel Protection

- A. Provide and require all workers to wear protective clothing and half face respirators when present in the Regulated Area established by the Competent Person.

1.7 Worker Training Requirements

- A. Training for the Competent Person, Supervisor, and Workers shall meet the requirements of Federal and State Regulations

PART 2 PRODUCTS

2.1 Materials

- A. Polyethylene sheeting and disposal bags shall be six (6) mil.
- B. Labels and signs shall conform to applicable regulations.

2.2 Tools and Equipment

- A. Air monitoring equipment of the type and quantity required to monitor operations and conduct personnel exposure surveillance per OSHA requirements.
- B. Protective clothing, respirators, filter cartridges, air filters and sample filter cassettes shall be provided in sufficient quantities for the project.
- C. Waste Containers shall be lined with 2 layers of 6 mil polyethylene sheeting and 1 layer of polypropylene burlap.

PART 3 EXECUTION

3.1 Preparation of Work Area

- A. Post warning signs meeting the specifications of OSHA 29 CFR 1910 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.
- B. Prior to start of work, and as needed during the job, the Competent Person shall inspect the work site and determine whether the roofing material is non-friable asbestos containing material and will likely remain non-friable asbestos containing material during removal activities.
- C. Shut down and seal (with duct tape and 6-mil. poly sheeting) windows & roof level heating and ventilation air intakes that are in position to entrain dust or vapors from the roofing activities. Coordinate shut down of mechanical systems with Agency personnel. Where intake shutdown is not feasible (as determined by Agency), supply and install horizontal or vertical extensions to relocate the opening of the air intake outside or above the regulated area so as not to entrain dust and vapor emissions from

the roofing removal and re-roofing activity.

3.2 Asbestos-Containing Roofing Material Removal

- A. All work shall be performed in accordance with OSHA Construction Industry Standard (29 CFR 1926.1101) and EPA NESHAP Standard (40 CFR 61) and applicable State of Connecticut Regulations.
- B. A Competent Person shall be on the job at all times to ensure proper work practices throughout the project.
- C. The Contractor shall Utilize methods which do not sand, grind, cut or abrade the Asbestos-Containing Roofing Material. Should roofing materials be identified as regulated asbestos-containing material additional federal and state regulations will apply.
- D. Pick up or HEPA vacuum asbestos-containing roofing debris from non-intact roofs prior to removal of the roofing. Bag debris for disposal.
- E. Utilize wet methods to remove asbestos-containing roofing materials unless such wet methods are not feasible or will create safety hazards, as determined by the competent person, in writing.
- F. HEPA vacuum asbestos-containing dust and debris left after the removal of asbestos-containing roofing. Where asbestos-containing built-up roofing is removed, HEPA vacuum the roof decking following roofing removal. Bag dust and debris for disposal.
- G. When removing asbestos-containing shingles, cut the nails with flat, sharp instruments prior to removal. Do not intentionally cut, abrade, or break shingles during removal.
- H. Remove asbestos-containing flashings and associated cements or mastics using manual methods (such as axe, knife, or shovel). Do not sand, abrade or grind these materials.
- I. Asbestos-containing roofing material shall be carried or passed to the ground by hand or lowered to the ground by crane or hoist. Do not drop asbestos-containing roofing material to the ground or into the dumpster. Transfer lowered asbestos-containing roofing material to the leak tight disposal dumpster carefully so as not to disperse dust.

3.3 Disposal of Asbestos-Containing Roofing Material

- 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 Office of Solid Waste Management, Department of Environmental Protection, State of Connecticut, or other designated agency having jurisdiction over solid waste disposal.
- B. Asbestos warning signs must be attached to containers used to transport asbestos-

containing waste. Warning signs shall be posted during loading and unloading of disposal containers. The signs must be posted so that they are plainly visible.

- C. Label containers of asbestos-containing waste material or wrapped asbestos-containing waste material using warning labels specified by OSHA 29 CFR 1926.1101. Label asbestos-containing waste material destined for off-site transport with the name of the waste generator and the location where the waste was generated.

3.4 Contractor Personal Air Monitoring Responsibility

- A. Conduct air sampling to assure that workers are using appropriate respiratory protection in accordance with OSHA Construction Industry Standard 1926.1101. 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. Produce a written initial asbestos exposure assessment prior to starting asbestos roofing removal work in compliance with OSHA Standard 1926.1101. Keep the exposure assessment on site for review by all concerned parties.

END OF SECTION 02 82 34

PART 1 GENERAL

1.1 APPLICABLE PUBLICATIONS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to this work.

“Self-Implementing Cleanup Plan, Eli Whitney Technical High School,” prepared by TRC Environmental Corporation, June 2011. (“PCB Site Remedial Plan”)

Section 02 61 23 Removal and Disposal of Polychlorinated Biphenyl (PCB) Contaminated Soils Specifications

EPA PCB Regulations 40 CFR Part 761

Connecticut PCB Statutes, Chapter 446k Sections 22a-463 through 469

Connecticut Department of Energy and Environmental Protection (CTDEEP) Remediation Standard Regulations (RSR) 22a-133k-1 through 3

1.2 DESCRIPTION

Work under this item shall include the abatement of: PCB-containing caulk and glazing (Federally-regulated and non-federally regulated PCB), removal of adjacent non-porous building materials (metal door and/or window framing, glass, etc), and removal of abutting porous building materials (e.g., brick, block, granite paneling, etc), as identified in the Contract Plans and PCB Site Remedial Plan that are coated with Federally-regulated PCB-containing caulk and/or glazing (“PCB Bulk Product Waste”) or non-Federally regulated PCB-containing caulking and/or glazing compounds (“Connecticut Regulated Waste CR01”).

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 shall have all the required asbestos licensing/training as required in Specification Section 028213.

1.3 REQUIREMENTS

The Owner will hire a PCB Engineer for the duration of the PCB abatement work. The PCB Engineer will provide a Project Monitor to oversee the activities of the Remediation Contractor.

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 PCB-containing caulk and glazing shall be removed by the Remediation Contractor and all associated non-porous and/or porous building materials in contact with the subject caulk and glazing shall be removed by the Remediation Contractor to the depths identified in this specification and as indicated on Figures PCB-1 through PCB-8, unless otherwise indicated by the PCB engineer that more material requires removal.

Building materials in contact with the federally regulated caulking and/or glazing compounds shall be appropriately removed and remaining building materials cleaned by the Remediation Contractor as per these Specifications. Verification samples of the remaining, cleaned building materials shall then be taken (as described below) by the Project Monitor and re-occupancy testing shall be performed by the Project Monitor.

PCB Bulk Product Wastes and adjacent building materials shall be considered removed when all verification samples are < 1 mg/kg total PCBs. Work areas shall be considered cleaned when no visible caulking/glazing residue remains and all re-occupancy wipe tests are < 1 $\mu\text{g}/100\text{cm}^2$.

Caulks/glazes found to have a PCB concentration ≥ 50 mg/kg at Eli Whitney Technical High School were as follows:

Building material abutting caulk, identified as IE3 as shown on the Contract Drawings, shall be removed by the Remediation Contractor to a depth of at least sixty (60) inches of building materials on either side of the caulk. The remaining building materials shall then be cleaned by the Remediation Contractor as per these Specifications. Twenty (20) verification samples shall be collected by the Project Monitor. Any residuals resulting from the cleaning of adjacent surfaces are to be handled and disposed of along with the caulks.

Building material abutting caulk, identified as IDC4 on the Contract Drawings, shall be removed by the Remediation Contractor to a depth of at least forty-eight (48) inches of building materials out from where the caulk contacts the porous concrete CMU. Metal door frames abutting the subject caulk shall be removed and disposed of as PCB Bulk Product Waste. The doors may be removed prior to abatement activities and shall not be considered PCB Waste unless another PCB Bulk Product Waste is identified on the same door (e.g. window glazing on door windows). The remaining building materials shall then be cleaned by the Remediation Contractor as per these Specifications. Since pre-verification samples were already collected in association with this type of caulk, no verification samples shall be collected by the Project Monitor. Any residuals resulting from the cleaning of adjacent surfaces are to be handled and disposed of along with the caulks.

Building material abutting caulk, identified as IC4 as shown on the Contract Drawings, shall be removed by the Remediation Contractor to a depth of at least four courses of CMU (including the sill) below the caulked edge of the window frame. Metal window frames abutting the subject caulk shall be removed and disposed of as PCB Bulk Product

Waste. The remaining building materials shall then be cleaned by the Remediation Contractor as per these Specifications. Twelve (12) verification samples shall be collected by the Project Monitor. Any residuals resulting from the cleaning of adjacent surfaces are to be handled and disposed of along with the caulks.

Building material abutting caulk, identified as IC5 on the Contract Drawings, shall be removed by the Remediation Contractor to a depth of at least nine (9) inches of building materials out from where the caulk contacts the porous concrete CMU. Metal window wall frames abutting the subject caulk shall be removed and disposed of as PCB Bulk Product Waste. If glass panes are in contact with a PCB Bulk Product Waste (i.e. window glazing), then the Remediation Contractor shall dispose of the entire window wall as PCB Bulk Product Waste. The remaining building materials shall then be cleaned by the Remediation Contractor as per these Specifications. Since pre-verification samples were already collected in association with this type of caulk, no verification samples shall be collected by the Project Monitor. Any residuals resulting from the cleaning of adjacent surfaces are to be handled and disposed of along with the caulks.

Building material abutting caulk, identified as IC9 on the Contract Drawings, shall be removed by the Remediation Contractor to a depth of at least thirty (30) inches of building materials out from where the caulk contacts the porous concrete CMU. Metal door frames abutting the subject caulk shall be removed and disposed of as PCB Bulk Product Waste. The doors may be removed prior to abatement activities and shall not be considered PCB Waste unless another PCB Bulk Product Waste is identified on the same door (e.g. window glazing on door windows). The remaining building materials shall then be cleaned by the Remediation Contractor as per these Specifications. Since pre-verification samples were already collected in association with this type of caulk, no verification samples shall be collected by the Project Monitor. Any residuals resulting from the cleaning of adjacent surfaces are to be handled and disposed of along with the caulks.

Building material abutting caulks, identified as E1 and E2 on the Contract Drawings, shall be removed by the Remediation Contractor to a depth of at least twelve (12) inches of brick on either side of the caulk. The remaining building materials shall then be cleaned by the Remediation Contractor as per these Specifications. Since pre-verification samples were already collected in association with this type of caulk, no verification samples shall be collected by the Project Monitor. Any residuals resulting from the cleaning of adjacent surfaces are to be handled and disposed of along with the caulks. Window systems on which glazes, identified as G4, G7, IG7 and IG8 on the Contract Drawings, are located shall be removed by the Remediation Contractor and disposed of as PCB Bulk Product Wastes.

Building material abutting caulk, identified as C2 as shown on the Contract Drawings, shall be removed by the Remediation Contractor to a depth of 12 inches on either vertical side of the window units. Metal window frames and metal window soffits abutting the subject caulk shall be removed and disposed of as PCB Bulk Product Waste. The remaining building materials shall then be cleaned by the Remediation Contractor as per

these Specifications. Since pre-verification samples were already collected in association with this type of caulk, no verification samples shall be collected by the Project Monitor. Any residuals resulting from the cleaning of adjacent surfaces are to be handled and disposed of along with the caulks.

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 as a TSCA-regulated waste per these Specifications by the Remediation Contractor. The locations of the identified non-federally regulated PCB-containing materials are shown on Figures PCB-1 through PCB-8.

Building materials in contact with the non-federally regulated caulking and/or glazing compounds shall be appropriately cleaned by the Remediation Contractor as per these Specifications after the caulk and/or glazing is removed. Since abutting building material samples were already collected in association with non-federally regulated PCB-containing caulk, no verification samples shall be collected by the Project Monitor.

Re-occupancy testing shall be performed by the Project Monitor. Work areas shall be considered cleaned when no visible caulking/glazing residue remains and all re-occupancy wipe tests are $< 1 \mu\text{g}/100\text{cm}^2$.

Caulks/glazes found to have a PCB concentration ≥ 1 mg/kg and < 50 mg/kg at Eli Whitney Technical High School were as follows:

1. Non-federally regulated interior and exterior glazing identified as G2, IG1, IG2, IG3, IG4, IG5, IG11, IG12, IG14, IG17, IG18, IG22 and IG23 shall be removed along with the windows and/or doors in which they are in contact and handled and disposed of as a TSCA-regulated waste.
2. Non-federally regulated PCB-containing exterior caulk identified as C9 and present around exterior vents shall be removed along with the vent cover with which it is in contact and handled and disposed of as a TSCA-regulated waste. Adjacent porous surfaces in contact with C9 shall be cleaned of all visible caulk. Any residuals resulting from the cleaning of adjacent surfaces are to be handled and disposed of along with the caulks.
3. Non-federally regulated PCB-containing interior and exterior caulks, identified as E3, IE2 and IE4 shall be removed, handled and disposed of as a TSCA-regulated waste. Adjacent porous surfaces in contact with these caulks shall be cleaned of all visible caulk. Any residuals resulting from the cleaning of adjacent surfaces are to be handled and disposed of along with the caulks.
4. Non-federally regulated PCB-containing interior and exterior caulks, identified as IC1, IC2, IC3, IC6, C5, C8 and C14 shall be removed, handled and disposed of as a TSCA-regulated waste. Adjacent porous surfaces in contact with these caulks

shall be cleaned of all visible caulk. Any residuals resulting from the cleaning of adjacent surfaces are to be handled and disposed of along with the caulks.

Work shall be performed in conjunction with the construction schedule for the proposed renovations. Work performed while children/students are in the building for classes will be performed on off-hours, as defined in the General Requirements. Work performed during school vacations, weekends, and summer will be performed during normal working hours, as defined in the General Requirements.

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, Connecticut General Statutes 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 Remediation Contractor as PCB Bulk Product Waste in accordance with 40 CFR Part 761.

Deviations from these Specifications require the written approval from the Owner.

1.4 DEFINITIONS

1.4.1 Contaminant Zones

Contaminant zones are those areas of active abatement and the waste storage area.

1.4.2 Abatement

The removal of PCB contaminated caulks/glazes and associated building materials in the manner specified in this section.

1.4.3 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.

1.4.4 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.

1.4.5 PCB Waste

PCB waste means PCB-containing caulk and glazing (Federally-regulated and non-federally regulated PCB) and impacted abutting building materials to the subject caulk and glazing.

1.4.6 PCB Site Remedial Plan

“Self-Implementing Cleanup Plan, Eli Whitney Technical High School”, Prepared by TRC, June 2011.

1.4.7 Remedial Action Level

Concentration to which PCB contaminated building materials must be removed to verify completion of the abatement work.

1.4.8 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, concrete block, mortar, metal, and stone window sills.

1.4.9 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.

1.4.10 Verification Sampling

Sampling performed by the Project Monitor to determine the completion of abatement activities as per the PCB Site Remedial Plan.

1.4.11 Waste Storage Area

The secured location in which the Remediation Contractor shall store PCB wastes prior to offsite transport for disposal. The Remediation 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 Remediation Contractor.

1.4.12 PCB Engineer

Consulting firm responsible for overseeing PCB abatement work and for performing and evaluating verification and re-occupancy sample data on behalf of the Owner. The PCB Engineer shall be represented daily onsite by the Project Monitor.

1.4.13 Owner

The Owner is the State of Connecticut, Department of Construction Services, as further defined in the General Conditions.

1.4.14 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, perform sampling during and after abatement activities, and verify that abatement has been successfully performed and allowing containments to be removed for re-occupancy.

1.4.15 Remediation Contractor

The Remediation Contractor shall be knowledgeable, qualified, trained and licensed in the removal, treatment, handling, and disposal of PCB contaminated wastes and the subsequent cleaning of the affected environment. The Remediation Contractor shall also have all the required asbestos licensing/training as required in Specification Section 02 82 13, Asbestos Abatement.

1.4.16 Remediation Contractor Certification Form for PCB Abatement

The Remediation 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 Construction Services and the United States Environmental Protection Agency (EPA), and the EPA Approval Notice. By signing the Remediation Contractor Certification Form for PCB Abatement, the Remediation Contractor agrees to abide by the Conditions specified in the EPA Approval Notice.

1.5 SUBMITTALS

Prior to the performance of the work described in this section the Remediation Contractor shall submit to the Owner and Owner's Representative (OR) the following on the schedule indicated:

1.5.1 The following must be provided to the Owner, OR, 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 Remediation Contractor.

Current certification of employees' 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).

- 1.5.2 Prior to any worker accessing the site to perform the work described in this section, the Remediation Contractor shall provide documentation, typed on company letterhead and signed by the Remediation Contractor, certifying that all employees assigned to the PCB abatement work listed therein have received the following:
1. Medical monitoring within the previous twelve (12) months, as required in 29 CFR 1910.120;
 2. 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).

- 1.5.3 At least seven (7) days prior to performing any abatement work that shall generate PCB wastes, the Remediation 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.
- 1.5.4 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 Remediation 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.
- 1.5.5 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 Remediation Contractor receives such documents.
- 1.5.6 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.

1.6 REGULATORY REQUIREMENTS

- 1.6.1 All abatement and decontamination wastes are to be handled and stored in accordance with the provision of 40 CFR Part 761 Subpart D. The Remediation 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.

1.7 DELIVERY AND STORAGE

- 1.7.1 The Remediation Contractor shall deliver and store materials in a manner to prevent contamination, segregation, freezing, and other damage.

1.8 PROTECTION

1.8.1 Structures and Surfaces

The Remediation Contractor shall protect adjacent structures and surfaces from traffic or any other damage. The Remediation 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 Remediation Contractor.
- 2.3 Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating 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, Connecticut General Statutes 22a-463 through 469, 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.
- 2.9 Remediation Contractor shall at their discretion utilize specialty cleaning products such as *Capsur*, *TechXtract* or other cleaners for use in cleaning porous and non-porous surfaces to remain. All such products shall be utilized in accordance with manufacturer's specifications as intended. Remediation Contractor shall ensure appropriate use and disposal associated with use in accordance with the MSDS sheets for each product utilized. It shall be incumbent upon the Remediation Contractor to determine the need for use of specialty products to meet required cleaning verification levels established herein and in accordance with the PCB Site Remedial Plan.

- 2.10 Respirators shall be approved by the Mine Safety and Health Administration (MSHA), Department of Labor, or the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

PART 3 EXECUTION

- 3.1 General Requirements for Abatement of PCB Containing Building Materials.
- A. 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 Remediation Contractor. The Remediation Contractor shall be prepared to work all shifts and weekends throughout the course of this work.
- B. Prior to beginning work per these Specifications, the PCB Engineer and Remediation Contractor shall perform a visual survey of each work area and review conditions at the site for safety reasons. In addition, the Remediation 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.
- C. Prior to the performance of any abatement work, the Remediation Contractor shall perform the following tasks at a minimum:
- 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 Remediation Contractor is responsible for proper connection and installation of electrical wiring. Connections must be performed by a State of Connecticut licensed electrician.

- D. If sufficient electrical service is unavailable, the Remediation 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.

- E. Negative pressure must be maintained in each active interior work area where PCB Bulk Product Waste removal is to occur, until the area achieves satisfactory re-occupancy criteria and is approved by the Project Monitor to be deregulated.

- F. Water service may not be available at the site. Remediation Contractor shall supply sufficient water for each shift to operate the decontamination units as well as to maintain the work areas adequately wet.

- G. 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.

- H. 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.

- I. 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 Remediation Contractor for determining the presence and location of all PCB Waste. The Remediation Contractor shall verify all field conditions affecting performance of the work as described in these Specifications in accordance with applicable OSHA, USEPA, USDOT, and CTDEEP standards. Compliance with the applicable requirements is solely the responsibility of the Remediation Contractor.

- J. The PCB Engineer will provide a Project Monitor to oversee the activities of the Remediation Contractor. No PCB abatement work shall be performed until the Project Monitor is on-site.

- K. Shoring, bracing, stabilizing, etc. is the responsibility of the Remediation Contractor. All shoring, bracing, stabilizing, etc of walls, lintels, openings etc. shall be the responsibility of the Remediation Contractor.

3.2 Construction of Interior and Exterior Containments.

A. Containments involving PCB Bulk Product Wastes (≥ 50 PPM PCBs)

Containments for interior and/or exterior abatement work involving ≥ 50 ppm PCBs waste (PCB Bulk Product Waste) shall be constructed in the same manner with the exception of establishment of negative pressure. Interior containments shall require the establishment of negative pressure, while exterior containments shall not require the establishment of negative pressure.

The Remediation 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 Remediation Contractor's Site Supervisor will maintain the Control Areas and escort unauthorized personnel from the area promptly. Only those personnel actively working on the removal, abatement, and/or soil excavation actions will be allowed within the Regulated/Containment Area and they shall be equipped with appropriate Personal Protective Equipment (PPE).

The Remediation 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 Remediation 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 Remediation 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 Remediation Contractor. No worker or other person shall leave a Regulated Area without showering. Shower water shall be collected.

The Remediation 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 Remediation 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 Remediation 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. Where no walls exist (such as exterior work spaces) or a room is to be divided in half, the polyethylene sheeting itself shall comprise the containment structure and shall be supported with materials which will form the containment structure and which shall maintain such integrity throughout the duration of use. For exterior containments, no negative pressure is required; however the containment must be constructed per the above mentioned description.

Conspicuously label and maintain emergency and fire exits from the Regulated Area satisfactory to fire officials.

For interior work areas, the Remediation 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 to establish a negative pressure enclosure (NPE). 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 Remediation 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 Remediation 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 Remediation Contractor shall post warning signs to deter unauthorized personnel from entry. Additional signs may require posting following construction of workplace enclosure barriers.

B. Containments involving CT Regulated Wastes (<50 PPM PCBs)

Containments for interior and/or exterior abatement work involving <50 ppm PCBs waste (CT Regulated Waste) shall be constructed in the same manner.

The Remediation 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 Remediation 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 Remediation 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 CT Regulated Wastes. 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 mono-dispersed 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 Remediation 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 Remediation Contractor shall establish within the Control Area, a remote 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 Remediation Contractor. No worker or other person shall leave a Regulated Area without showering. Shower water shall be collected and disposed of properly by the Remediation Contractor.

The Remediation 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 Remediation Contractor shall install a polyethylene drop cloth, consisting of a minimum of one (1) layer of six (6) mil polyethylene sheeting securing the edges with tape and glue, under the area where removal of CT Regulated PCB Waste is to be performed. If necessary, the Remediation Contractor shall install polyethylene sheeting, consisting of a minimum of one (1) layer of six (6) mil polyethylene sheeting securing the edges with tape and glue, along the sides of the work area to limit the ability of CT Regulated Waste to migrate from the work area.

Conspicuously label and maintain emergency and fire exits from the Regulated Area satisfactory to fire officials.

The Remediation Contractor shall post warning signs to deter unauthorized personnel from entry. Additional signs may require posting following construction of workplace enclosure barriers.

3.3 Personnel Protection

The Remediation Contractor shall utilize all appropriate engineering controls and safety and protective equipment while performing the work in accordance with applicable OSHA, USEPA, USDOT, CTDEEP, CTDPH regulations, and other Contract provisions.

The Remediation 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 and 42 CFR Part 84. A formal respiratory protection program must be implemented in accordance with 29 CFR 1910.134.

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 Remediation 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.

3.4 PCB Abatement Procedures

The Remediation Contractor's Site Supervisor, as the OSHA Competent Person, shall be at the site at all times during the performance of abatement work.

The Remediation 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 as PCB contaminated waste. No one shall eat, drink, smoke, chew gum or tobacco, or apply cosmetics while in a Regulated Area.

Phasing of the work areas is to be coordinated with the Construction Manager. Phase areas may be combined or divided at the direction of the Construction Manager. Proceed through the sequencing of the work phases under the direction of the Construction Manager.

See the PCB Site Remedial Plan and Figures PCB-1 through PCB-8 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 Remediation 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 Remediation Contractor shall employ mechanical methods such as cutting, grinding, and pneumatic hammers to remove PCB contaminated wastes and associated substrates. 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 Remediation

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 Remediation 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 Remediation Contractor is responsible for shoring, stabilizing, bracing, etc. as needed. See applicable section for shoring in the architect's package for shoring procedures and locations where shoring is necessary.

The Remediation 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 Remediation 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 must be placed intact into final waste disposal containers intact and may not be reused by the Remediation Contractor nor can the contents within the drums be emptied inside the final waste disposal container.*** All drums used to handle wastes must not be broken down and must be 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 Remediation 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 Remediation 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 Remediation 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 Remediation 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 Remediation 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 Remediation 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 Remediation 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 Remediation Contractor from the Regulated Area. Negative air filtration devices shall remain in place and operating for the remainder of the clean-up operation.

3.5 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 Remediation 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 Remediation 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 Remediation 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 the PCB Abatement Procedures section 3.1 of this specification.

3.6 Post-Abatement Verification and Re-occupancy Procedures

In areas where PCB Wastes have been removed along with some portion of the porous material substrates, the remedial standard to be achieved by all verification samples of the remaining building substrates is <1 mg/kg total PCBs. If this standard is achieved then additional re-occupancy testing will be performed as described below. If the remedial standard is exceeded, the Remediation Contractor shall be instructed to remove additional building materials as instructed by the Project Monitor.

The Project Monitor shall collect verification samples as per the EPA Standard Operating Procedures for Sampling Porous Surfaces for PCBs, dated May 23, 2011, 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 Remediation Contractor shall expect 48 to 72 hours (these hours do not include weekend and/or holiday hours) delay until analytical results are available.

In areas where federally or non-federally regulated PCB caulks/glazes have been removed and no associated building materials substrate impact has been identified, the remedial standard to be achieved is appropriate cleaning of the substrate such that no visible caulk/glazing residue remains. The Project Monitor shall perform the visual inspection to verify appropriate cleaning.

Following completion of the visual inspections and the collection and analysis of verification samples indicating that remediation goals have been achieved, the Project Monitor shall collect re-occupancy wipe samples of surfaces within the Containment Area at the frequency specified in the approved PCB Site Remedial Plan to determine if the decontamination performed by the Remediation 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 Remediation 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 Remediation Contractor to perform additional decontamination if wipe sample results are $\geq 1.0 \mu\text{g}/100 \text{ cm}^2$. Areas which do not comply shall continue to be cleaned by and at the Remediation Contractor's 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 for interior containment areas where PCBs are greater than 50 ppm). 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 Remediation 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 containment work areas.

3.7 Post Abatement Work Area Deregulation

The Remediation 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 Remediation 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 Remediation Contractor at no additional expense to the Owner.

3.8 Waste Disposal

If the Remediation Contractor chooses to store PCB wastes onsite prior to transport offsite for disposal, the Remediation Contractor shall construct a secured Waste Storage Area at a location agreed to by the Remediation 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 Remediation 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 Remediation 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 **M_L** 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 Remediation 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 Remediation Contractor shall dispose of PCB Bulk Product Waste and PCB Remediation 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), Toxic Substances Control Act (TSCA) and CTDEEP requirements. Materials may be required to be stored on-site and tested by the Project Monitor to determine proper waste disposal requirements.

3.9 Decontamination

The Remediation Contractor shall decontaminate all moveable equipment that contact PCB Wastes in accordance with the procedures specified in §761.79(c). The Remediation Contractor shall not remove any equipment from the Contaminant Zone until it has been properly decontaminated.

Specifically, the Remediation 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 Remediation 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.

3.10 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:

3.10.1 Site Supervisor job log;

3.10.2 Completed waste shipment records.

The Remediation Contractor shall submit the original completed waste shipment records to the PCB Engineer.

3.11 Method of Measurement:

Abatement of PCB Wastes. Payment for the complete abatement, transportation, and disposal of all PCB Wastes shall be based on a lump sum price. No measurement will be made for the abatement work of Federally-regulated and non-Federally regulated PCB Wastes 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 Remediation 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.

The lump sum price for the abatement of all PCB Wastes shall also include providing adequate containers for storage of PCB wastes until they are removed from the site and the transport to, and disposal of these materials at a TSCA-permitted facility. Both federally-regulated and non-federally-regulated PCB wastes will be disposed of at a TSCA-permitted facility. Payment for PCB Bulk Product Waste disposal shall be made when the Remediation Contractor submits manifests signed by the receiving facility documenting the mass of waste disposed and the Certificates of Disposal provided by the waste disposal facility for each manifested load to the PCB Engineer. Once the manifest and Certificate of Disposal have been received, the Owner shall make payment to the Remediation Contractor.

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 lump sum base bid for Abatement of PCB Wastes.

3.12 Unit Price Schedule - Additional or Reduced PCB Abatement

The Remediation Contractor shall use the add/deduct prices presented in Specification Section 01 20 00 Contract Considerations for determining the cost for additional work if required. If additional areas requiring work are found outside of an area that would already require containment, the Remediation Contractor shall use the lump sum base bid price of the containment plus the unit prices for additional 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 unit prices provided.

The unit price 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 are inclusive of all labor, equipment, materials, and overhead and profit. The add/deduct prices include providing adequate containers for storage of PCB wastes until they are removed from the site and the transportation and disposal of PCB wastes at a TSCA-permitted disposal facility. Payment for PCB Bulk Product Waste disposal shall be made when the Remediation Contractor submits manifests signed by the receiving facility documenting the mass of waste disposed and the Certificates of Disposal provided by the waste disposal facility for each manifested load to the PCB Engineer. Once the manifest and Certificate of Disposal have been received, the Owner shall make payment to the Remediation Contractor.

End of Section 028433

SECTION 03 01 30 – CONCRETE RETAINING WALL CLEANING & STAINING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Work included: Provide concrete cleaning and staining of the existing retaining walls in accordance with the Contract Documents. The Work of this Section shall include but not be limited to the following:
 - 1. General: Provide all supervision, labor, materials, equipment and services required to complete the concrete cleaning and staining and related work, as indicated on the drawings, as specified in this section, and as may be required by conditions and authorities.
 - 2. The work includes, but is not limited to:
 - a. Cleaning concrete retaining walls
 - b. Staining concrete retaining walls

1.3 SUBMITTALS

- A. General: Submit the following in accordance with the provisions of the Contracts.
- B. Color: Submit, for approval by the Engineer, a palette of available stain colors.
- C. Test panels:
 - 1. Cleaning: Demonstrate materials and methods to be used for cleaning and condition on sample panel of approximately 25 sq. ft. in area. Begin water cleaning at most gentle pressure, increase as directed by Engineer. Allow waiting period of duration indicated, but not less than 7 calendar days after completion of sample panels for negative reactions. Sample areas shall be located in an inconspicuous location on the retaining wall, as determined by the Engineer.
 - 2. Paint, Graffiti, and Metallic stain removal: Demonstrate materials and methods to be used for paint, graffiti, and stain removal and condition of sample panel 4 sq. ft. in area. The removal method or methods shall be tested on an inconspicuous area of the wall, as determined by the Engineer.
 - 3. The Contractor shall resubmit panels until the Engineer is fully satisfied. No work shall proceed until approval of the mockups. All samples shall be in

locations acceptable to the Engineer and accessible for review by the Engineer. The Engineer will monitor all work. The test area shall be easily accessible to the Engineer.

4. The approved test panels will be covered for the remainder of the work and will represent the minimum acceptable standard for the cleaning and staining.

1.4 QUALITY ASSURANCE

- A. All materials shall be manufactured by a nationally recognized producer of these products and installation shall be in accordance with the manufacturer's current printed recommendations.

1.5 USE OF PREMISES

- A. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the Work is indicated.
 1. Limits: Confine operations to areas indicated on the Drawings.
 2. Access to Site: Keep driveways, sidewalks and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of access routes.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.6 JOB CONDITIONS

- A. Perform all work of this Section following all applicable Federal, State, and Local health, safety, and environmental requirements.
- B. Take all necessary precautions to protect workers, residents, public, and neighbors from the work of this Section.
- C. Staining: Protect base of walls from rain splashed mud by means of coverings spread on ground and over wall surface.
- D. Cold Weather Protection: Do not apply stain when air or concrete temperature is below 40 degrees Fahrenheit or when it is expected to drop below 40 degrees Fahrenheit within 48 hours of the application.
- E. Protection from rain: Protect all stained areas with heavy waterproof sheeting from any direct attack by rain or other precipitation for at least 24 hours after stain has been applied.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.
- B. Store materials at temperatures between 45 and 90 degrees Fahrenheit in a well ventilated area, out of direct sunlight. Protect from freezing.
- C. Comply with health and fire regulations.
- D. Take precautionary measures to prevent fire hazards and spontaneous combustion.
- E. Comply with manufacturer's current specifications.

PART 2 – PRODUCTS

2.1 CLEANER

- A. Wall Cleaner
 - 1. PROSOCO Light Duty Restoration Cleaner, or approved equal.
- B. Water: Water shall be clean, potable, and free of amounts of oils, acids, alkalis, salts, organic materials or other substances that may be deleterious to mortar, masonry units, or any metal in the walls.

2.2 STAIN

- A. Wall Stain
 - 1. LITHOCHROME Chemstain Classic, or approved equal.

PART 3 – EXECUTION

3.1 CLEANING AND STAIN REMOVAL

- A. General
 - 1. Proceed with cleaning in an orderly manner.
 - 2. Use only those cleaning methods indicated.
 - 3. Perform each cleaning method indicated in a manner which results in uniform coverage of all surfaces and which produces an even effect without streaking or damage to concrete surfaces.
 - 4. Rinse off chemical residue and soil working upwards from bottom to top of each treated area at each stage.

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5. Removal of Plant Growth: Remove plant, moss and shrub growth completely from masonry surfaces. Carefully remove plants, creepers and vegetation by cutting at roots and allowing to dry as long as possible prior to removal. Remove loose soil or debris from open masonry joints to whatever depth it occurs.

B. Inspection

1. Before starting any work of this section, the Contractor shall make a complete inspection of all concrete and appurtenances to identify and confirm all surfaces to be cleaned and all areas that will require special care in cleaning, or are too fragile to clean.
2. Prior to cleaning, determine degree of cleaning to be carried out and review areas requiring additional treatment with the Engineer.

C. Preparation

1. Dry brush any areas with loose dirt or soil, or extreme dirt build up, to remove as much material as possible, prior to wet cleaning.

D. Cleaning

1. Cleaning shall begin at the bottom of the wall and slowly and continuously progress up the wall applying an even coat.
2. Thoroughly wet surfaces prior to application of cleaning agent. Wet surfaces with low pressure water spray. Surfaces should not be allowed to dry prior to application of cleaning agents.
3. To avoid streaking on walls, all wall surfaces immediately below the area being cleaned shall be kept wet and rinsed free of dripping cleaning agent.
4. Application of cleaning agent
 - a. Apply in strict accordance with manufacturer's written instructions.
 - b. Pre-wet surface.
 - c. Brush, spray, or roller apply by the method and in the concentration approved by the Engineer, to the pre wet surface. Cleaning agent shall not be applied with a high pressure spray.
 - d. Allow cleaning agent to dwell on surfaces for the time period determined during testing and approved by the Engineer. Adjustments to dwell time may be made to accommodate changes in ambient temperature, degree of soiling, or other as yet undetermined conditions.
 - e. Agitate cleaner by stippling with a natural bristle brush during the dwell period in a manner predetermined during the testing process.
 - f. Do not allow cleaning agent to dry on surface under any circumstances.
 - g. Reapply cleaning agent as necessary but not to exceed three (3) applications.

5. Rinsing

- a. Thoroughly rinse surfaces of all cleaning agents as approved by the Engineer. Use clean water. Rinse from the bottom of the cleaned area up to the top and down again. Rinse areas adjacent to the cleaned areas as well.
- b. Rinsing shall be confined to the work area. Necessary protective measures shall be employed to confine water spray.
- c. Rinse until the wet masonry surface is of the same pH as the rinse water. Surfaces shall be tested with pH strips.

E. Completion

1. If used, remove all backer rod after final rinsing.
2. Remove any temporary protection after the Engineer's written direction has been received.

3.2 Staining

A. Preparation

1. Examine the areas and conditions under which work of this Section will be performed. All surfaces must be clean and structurally sound.

B. Application of stain

1. Apply in strict accordance with manufacturer's written instructions.
2. Brush, spray, or roller apply by the method and in the concentration approved by the Engineer. Application must be made in an even, saturating manner. Stain shall not be applied with a high pressure spray.
3. Avoid excessive run down, draping, or overlapping.
4. Protect shrubbery and glass from overspray.
5. Rate of application, number of coats and method of application shall be consistent with approved test panel.
6. Protect stained surfaces until sufficiently dry; and not less than time recommended by manufacturer or determined by test panel.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Suspended slabs.
 - 5. Concrete toppings.
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.
 - 2. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

- D. Samples: For vapor retarder.
- E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- F. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Waterstops.
 - 6. Curing compounds.
 - 7. Bonding agents.
 - 8. Adhesives.
 - 9. Vapor retarders.
 - 10. Joint-filler strips.
 - 11. Repair materials.
- G. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.
- H. Field quality-control test and inspection reports.
- I. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. 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."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency

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laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete,"
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

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. Products: Subject to compliance with requirements, provide one of the products specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 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.
 - 1. Plywood, metal, or other approved panel materials.
- 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.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from galvanized steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. 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 CRSI Class 1 plastic-protected steel wire according to CRSI's "Manual of Standard Practice".

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 - B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: 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. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

1. Products:
 - a. Boral Material Technologies, Inc.; Boral BCN.
 - b. Euclid Chemical Company (The); Eucon CIA.
 - c. Grace Construction Products, W. R. Grace & Co.; DCI.
 - d. Sika Corporation; Sika CNI.

- D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
 1. Products:
 - a. Boral Material Technologies, Inc.; Boral BCN2.
 - b. Grace Construction Products, W. R. Grace & Co.; DCI-S.
 - c. Sika Corporation; FerroGard-901.

2.7 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
 1. Products:
 - a. Colloid Environmental Technologies Company; Volclay Waterstop-RX.

2.8 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 1. Products:
 - a. Stego Industries, LLC; Stego Wrap, 15 mils

- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 1. Products:
 - a. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
 - b. Dayton Superior Corporation; Sure Film.

- c. Euclid Chemical Company (The); Eucobar.
 - d. Sika Corporation, Inc.; SikaFilm.
- 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, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- 1. Products:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - b. Burke by Edoco; Aqua Resin Cure.
 - c. ChemMasters; Safe-Cure Clear.
 - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - f. Euclid Chemical Company (The); Kurez DR VOX.
 - g. Kaufman Products, Inc.; Thinfilm 420.
 - h. Lambert Corporation; Aqua Kure-Clear.
 - i. L&M Construction Chemicals, Inc.; L&M Cure R.
 - j. Meadows, W. R., Inc.; 1100 Clear.
 - k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
 - l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
 - m. Tamms Industries, Inc.; Horncure WB 30.
 - n. Unitex; Hydro Cure 309.
 - o. US Mix Products Company; US Spec Maxcure Resin Clear.
 - p. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- 1. Products:
 - a. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
 - b. Dayton Superior Corporation; Safe Cure and Seal (J-18).
 - c. Euclid Chemical Company (The); Aqua Cure VOX.

2.10 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.

- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Reglets: Fabricate reglets of not less than 0.0217-inch- thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- E. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 25 percent.
 2. For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
- E. Maximum Water-Cementitious Materials Ratio: 0.40 for corrosion protection of steel reinforcement in concrete exposed to chlorides from deicing chemicals, salt, saltwater, brackish water, seawater, or spray from these sources.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings and Foundation Walls: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: per general structural notes on drawings.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
- B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: per general structural notes on drawings.
 2. Maximum Water-Cementitious Materials Ratio: 0.45 typical, except 0.40 for exterior slabs on grade.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
 5. See general structural notes on drawings for Barrier-1 admixture for slabs.
- C. Suspended Slabs on metal deck: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: per general structural notes on drawings.

2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

D. Concrete Toppings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: Do not allow air content of troweled finished toppings to exceed 3 percent.

2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, 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.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

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.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
- B. Granular Course: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch. Fine graded granular material must be protected from getting wet before the slab concrete is placed.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 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.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.7 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. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. 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. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

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3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 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, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 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.
1. Apply to concrete surfaces not exposed to public view.
- 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.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.
- 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.
- 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.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.
1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces indicated exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

- a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.11 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. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after

loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. 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 with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 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.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..
 - 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.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 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.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's

written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
1. Steel reinforcement placement.
 2. Headed bolts and studs.
 3. Verification of use of required design mixture.
 4. Concrete placement, including conveying and depositing.
 5. Curing procedures and maintenance of curing temperature.
 6. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

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2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

**SECTION 033000
CAST-IN-PLACE CONCRETE**

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- D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION 033000

SECTION 03 30 01 - PORTLAND CEMENT CONCRETE (SITE)

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.
- B. “Form 816” shall mean the State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 816-2004 or its latest edition and any supplemental specifications.

1.2 SUMMARY

- A. This Section includes specifications for cast-in-place and precast concrete.

1.3 RELATED SECTIONS

- A. Section 32 12 13 Portland Cement Concrete Pavement and Curb

1.4 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.5 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For concrete pavement mix.
- C. Material Test Reports: Submit material test results in compliance with the General Requirements for Special Inspections, for specified materials.
- D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Steel reinforcement and reinforcement accessories.

3. Admixtures.
4. Curing compounds.
5. Applied finish materials (i.e., traffic paint).
6. Joint fillers.

1.6 QUALITY ASSURANCE, CAST IN PLACE CONCRETE

- A. Materials and methods of construction shall comply with the following standards:
 1. American Society for Testing and Materials (ASTM)
 2. American Concrete Institute (ACI)
 3. State of Connecticut DOT Standard Specifications (DOT Form 816 - 2004)
- B. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source. Do not change source of brands of cement, aggregate materials, or batching plant during course of work.
- E. ACI Publications: Comply with all ACI requirements unless modified by the requirements of the Contract Documents.

1.7 QUALITY ASSURANCE, PRE-CAST CONCRETE

- A. Fabricator Qualifications: A firm that complies with the following requirements and is experienced in manufacturing precast structural concrete units similar to those indicated for this Project and with a record of successful in-service performance.
 1. Assumes responsibility for engineering precast structural concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings by a qualified professional engineer.
 2. 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 precast structural concrete that are similar to those indicated for this Project in material, design, and extent.

3. Participates in PCI's Plant Certification program and is designated a PCI-certified plant.
 4. Source Limitations: Obtain precast concrete light pole foundations through one source from a single manufacturer.
- B. Design Standards: Comply with **ACI 318** and the design recommendations of PCI MNL 120, "PCI Design Handbook—Precast and Prestressed Concrete."
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of precast concrete units and are based on the specific types of units indicated. Other fabricators' precast concrete units complying with requirements may be considered.

PART 2 – PRODUCTS

2.1 FORMS

- A. Conform to Article 8.11.03-3 and 9.21.03-3 of Conn DOT Form 816, latest revision.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 REINFORCING MATERIALS:

- A. Reinforcing Bars and Tie Bars: ASTM A 615, Grade 60, deformed, galvanized or epoxy coated.
- B. Plain, Cold-Drawn Steel Wire: ASTM A 82, galvanized or epoxy coated.
- C. Steel Welded Wire Fabric: ASTM A 185, galvanized or epoxy coated.
- D. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs, galvanized or epoxy coated.
- E. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar-type supports complying with CRSI specifications.

1. Use supports with sand plates or horizontal runners where base material will not support chair leg.

- F. Bending: All reinforcement shall be bent cold. Only competent mechanics shall be employed for cutting and bending, and proper appliances shall be provided for such work. The reinforcement shall be bent to the shapes shown on the plans. Bends for stirrups and ties shall be made around a pin having a diameter not less than two times the minimum thickness of the bar. Bends for other bars shall be made around a pin having a diameter not less than six times the minimum thickness of the bar, except that for bar larger than one inch the pin shall not be less than eight times the minimum thickness of the bar. Reinforcement shall be formed to the dimensions indicated on the plans before it is embedded in the concrete.

- G. Splices: All Splicing shall be as specified in American Concrete Institute (ACI) Building Code.

- H. Placing and Fastening: Placing and Fastening shall be as specified in ACI Standards. Before any concrete is placed, all mortar shall be cleaned from the reinforcement. No concrete shall be poured until the Engineer has inspected the placing of the reinforcing metal and permission to place concrete is granted. All concrete placed in violation of this provision shall be rejected and removed.

- G. Epoxy coated bar reinforcement shall conform to Form 816 and the requirements of ASTM A 615M, Grade 420 and shall be epoxy coated to the requirements of ASTM D 3963/D 3963M.

- H. Galvanized bar reinforcement shall conform to Form 816 and the requirements of ASTM A 615/A 615M, Grade 60, (420) and be galvanized, after fabrication, to the requirements of ASTM 767/A *767M, Class 1, including supplemental requirements. Dowels and tie bars for masonry facing and for granite curbing shall be galvanized, after fabrication, in accordance with ASTM A 706/A 706M.

2.3 CONCRETE MATERIALS

- A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

- B. Concrete: Conform to the requirements of Form 816-2004, Article M.03.01, Class "A" "C" or "F" and ASTM C-94. Batch mixing at project site not acceptable.

- C. Compressive strength: Min. 3,000 psi at 28 days unless otherwise noted on the Plans.

- D. Entrained air: 4 to 6%.

- E. Reactive aggregates and calcium chloride are not allowed.

- F. Water: Potable.

2.4 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

2.5 CURING MATERIALS

- A. Conform to Article 4.01.03, Item F7 "Curing", Form 816-2004.

2.6 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
 - 1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.7 CONCRETE MIX

- A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301. Contractor to submit design mixes to Engineer for approval.
- B. Proportion mixes to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28-Day): Min. 3000 psi or as shown on Plans.
 - 2. Slump Limit at Point of Placement: 2 to 4 inches.
 - 3. Air Entrainment of Between 4-6%. Air entrainment agent shall conform to ASTM C260.
- C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

2.8 EXPANSIONS JOINTS

- A. Premolded joint filler: ASTM D-994, premolded, resilient, non-extruding, joint filler, as distributed by A. H. Harris, New Britain, CT or approved equal.
 - 1. Expansion joint filler shall be preformed bituminous cellular type conforming to the requirements of ASHTO M213.
 - 2. Thickness: as indicated on the drawings.
 - 3. Depth: to match concrete section

- B. Joint Sealer (for non-colored concrete): Two component polyurethane elastomeric type complying with FS-TT-S-00227, self-leveling, designed for foot traffic, as manufactured by SIKA, Pecora, or approved equal.
 - 1. Color to match finished/cured concrete. Final color to be approved by Engineer.
 - 2. Provide backer rod and primer per manufacturer recommendation.

2.9 RELATED MATERIALS

- A. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.

- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Epoxy Adhesive:
 - a. Burke Epoxy M.V.; The Burke Co.
 - b. Resi-Bond (J-58); Dayton Superior.
 - c. Euco Epoxy System #452 or #620; Euclid Chemical Co.
 - d. Concesive Standard Liquid; Master Builders, Inc.
 - e. Rezi-Weld 1000; W.R. Meadows, Inc.
 - f. Sikadur 32 Hi-Mod; Sika Corp.
 - g. R-600 Series; Symons Corp.

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Do not begin concrete work until such conditions have been corrected and are ready to receive concrete.
- B. Remove loose material from compacted subbase surface and excavations immediately before placing concrete. Comply with Section 31 23 16 Earthwork for construction of base and subbase material.

3.2 FORMS

- A. Set, brace, and secure forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 72 hours after concrete placement.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in 10 feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.
- D. Form recess to receive brick facing masonry in exposed ramp wall as detailed in the Drawings.

3.3 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 JOINTS

- A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.

- B. Contraction Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as shown on Drawings. Construct contraction joints for a depth equal to at least $\frac{1}{4}$ of the concrete thickness, as follows:
 - 1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
 - 2. Inserts: Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.

- C. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 2 hours, unless paving terminates at isolation joints.
 - 1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless indicated otherwise. Embed keys at least 1-1/2 inches into concrete.
 - 2. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
 - 3. Provide tie bars at sides of paving strips where indicated.
 - 4. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

- D. Isolation Joints: Form isolation joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 20 feet, unless indicated otherwise.
 - 2. Extend joint fillers full width and depth of joint, not less than 2 inch or more than 1 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.

3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- E. Installation of joint fillers and sealants shall conform applicable sections of Form 816.
- F. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one half of dowel length to prevent concrete bonding to one side of joint.

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcing before placing concrete. Do not place concrete on surfaces that are frozen.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
 1. When concrete placing is interrupted for more than 2 hours, place a construction joint.
- E. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- F. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.
- G. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.

- H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Engineer.
- I. Curbs and Gutters: Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete.
- J. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- K. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
 - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg 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 water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 - 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

- A. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of ¼ inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across concrete sidewalk surface perpendicular to line of traffic to provide a uniform fine line texture finish.
- B. Final Tooling: Radius: 3/8 inch. Tool edges of paving, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
- C. Rubbed Finish: Conform to Form 816, Article 6.01.03.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by curing compound, as follows:
 1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 FIELD QUALITY CONTROL TESTING

- A. Contractor shall coordinate field quality control testing with Owner employed independent testing and inspection agency representatives hired to sample materials, perform tests, and submit test reports during concrete placement per the General Requirements for Special Inspections. Contractor may test sample material at their own expense as they deem necessary.
- B. Item deleted.
 1. Item deleted.
 2. Item deleted.
 3. Item deleted.
 4. Item deleted.
 5. Item deleted.

- B. Test results will be reported in writing to the Engineer, concrete manufacturer, and Contractor within 24 hours of testing. Reports shall comply with the General Requirements for Special Inspections. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in paving, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day and 28-day tests.

3.9 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.
- B. Drill test cores where directed by the Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

3.10 PROTECTION/CLEAN-UP

- A. Protect work completed until acceptance of project. Replace or repair concrete if damaged prior to acceptance. As work proceeds, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris related to this work.

END OF SECTION

SECTION 034100 - PRECAST STRUCTURAL CONCRETE

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 plant-precast structural concrete units, including the following:
 - 1. Hollow-core slab units.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide precast structural concrete units and connections capable of withstanding design loads within limits and under conditions indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixes: For each concrete mix.
- C. Shop Drawings: Detail fabrication and installation of precast structural concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, openings, and types of reinforcement, including special reinforcement.
 - 1. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, inserts, connections, and joints, including accessories.
 - 2. Indicate locations and details of anchorage devices to be embedded in other construction.
 - 3. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation. Analysis shall include design and detailing of embedded steel items to resist the design loads.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed precast structural concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

- B. Fabricator Qualifications: A firm that complies with the following requirements and is experienced in manufacturing precast structural concrete units similar to those indicated for this Project and with a record of successful in-service performance.
1. Assumes responsibility for engineering precast structural concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 2. 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 precast structural concrete that are similar to those indicated for this Project in material, design, and extent.
 3. Participates in PCI's Plant Certification program and is designated a PCI-certified plant.
 4. Has sufficient production capacity to produce required units without delaying the Work.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- D. Design Standards: Comply with ACI 318 (ACI 318M) and the design recommendations of PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."
- E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and camber and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products."
- F. Product Options: Drawings indicate size, profiles, and dimensional requirements of precast concrete units and are based on the specific types of units indicated. Other fabricators' precast concrete units complying with requirements may be considered. Refer to Division 1 Section "Substitutions."
- G. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- H. Fire-Test-Response Characteristics: Provide precast structural concrete units that comply with the following requirements:
1. Fire-response testing was performed by UL, ITS, or another testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services. The required fire rating is shown on the architectural drawing code sheets.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver precast structural concrete units to Project site in such quantities and at such times to ensure continuity of installation. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.

- B. Lift and support units only at designated lifting and supporting points as shown on Shop Drawings.

1.7 SEQUENCING

- A. Furnish anchorage items to be embedded in other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from galvanized steel wire into flat sheets.
- C. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to CRSI's "Manual of Standard Practice," PCI MNL 116, and as follows:
 - 1. For uncoated reinforcement, use CRSI Class 1 plastic-protected bar supports.

2.2 PRESTRESSING TENDONS

- A. Prestressing Strand: ASTM A 416/A 416M, Grade 250 or 270 (Grade 1725 or 1860), uncoated, 7-wire, low-relaxation strand.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III, of same type, brand, and source.
- B. Lightweight Aggregates: ASTM C 330.
- C. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.
- D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- E. Water-Reducing Admixture: ASTM C 494, Type A.
- F. Retarding Admixture: ASTM C 494, Type B.
- G. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

- H. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- I. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
- J. Plasticizing Admixture: ASTM C 1017.
- K. Fly Ash Admixture: ASTM C 618, Class C or F.
- L. Silica Fume Admixture: ASTM C 1240.

2.4 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
- B. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
- C. Finish: All embedded steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M, after fabrication, and ASTM A 153/A 153M, as applicable.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.
- D. Welding Electrodes: Comply with AWS standards.
- E. Accessories: Provide clips, hangers, plastic shims, and other accessories required to install precast structural concrete units.

2.5 BEARING PADS

- A. Provide bearing pads for precast structural concrete units as follows:
 - 1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer, minimum tensile strength 2250 psi (15.5 MPa) per ASTM D 412.
 - 2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer.
 - 3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer. Surface hardness of 80 to 100 Shore A durometer.
 - 4. Frictionless Pads: Tetrafluoroethylene, glass-fiber reinforced, bonded to mild-steel plate, of type required for in-service stress.
 - 5. Hardboard: AHA A135.4, Class 1, tempered hardboard strips, smooth on both sides.
 - 6. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.6 GROUT MATERIALS

- A. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application.

2.7 CONCRETE MIXES

- A. Prepare design mixes for each type of concrete required.
 - 1. Limit use of fly ash and silica fume to not exceed, in aggregate, 25 percent of portland cement by weight.
- B. Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.
- C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318 (ACI 318M).
- D. Normal-Weight Concrete Mixtures: Proportion face and backup mixtures or full-depth mixtures, at fabricator's option 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): 4000 psi (34.5 MPa).
 - 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 116.
- F. Other Admixtures: Use water-reducing, high-range water-reducing, water-reducing and accelerating, or water-reducing and retarding admixtures according to manufacturer's written instructions.
- G. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.8 FABRICATION

- A. Formwork: Accurately construct forms, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for pretensioning and detensioning operations. Maintain formwork to provide completed precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances.
 - 1. Coat surfaces of forms with bond-breaking compound before reinforcement is placed. Provide commercial-formula, form-coating compounds that will not bond with, stain, or

- adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's written instructions.
2. Unless forms for precast, prestressed concrete units are stripped before detensioning, design forms so stresses are not induced in precast concrete units because of deformation or movement of concrete during detensioning.
- B. Built-in Anchorages: Accurately position built-in anchorage devices and secure to formwork. Locate anchorages where they do not affect position of main reinforcement or concrete placement. Do not relocate bearing plates in units unless approved by Architect.
- C. Cast-in openings larger than 8 inches (250 mm) in diameter or 8 inches (250 mm) square according to Shop Drawings. Smaller holes may be field cut by trades requiring them, as approved by Architect.
- D. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" 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.
 2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete-placement operations. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
 3. Place reinforcement to obtain at least the minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
 4. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Prestress tendons for precast structural concrete units by either pretensioning or posttensioning methods. Comply with PCI MNL 116.
1. Delay detensioning until concrete has reached at least 70 percent of its compressive strength as established by test cylinders cured under the same conditions as concrete.
 2. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
 3. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat-cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
- F. Mix concrete according to PCI MNL 116 and requirements in this Section. After concrete batching, no additional water may be added.
- G. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 116 for measuring, mixing, transporting, and placing concrete.

- H. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 116.
- I. Comply with ACI 306.1 procedures for cold-weather concrete placement.
- J. Comply with ACI 305R recommendations for hot-weather concrete placement.
- K. Identify pickup points of precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint casting date on each precast concrete unit on a surface that will not show in finished structure.
- L. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.
- M. Product Tolerances: Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product tolerances.
- N. Finish formed surfaces of precast structural concrete which are exposed to view for each type of unit, and as follows (see architectural plans, sections and details for complete understanding of where precast concrete surfaces are exposed to view):
 - 1. Grade A Finish: Fill air pockets and holes larger than 1/8 inch in diameter with sand-cement paste matching color of precast concrete. Grind smooth form offsets or fins larger than 1/8 inch. Float-apply a neat cement-paste coating to exposed surfaces. Rub dried paste coat with burlap to remove loose particles.

2.9 HOLLOW-CORE SLAB UNITS

- A. Type: Precast, prestressed concrete units with open, hollow cores running the full length of the slab units.
- B. Furnish units free of voids and honeycombs.
- C. Reinforce units to resist transportation and erection stresses.
- D. Include cast-in weld plates where required.
- E. Coordinate with other trades for installation of cast-in items.
- F. Provide solid, monolithic, precast concrete slab units forming an integral part of hollow-core slab unit system. Design and fabricate solid units to dimensions and details indicated for hollow-core slab units.
- G. Provide headers of cast-in-place concrete or structural-steel shapes for openings larger than one slab width according to hollow-core slab unit fabricator's written recommendations.

2.10 SOURCE QUALITY CONTROL

- A. Owner will employ an independent testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.
 - 1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixes as may be requested for additional testing and evaluation.
- B. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements.
- C. Strength of precast concrete units will be considered deficient if units fail to comply with PCI MNL 116 requirements, including the following:
 - 1. Units fail to comply with compressive-strength test requirements.
 - 2. Reinforcement and prestressed tendons of units do not comply with fabrication requirements.
 - 3. Concrete curing and protection of units against extremes in temperature fail to comply with requirements.
 - 4. Units are damaged during handling and erecting.
- D. Testing: If there is evidence that the strength of precast concrete units may be deficient or may not comply with PCI MNL 116 requirements, Owner will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42.
 - 1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.
 - 2. Cores will be tested, after immersion in water, in a wet condition per ACI 301 if units will be wet under service conditions.
 - 3. Cores will be tested in an air-dry condition per ACI 301 if units will be dry under service conditions.
 - 4. Strength of concrete for each series of 3 cores will be considered satisfactory if the average compressive strength is equal to at least 85 percent of the 28-day design compressive strength and no single core is less than 75 percent of the 28-day design compressive strength.
 - 5. Test results will be made in writing on the same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:
 - a. Project identification name and number.
 - b. Date when tests were performed.
 - c. Name of precast concrete fabricator.
 - d. Name of concrete testing agency.
 - e. Identification letter, name, and type of precast concrete unit or units represented by core tests; design compressive strength; type of break; compressive strength at break, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

- E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mix that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
- F. Dimensional Tolerances: Units with dimensions smaller or larger than required and not complying with tolerance limits may be subject to additional testing.
 - 1. Precast concrete units with dimensions larger than required will be rejected if the appearance or function of the structure is adversely affected or if larger dimensions interfere with other construction. Repair or remove and replace rejected units, as required, to comply with construction conditions.
- G. Defective Work: Precast concrete units that do not comply with requirements, including strength, manufacturing tolerances, and finishes, are unacceptable. Replace with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Bearing Pads: Install bearing pads as precast concrete units are being erected. Set pads on true, level, and uniform bearing surfaces and maintain in correct position until precast concrete units are placed.
- B. Install precast structural concrete. Shore and brace precast concrete units to maintain location, stability, and alignment until permanent connections are installed.
- C. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.
 - 1. Protect precast concrete units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
 - 2. Repair damaged metal surfaces by cleaning and applying a coat of galvanized repair paint to galvanized surfaces.
 - 3. Repair damaged metal surfaces by cleaning and repriming damaged painted surfaces.
- D. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units unless approved by Architect.

- E. Erection Tolerances: Install precast concrete units level, plumb, square, and true, without exceeding the recommended erection tolerances in PCI MNL 127, "Recommended Practice for Erection of Precast Concrete."
- F. Grouting Connections and Joints: After precast concrete units have been placed and secured, grout open spaces at keyways, connections, and joints as follows:
 - 1. Provide forms or other approved method to retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it hardens.

3.3 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- B. Field welds and connections using high-strength bolts will be subject to tests and inspections.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.4 CLEANING

- A. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains.
 - 1. Wash and rinse according to precast concrete fabricator's written recommendations. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.

END OF SECTION 034100

SECTION 03 45 00 - PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes precast architectural concrete units.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide precast architectural concrete units and connections capable of withstanding design loads within limits and under conditions indicated.

1.3 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Design Mixes: For each concrete mix.
- C. Shop Drawings: Detail fabrication and installation of precast architectural concrete units. Indicate member locations, plans, elevations, dimensions, shapes, cross sections, limits of each finish, and types of reinforcement, including special reinforcement.
 - 1. Comprehensive engineering analysis certified by the qualified professional engineer responsible for its preparation.
- D. Samples: For each type of finish, in sets of 3, 12 by 12 by 2 inches (300 by 300 by 50 mm).
- E. Welding certificates.
- F. Material certificates.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator who assumes responsibility for engineering precast architectural concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
 - 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
- B. Design Standards: Comply with ACI 318 (ACI 318M) and the design recommendations in PCI MNL 120, "PCI Design Handbook--Precast and Prestressed Concrete."

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PRECAST ARCHITECTURAL CONCRETE

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- C. Quality-Control Standard: Comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
- D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- E. Sample Panels: Produce a minimum of 3 sets of full-scale sample panels, approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high, to demonstrate range of finish, color, and texture variations of approved samples.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store units at Project site to prevent cracking, distorting, warping, staining, or other physical damage, and so markings are visible.
- B. Lift and support units only at designated lifting and supporting points shown on Shop Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Reinforcing:

1. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
2. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
3. Plain-Steel Wire: ASTM A 82, as drawn.
4. Deformed-Steel Wire: ASTM A 496.
5. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
6. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
7. Supports: Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to PCI MNL 117.
8. Prestressing Strand: ASTM A 416/A 416M, Grade 250 or 270 (Grade 1725 or 1860), uncoated, 7-wire, low-relaxation strand.

B. Concrete:

1. Portland Cement: ASTM C 150, Type I or Type III, white, of same type, brand, and source.
2. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S.
3. Coloring Admixture: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures, temperature stable, nonfading, and alkali resistant.
4. Air-Entraining Admixture: ASTM C 260.
5. Fly Ash Admixture: ASTM C 618, Class C or F.
6. Metakaolin Admixture: ASTM C 618, Class N.
7. Silica Fume Admixture: ASTM C 1240.

- C. Steel Connections:
 - 1. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.
- D. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

2.2 CONCRETE MIXES

- A. Normal-Weight Concrete Face and Backup Mixes: Proportion mixes 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 (34.5 MPa).
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
- B. Water Absorption: 12 to 14 percent by volume, tested according to PCI MNL 117.
- C. 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.

2.3 FABRICATION

- A. Anchorage Hardware: Fabricate with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations.
- B. Furnish loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast architectural concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in precast architectural concrete units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.
- D. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 117 for fabricating, placing, and supporting reinforcement.
- E. Reinforce precast architectural concrete units to resist handling, transportation, and erection stresses.
- F. Prestress tendons for precast architectural concrete units by either pretensioning or posttensioning methods. Comply with PCI MNL 117.
- G. Mix concrete according to PCI MNL 117 and requirements in this Section. After concrete batching, no additional water may be added.

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- H. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 117 for measuring, mixing, transporting, and placing concrete.
- I. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 117.
- J. Comply with ACI 306.1 procedures for cold-weather concrete placement.
- K. Comply with ACI 305R recommendations for hot-weather concrete placement.
- L. Identify pickup points of precast architectural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast architectural concrete unit on a surface that will not show in finished structure.
- M. 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.
- N. Discard precast architectural concrete units that are warped, cracked, broken, spalled, stained, or otherwise defective unless repairs are approved by Architect.
- O. Fabricate precast architectural 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.

2.4 FINISHES

- A. Finish exposed-face surfaces of precast architectural concrete units to match approved design reference sample and as follows:
 - 1. PCI and APA's "Architectural Precast Concrete--Color and Texture Selection Guide," of plate numbers indicated.
 - 2. Smooth-Surface Finish: Free of pockets, sand streaks, and honeycombs, with uniform color and texture.
- B. Finish exposed surfaces of precast architectural concrete units to match face-surface finish.

2.5 SOURCE QUALITY CONTROL

- A. Owner will employ an independent testing agency to evaluate precast architectural concrete fabricator's quality-control and testing methods.
- B. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install precast concrete units until supporting cast-in-place building structural framing has attained minimum allowable design compressive strength or supporting steel or other structure is complete.

3.2 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.
- B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
 - 1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
 - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
 - 4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch (19 mm).
- C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
 - 1. Do not permit connections to disrupt continuity of roof flashing.
- D. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
 - 1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

END OF SECTION 03 45 00

PART 1 – GENERAL

1.01 SUMMARY

- A. This section includes the following:
 - 1. All labor, materials, tools, equipment and service for all concrete sealer/densifier/hardener application as indicated in the contract documents.
 - 2. Complete coordination with all other trades as required.
 - 3. Furnish and install all miscellaneous items, appurtenances and devices incidental to, or necessary for a sound, secure, and complete installation.

- B. Related Sections:
 - 1. Division 3 Section: Cast in Place Concrete
 - 2. Division 3 Section: Portland Cement Concrete (Site)
 - 3. Division 3 Section: Self Leveling Underlayment

1.02 SYSTEM

- A. Description: A sealer/densifier/hardener that will react with concrete surfaces to produce a dense, hydrophobic, insoluble, moisture barrier to seal out contaminants, while hardening and densifying the surface.
- B. Location of work: As indicated in the Room Finish schedule and notes on the contract drawings.

1.03 REFERENCES AND QUALITY ASSURANCE

- A. References:
 - 1. Corps of Engineers Spec: CEGS 03300 4-79
 - 2. USDA approved
 - 3. Dept. of Navy, GSA, VA approved

- B. Design criteria:
 - 1. AC1 302 Class 1 through 4 concrete floors.
 - 2. Maybe used on Class 5 and 6 floors when used with mineral or metallic aggregate hardeners and toppings, and Class 9, Super-flat floors.
 - 3. Complies with all Federal and State VOC requirements
 - 4. Independent Test Data, ASTM C779, Procedure A, reduction of surface abrasion by 50% or more at the 30 minute time interval.

- C. Applicator qualifications:
 - 1. Applicator must be approved in writing by manufacturer.

1.04 SUBMITTALS

- A. Division 1 Section: Submission Procedures
- B. Product Data: Provide complete product data and properties for Densifier/Sealer/Hardener.
- C. Samples:
 - 1. Provide samples for verification of finish, and color
 - 2. Provide certificate of rate of application
 - 3. Provide product and field test reports
- D. Qualification Data: Provide installer's qualification data.
- E. Warranty: Signed 10 year warranty as specified in this section.

1.05 DELIVERY, STORAGE AN HANDLING

- A. Deliver to jobsite in sealed, labeled container.
- B. Store and handle to prevent damage to product and environment

1.06 JOB CONDITIONS

- A. Existing conditions, prior to installation;
 - 1. Assure concrete has been cured a minimum of 3 days.
 - 2. Assure concrete is clean and free of membrane forming curing compounds and/or other sealers.
 - 3. Assure concrete is free of laitance, grease, oil and contaminants
- B. Environmental requirements
 - 1. Comply with all VOC and EPA requirements.
- C. Protection
 - 1. Protect adjacent surfaces/areas from damage due to over spray; especially glass and painted surfaces.
 - 2. Comply with 1.06.A above.

1.07 PRE-INSTALLATION MEETING

- A. At the Architects' request, technical personnel shall be available for a pre-job conference to review installation procedures.

1.08 WARRANTY

- A. Written warranty signed jointly by applicator, manufacturer and contractor.
- B. Warrant installation for a period of 10 years from date of substantial completion against dusting from abrasion.

PART 2 – PRODUCTS

2.01 CONCRETE SEALER/DENSIFIER/HARDENER

- A. Basis of Design - Manufacturer: L & M Construction Chemicals, Inc., 14851 Calhoun Road, Omaha, NE 68152 (800-362-3331).
 - 1. Basis of Design - Product:
 - a. Base: SEAL HARD; a solution of 100% active ingredient chemicals which penetrate concrete to seal, densify, dustproof and harden to resist water and oil penetration, and contamination.
Active ingredients: 100%
Type: Alkali Siliconate
Flash Point: None
Specific Gravity: 1.155
VOC: gm/L: 0
Solids minimum: 30%
- B. Substitution for the above-specified manufacturer/product will be allowed as defined in Division 1.

PART 3 – EXECUTION

3.01 PRE-INSTALLATION INSPECTION

- A. Assure surfaces are clean and free of all contaminants, and any film forming curing compounds or sealers.
- B. Assure concrete has been cured a minimum of 3 days before application.
- C. Protect concrete from construction activity staining.

3.02 APPLICATION

- A. Apply in accord with manufacturer's instructions.
 - 1. Apply directly from sealer container onto prepared surfaces, undiluted.
 - 2. Application equipment: Mechanical "walk-behind" or riding scrubber.
 - 3. Apply at minimum rate of 1 gallon per 150-200 sq. ft.
 - 4. Allow surfaces to remain wet with sealer for 30-60 minutes.
 - 5. Remove excess sealer at end of application procedure by water flushing and then squeegee dry.
 - 6. Apply 2 coats to porous or rough concrete surfaces.
 - 7. Apply 2 coats to floor areas that will be exposed to frequent oil spills.

3.03 FIELD QUALITY CONTROL

- A. Have applicator certify rate of application.

3.04 CLEANING

- A. Leave area broom clean.

END OF SECTION 03 53 19

SECTION 03 54 00 – SELF LEVELING UNDERLAYMENT

PART I – GENERAL

1.01 SUMMARY

- A. Self-Drying, Self-Leveling Cementitious Topping for fast-track resurfacing, smoothing, or leveling of indoor concrete.

1.02 SECTION INCLUDES

- A. Self-Drying, Self-Leveling Concrete Topping.
- B. Primer.

1.03 QUALITY ASSURANCE

- A. Installation of the cement-based, self-drying, self-leveling topping must be by a factory-trained applicator who has specific experience with the installation of product specified using mixing equipment and tools approved by the manufacturer.
- B. Topping material shall achieve compressive strength of 6100 psi after 28 days per ASTM C109/modified (air-cure only).
- C. Topping shall be able to be installed from ¼" to 2" in one pour, up to 5" with the addition of an appropriate aggregate, and may be tapered to match existing elevations.
- D. Topping shall be walkable after 2 – 3 hours (70°F) and be able to be coated with a water-borne coating as soon as the surface can be worked on without damage.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in their unopened packages and protect from extreme temperatures and moisture. Protect liquids from freezing.

1.05 SITE CONDITIONS

- A. Specified product is a cementitious material. Observe the basic rules of concrete work. Do not install below 50°F surface temperature. Install quickly if floor is warm and follow hot weather precautions available from the manufacturer. Never mix with cement or additives other than manufacturer approved products.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Basis-of-Design Product (for use in areas requiring ½” or less leveling): The design for the cement-based, self-drying, self-leveling underlayment shall be ARDEX SD-T Self-Drying, Self-Leveling Concrete Topping. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Ardex.
2. ChemRex.
3. Conspec.
4. Maxxon Corp.

B. Basis-of-Design (for areas requiring more than ½” of leveling)

1. Quickrete Sand/Topping mix No. 1103
2. Epoxy.com
3. MIDAmerica

C. Primer for absorbent concrete shall be as recommended by manufacturer.

D. Aggregate shall be well-graded, washed gravel (1/8” to ¼” or larger) for use in pre-leveling or when the material is installed over 2” thick.

E. Water shall be clean, potable, and sufficiently cool (not warmer than 70°F).

PART 3 – EXECUTION

3.01 PREPARATION

A. All subfloors must be sound, solid, cleaned, and primed:

1. All concrete subfloors must be of adequate strength, clean, and free of all oil, grease, dirt, curing compounds and any substance that might act as a bondbreaker before priming. Mechanically clean if necessary using shot blasting or other. Acid etching and the use of sweeping compounds and solvents are not acceptable.
2. All cracks in the subfloor shall be repaired to minimize telegraphing through the underlayment.
3. Substrates shall be inspected and corrected for moisture or any other conditions that could affect the performance of the underlayment or the finished floor covering.

B. JOINT PREPARATION

1. Moving Joints – honor all expansion and isolation joints up through the underlayment.
2. Saw Cuts and Control Joints – fill all non-moving joints with manufacture's recommended product as required.

C. PRIMING

1. Apply primer over prepared substrate at manufacture's recommended spreading rate.

3.02 APPLICATION OF CEMENTITIOUS TOPPING

A. Apply underlayment to produce uniform, level surface.

1. Apply a final layer without aggregate to produce surface.
2. Feather edges to match adjacent floor elevations.

B. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

C. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

D. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.04 PROTECTION

- A. Prior to the installation of the sealer, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, Masonite or other suitable protection course.
- B. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03 54 00

SECTION 04 01 20 - CLAY MASONRY RESTORATION AND CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes restoration and cleaning of brick as follows:

1. Repairing clay masonry, including replacing damaged units.
 - a. See drawings for base bid quantity of brick replacement.
2. Repointing mortar joints.
 - a. See drawings for base bid quantity of masonry repointing.
3. Cleaning all existing and exposed clay masonry surfaces.

1.2 DEFINITIONS

- A. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).
- B. Medium-Pressure Spray: 400 to 800 psi (2750 to 5500 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use.
- B. Samples: For each exposed material required for replacing or repairing existing materials.
- C. Qualification Data: For restoration specialists.

1.4 QUALITY ASSURANCE

- A. Preconstruction Testing Service: Engage a qualified independent testing agency to test the following:
 1. Replacement Brick: Test according to ASTM C 67 for compressive strength, 24-hour cold-water absorption, 5-hour boil absorption, saturation coefficient, and initial rate of absorption (suction).
 2. Existing Brick: Test according to ASTM C 67 for compressive strength, 24-hour cold-water absorption, 5-hour boil absorption, saturation coefficient, and initial rate of absorption (suction). Carefully remove from locations designated by Architect.
- B. Mockups: Prepare mockups of restoration and cleaning as follows to demonstrate aesthetic effects and qualities of materials and execution.

1. Patch three small areas as directed for each type of masonry material indicated to be patched.
2. Clean an area approximately 25 sq. ft. (2.3 sq. m) in area for each type of clay masonry and surface condition.
3. Rake out joints in two separate areas approximately 36 inches (900 mm) high by 72 inches (1800 mm) wide for each type of repointing required and repoint one of the two areas.

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. Products: Subject to compliance with requirements, provide one of the products specified.
 3. 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.
 4. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 MASONRY MATERIALS

- A. Face Brick and Accessories: Provide face brick and accessories, including specially molded, ground, cut, or sawed shapes.
1. Provide units with colors, surface texture, size, and shape to match existing brickwork and with physical properties not less than those determined from preconstruction testing of selected existing units.
- B. Portland Cement: ASTM C 150, Type I or Type II.
1. Provide white cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Mortar Sand: ASTM C 144, unless otherwise indicated.
1. Color: Provide natural sand of color necessary to produce required mortar color.
 2. For pointing mortar, provide sand with rounded edges.

3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands, if necessary, to achieve suitable match.

E. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes.

F. Water: Potable.

2.3 CLEANING MATERIALS

A. Water for Cleaning: Potable.

B. Hot Water: Heat water to a temperature of 140 to 160 deg F (60 to 71 deg C).

C. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium polyphosphate (TSPP), 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every 5 gal. (20 L) of solution required.

D. Job-Mixed Mold, Mildew, and Algae Remover: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium polyphosphate (TSPP), 5 quarts (5 L) of 5 percent sodium hypochlorite (bleach), and 15 quarts (15 L) of hot water for every 5 gal. (20 L) of solution required.

E. Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing organic soiling from polished stone, brick, aluminum, plastics, and wood.

1. Products:

- a. Dominion Restoration, Inc.; Bio-Cleanse.
- b. Dumond Chemicals, Inc.; Safe n' Easy Architectural Cleaner/Restorer.
- c. Price Research, Ltd.; Price Non-Acid Masonry Cleaner.
- d. ProSoCo; Enviro Klean Restoration Cleaner.

2.4 MISCELLANEOUS MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.

1. Products:

- a. American Building Restoration Products, Inc.; LM 130 Acid Shield.
- b. Diedrich Technologies Inc.; Diedrich Acid Guard.
- c. Price Research, Ltd.; Price Mask.
- d. ProSoCo; Sure Klean Strippable Masking.

2.5 MIXES

- A. Mortar Mixes: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Mix materials in a clean, mechanical batch mixer.
 - 1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.
 - 2. Mortar Pigments: Do not exceed a pigment-to-cement ratio of 1:10 by weight.
- B. Do not use admixtures of any kind in mortar, unless otherwise indicated.
- C. Pointing Mortar for Brick: 1 part portland cement, 2 parts lime, and 6 parts sand.
 - 1. Add mortar pigments to produce mortar colors required.
- D. Rebuilding (Setting) Mortar: Comply with ASTM C 270, Proportion Specification, Type N, unless otherwise indicated; with cementitious material content limited to portland cement and lime.
- E. Chemical Cleaning Solutions: Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical cleaner manufacturer.
 - 1. Acidic Cleaner Solution for Brick: Dilute with water to produce hydrofluoric acid content of 3 percent or less.
 - 2. Acidic Cleaner Solution for Terra Cotta: Dilute with water to concentration demonstrated by testing that does not etch or otherwise damage terra cotta surface.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
- B. Prevent chemical cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
 - 1. Cover adjacent surfaces with materials that resist chemical cleaners used unless chemical cleaners will not damage surfaces. Use materials that contain only waterproof, UV-resistant adhesives. When no longer needed, promptly remove masking to prevent adhesive staining.
 - 2. Keep wall wet below area being cleaned to prevent streaking from runoff.

3.2 MASONRY REMOVAL, REPLACEMENT, AND PATCHING

- A. At locations indicated, remove masonry units that are damaged, spalled, or deteriorated. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
- B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.
- C. Remove in an undamaged condition as many whole bricks as possible.
 - 1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
- D. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles.
- E. Brick Replacement:
 - 1. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw to cut masonry with clean, sharp, unchipped edges.
 - 2. Lay brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. (30 g/194 sq. cm per min.). Maintain joint width to match existing joints.
 - a. Tool exposed mortar joints to match joints of surrounding existing brickwork.
- F. Masonry Unit Patching: Remove loose material from masonry surface. Remove additional material so patch will not have feathered edges and will be at least 1/4 inch (6 mm) thick.
 - 1. Rinse surface to be patched and leave damp, but without standing water.
 - 2. Brush-coat surfaces with slurry coat of patching compound.
 - 3. Place patching compound in layers not less than 1/4 inch (6 mm) or more than 2 inches (50 mm) thick. Roughen surface of each layer to provide a key for next layer.
 - 4. Trowel, scrape, or carve surface of patch to match texture and surface plane of surrounding masonry.
 - 5. Keep each layer damp for 72 hours or until patching compound has set.
 - 6. After final layer of patching compound has cured, apply glaze replacement to terra cotta. Apply two or more coats, as needed, to match glaze of adjacent terra cotta units.

3.3 CLEANING

- A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.

- B. Use only those cleaning methods indicated for each masonry material and location.
 - 1. Do not use wire brushes.
 - 2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip.
 - 3. For chemical cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
 - 4. For water spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.

- C. Removing Plant Growth: Completely remove plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.

- D. Chemical Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical cleaner manufacturer's written instructions; use brush or spray application methods, at Contractor's option. Do not spray apply at pressures exceeding 50 psi (345 kPa). Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.

- E. Detergent Cleaning: Use for brick.
 - 1. Wet masonry with cold water applied by low-pressure spray.
 - 2. Scrub masonry with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing.
 - 3. Rinse with cold water applied by low -pressure spray.

- F. Mold, Mildew, and Algae Removal:
 - 1. Wet masonry with cold water applied by low-pressure spray.
 - 2. Apply mold, mildew, and algae remover by brush.
 - 3. Scrub masonry with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing.
 - 4. Rinse with cold water applied by medium-pressure spray.

3.4 REPOINTING MASONRY

- A. Rake out and repoint mortar joints as follows:
 - 1. Remove mortar from joints to depth of joint width plus 1/8 inch (3 mm), but not less than 1/2 inch (13 mm) or not less than that required to expose sound, unweathered mortar. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar.
 - 2. Cut out mortar by hand with chisel and mallet.
 - 3. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and mallet. Strictly adhere to written quality-control program. Quality-control program shall include provisions for

demonstrating ability of operators to use tools without damaging masonry, supervising performance, and preventing damage due to worker fatigue.

4. Rinse masonry-joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen masonry-joint surfaces before pointing.
5. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch (9 mm). Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer. Where existing bricks have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces.
6. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.

B. Cure mortar by maintaining in thoroughly damp condition for at least 72 hours including weekends and holidays.

1. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.

3.5 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

END OF SECTION 04 01 20

SECTION 04 05 01 - MORTAR AND GROUT (SITE)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract and Division 1, General Supplementary and Special conditions shall apply to the work specified in this Section.

1.2 SUMMARY

- A. Under this Item the Contractor shall furnish and supply mortar and masonry grout in accordance with the plans, specifications and directions of the Engineer, including but not limited to:
 - 1. Brick veneer on new school sign.
 - 2. Stone cap on new school sign.
 - 3. Installation of new fence posts in existing concrete retaining wall.

1.3 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 03 45 00 - Precast Architectural Concrete
- C. Section 04 21 13 - Brick Masonry (Site)

1.4 SUBMITTALS

- A. Samples: Submit two strips, 1/2x4 inch in size illustrating mortar color and color range.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction, and as required by the State of Connecticut Building Code.

1.6 MIX TESTS:

- A. Testing of Mortar Mix: In accordance with ASTM C780.
- B. Testing of Grout Mix: In accordance with ASTM C1019.

PART 2 - PRODUCTS

2.1 MORTAR MATERIALS

- A. Portland Cement:
 - 1. ASTM Type I gray or non-staining white, depending on which gives the best color match, in accordance with ASTM C150. Colored cements are not acceptable. (See Mortar Mixes below).
 - 2. ASTM Type II gray or non-staining white, sulfate resistant, in accordance with ASTM C150. Colored cements are not acceptable. (See Mortar Mixes below.)
- B. Mortar Aggregate: ASTM C144, standard masonry type. Similar in color, grading and particle sizes to sands of original mortars, and shall match sand sample approved by the Engineer.
- C. Grout Aggregate: ASTM C404.
- D. Hydrated Lime: ASTM C207, Type (S).
- E. Dry Pigment Color Additive:
 - 1. Alkali-resistant (Lime-proof) inorganic pigments shall be used. Such as "Rainbow Dry Colors" as manufactured by Empire Blended Products, Bayville, NJ; or true tone colors as manufactured by Davis Colors, Beltsville, Maryland 20705 (301) 776-2400; or approved equal.
 - 2. Pigments shall be sufficiently fine to disperse throughout the mortar mixes, be capable of imparting the desired color when used in permissible quantities, and not react with other components to the detriment of the mortar. Use the minimum quantity of pigment to produce desired results. The maximum permissible quantity of most metallic oxide pigments is 10 percent of the cement/lime content by weight. The maximum permissible quantity of carbon black is 2 percent of the cement/lime content by weight.
- F. Prepared Masonry Cements: ASTM C91, Type N, S, or M.
- G. Prepared Masonry Cements: ASTM C91, using white cement, Normal strength; manufactured by Davis Colors, Beltsville, Maryland 20705.

- H. Mortar Color: True tone color; manufactured by Davis Colors, Beltsville, Maryland 20705, or approved equal.
- I. Water: Clean, potable, and free of oils, acids, alkalies, salts, organic materials or other substances that may be deleterious to mortar or masonry units.
- J. Admixtures: No air-entraining agents, cementitious materials containing air-entraining agents, antifreeze compounds, accelerators, retarders, water-repellent agents, calcium chloride, or other admixtures shall be added to mortar.
- K. Closed Cell Backer Rod: Compressible rod stock, polyethylene foam. Provide sizes and shapes of backer rod necessary to control joint depth of deep vertical joints.

2.2 MORTAR MIX

A. Brick Masonry Mortar

- 1. Mortar for pointing brick masonry units shall comply with the proportion guidelines of ASTM C 270-89, Type N, for all work and adhere to the following composition as formulated by the project conservator and found in their report of August 9, 2000 "Mortar Analysis and Recommended Replication Mixes":
- 2. Cement: 1 part by volume, (ASTM C150), to be composed of:
 - ¼ part Gray Portland Cement, Type I
 - ¾ part White Portland Cement, Type I
- 3. Lime: 1 part by volume Hydrated Lime, Type S (ASTM C207).
- 4. Sand: 5 parts aggregate sand to be composed of:
 - 3 parts "banding sand"
 - 2 parts Schofield "180"
- 5. Dry pigment: If needed, add small amount to dry mortar mix in such proportion as determined to achieve the desired color match, not to exceed 10% weight of binder. Mix thoroughly to disperse pigment before addition of water.
- 6. Water: Potable water as required to achieve a workable mix.

- B. Use clearly marked measuring containers to ensure consistent batch mixing. Measurements of mortar components, including pigments, are to be accurately recorded in the field to ensure consistent batch mixing and appearance.

2.3 GROUT AND ANCHORING CEMENT

- A. Non-shrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for exterior applications.

- B. Erosion-Resistant Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior applications.
- C. Use grouts with 4500 psi strength at 28 days; pre-mixed type in accordance with ASTM C 94.

2.4 GROUT MIXING

- A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C 476 Fine Grout.
- B. Do not use anti-freeze compounds to lower the freezing point for grout.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine all areas scheduled for work to determine whether existing masonry conditions will adversely affect execution of the work of this section. Report any such conditions to the Engineer.
- B. Conform to Section 04 21 13 - Brick Masonry (Site)

3.2 MORTAR PREPARATION

- A. Dry Ingredients. Mix sand, cement, hydrated lime, and dry pigment thoroughly for several minutes before adding water, until the even color of the mixed materials indicates that they have been thoroughly distributed throughout the mass.
- B. Water: Thoroughly mix cementitious and aggregate materials together before adding any water. Then mix again, adding only enough water to produce a damp, workable mix, which will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 1 hour. Add remaining water in small portions until mortar of desired consistency is reached. Use mortar within 30 minutes of final mixing.
- C. Use of Hardened Mortar: Clean mixing equipment thoroughly after each use to prevent hardened or partially hardened lumps of mortar from contaminating new batch.
- D. Mortar Additives: Add no additional substances to the mortar without the written permission of the Engineer. Additional substances include, but are not limited to anti-freeze compounds and air entraining agents.

- 3.3 **JOINT MOISTENING:** If the joints have dried since being rinsed, moisten again with a fine water spray. Allow no freestanding water to be present.
- 3.4 **MORTAR JOINT INSTALLATION:** Conform to Section 04 21 13 - Brick Masonry (Site)
- 3.5 **JOINT FINISHING**
- A. Tool final layer of mortar after it has become thumbprint hard, to slightly exceed depth of recess of adjacent sound joints.
 - B. Expose aggregate of mortar joints to match adjacent sound joints by applying water with stiff bristle brush just after mortar has set but before it has dried.
 - C. Remove excess mortar from masonry immediately after set but before it has dried to prevent smearing. As needed, use natural bristle brush and/or wood paddle, with water. Use of muriatic acid or any acid-based masonry cleaners is prohibited.
- 3.6 **PROTECTION/CLEAN-UP**
- A. Protect work completed until acceptance of project. Replace or repair the surfaces if damaged prior to acceptance.
 - B. As work proceeds, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris related to this work.

END OF SECTION

SECTION 04 20 00 - UNIT MASONRY ASSEMBLIES

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

This Section includes unit masonry assemblies consisting of the following:

1. Brick Masonry Units.
 2. Concrete Masonry Units.
 3. Mortar and grout.
 4. Reinforcing steel.
 5. Masonry joint reinforcement.
 6. Ties and anchors.
 7. Embedded flashing.
 8. Miscellaneous masonry accessories.
 9. Expansion / Control Joint Materials
 10. Cavity-wall insulation.
 11. Field Applied Water Repellant Coating
- B. Related Sections include the following:
1. Division 7 Section "Bituminous Dampproofing" for dampproofing applied to cavity face of backup wythes of cavity walls.
 2. Division 7 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
 3. Division 7 Section "Through-Penetration Firestop Systems" for firestopping at openings in masonry walls.
 4. Division 7 Section "Fire-Resistive Joint Systems" for firestopping at tops of masonry walls.
 5. Division 8 Section "Louvers and Vents" for wall vents (brick vents).
- 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 5 Section "Structural Steel."
- D. Products installed, but not furnished, under this Section include the following:
1. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."

2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."
3. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section "Steel Doors and Frames."

1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the following net-area compressive strengths (f_m) at 28 days.
- B. Determine compressive strength of masonry from net-area compressive strengths of masonry units and mortar types according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- C. Exterior Concrete Masonry Units: ASTM C-90, Type 1 Moisture Controlled.

1.5 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
- B. Shop Drawings: Show fabrication and installation details for the following:
 1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
 2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection: For the following:
 1. Unit masonry Samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required.
 2. Colored mortar Samples showing the full range of colors available.
- D. Samples for Verification: For the following:
 1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
 2. Colored mortar Samples for each color required, showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
 3. Weep holes/vents in color to match mortar color.
 4. Accessories embedded in the masonry.

- E. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents, unless such deviations are specifically brought to the attention of the Architect and approved in writing.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- G. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
1. Each type of masonry unit required.
 - a. Include size-variation data, verifying that actual range of sizes falls within specified tolerances.
 - b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.
 2. Mortar complying with property requirements of ASTM C 270.
 3. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.
- H. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
1. Each type of masonry unit required.
 - a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
 - b. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.
 2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
 3. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
 4. Each material and grade indicated for reinforcing bars.
 5. Each type and size of joint reinforcement.
 6. Each type and size of anchor, tie, and metal accessory.
- I. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- E. Sample Panels: Before installing unit masonry, build sample panels, using materials indicated for the completed Work, to verify selections made under sample Submittals and to demonstrate aesthetic effects. Build sample panels for each type of exposed unit masonry assembly in sizes approximately 48 inches long by 48 inches high by full thickness.
 - 1. Locate panels in the locations indicated or, if not indicated, as directed by Architect.
 - 2. Clean exposed faces of panels with masonry cleaner indicated.
 - 3. Protect approved sample panels from the elements with weather-resistant membrane.
 - 4. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
 - 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels, unless such deviations are specifically approved by Architect in writing.
 - 6. Demolish and remove sample panels when directed.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

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.

1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 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 (600 mm) down both sides and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Do not lay masonry when atmospheric temperature is below 32 degrees F on a rising temperature, or below 40 degrees F. on a falling temperature, unless approved provisions are made for heating materials and protecting work.
 2. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
1. When ambient temperature exceeds 100 deg F (38 deg C), or 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h), do not spread mortar beds more than 48 inches (1200 mm) ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 BRICK MASONRY

- A. General: Provide shapes indicated and as follows for each form of brick required:
1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.
- B. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
 3. Provide special shapes for outside corners which are less than or more than 90 degrees.
 4. For brick installed within interior of building, provide bullnose units for outside corners.
- C. Face Brick: ASTM C 216, Grade SW, Type FBS, and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi (20.7 MPa).
 2. Initial Rate of Absorption: Less than 20 g/30 sq. in. (20 g/194 sq. cm) per minute when tested per ASTM C 67.
 3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 4. Surface Coloring: Brick with surface coloring, other than flashed or sand-finished brick, shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m).

5. Size: Manufactured to the following actual dimensions:
 - a. Modular: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
 - b. Economy: 3-5/8 inches wide by 3-5/8 inches high by 7-5/8 inches long.
 6. Application: Use where brick is exposed, unless otherwise indicated.
 7. Color and Texture: Match Architect's samples.
 8. Basis-of-Design Product: Subject to compliance with requirements, provide the following products as distributed by Tri-State Brick of Connecticut, Inc:
 - a. Type A: Product of Endicott Clay Co. – Coppertone
 - b. Type B: Product of Mutual Materials Co. – Ebony
 - c. Type C: Product of Cloud Ceramics – Cloud Sahara LT Buff
 - d. Type D: Product of Taylor Clay Products, Inc. – Taylor 301 White
 - e. Type E: Product of Taylor Clay Products, Inc. – Pearl Gray
 - f. Type F: Product of Endicott Clay Products – Endicott Desert Iron Spot Smooth
 - g. Type G: Product of Watson town Brick Co. – Watson town Pennwine
 9. Additional acceptable Face Brick includes products comparable to those of Tri-State Brick of CT as distributed by the following:
 - a. Consolidated Brick Company
 - b. Mack Brick Company
- D. Common Brick: (for use in concealed areas only)
1. Manufacturer: Any of the above manufacturers meeting ASTM C62 or C216.
 2. Materials:
 - a. Finish & Color: Not important
 - b. Standards: ASTM C62 or C216 or above brick types, Grade SW
 3. Assembly:
 - a. Size: Match face brick size supplied or module
 - b. Core: Optional

- E. Salvage of Existing Brick: (where new openings or modifications are made to existing building)
Salvage existing brick where applicable to obtain a uniform appearance at connections.

2.2 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows:

- 1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
- 2. Provide bullnose units for outside corners, except where scheduled to receive ceramic tile or unless otherwise indicated.

- B. Concrete Masonry Units: (CMU) ASTM C 90 and as follows:

- 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
- 2. Weight Classification: Lightweight, unless otherwise indicated.
- 3. Provide Type I, moisture-controlled units.
- 4. Size (Width): Manufactured to the following dimensions:
 - a. 4 inches (102 mm) nominal; 3-5/8 inches (92 mm) actual.
 - b. 6 inches (152 mm) nominal; 5-5/8 inches (143 mm) actual.
 - c. 8 inches (203 mm) nominal; 7-5/8 inches (194 mm) actual.
 - d. 10 inches (254 mm) nominal; 9-5/8 inches (244 mm) actual.
 - e. 12 inches (305 mm) nominal; 11-5/8 inches (295 mm) actual.
- 5. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
 - a. Where units are to be left exposed, provide color and texture matching the range represented by Architect's sample.
- 6. Provide units bearing U.L. label for use in fire-resistance rated walls and partitions.

- C. Ground Face and Split Rib Concrete Masonry Units:

- 1. Basis of design product: The design of the Ground Face and Split Rib Concrete Masonry Units is based the following products as manufactured by:
 - a. Westbrook Concrete Block Co. Inc.
 - b. Clayton Block
 - c. A. Jandris & Sons, Inc..
- 2. Provide outside corner, head and sill ground face blocks in special shapes and sizes indicated on drawings and as required for smooth transitions around corners.
- 3. Provide colors and textures matching the range represented by Architect's samples for each block type.

4. All colored CMU's shall be produced in one continuous production run as per ASTM C90-(latest revision), Grade N, Type 1 moisture controlled.
5. Ground Face and Split Rib Block: Smooth ground face finish, ASTM C-331, with ASTM C-150 Portland cement. Units to be manufactured with integral water repellent, Dry-Block or approved equal.
 - a. 3-5/8" x 7-5/8" x 15-5/8" Block
 - b. 5-5/8" x 7-5/8" x 15-5/8" Block
 - c. 8-5/8" x 7-5/8" x 15-5/8" Block
 - d. 11-5/8" x 7-5/8" x 15-5/8" Block
 - e. 3-5/8" x 3-5/8" x 15-5/8" Block

D. Insulated Concrete Masonry Units:

1. Provide insulation inserts at all single wythe exterior masonry walls. Insulation for concrete masonry units shall be:
 - a. KORFIL Block Insulation or ICON Universal Insulation Inserts as manufactured by Concrete Block Insulating Systems, Inc. The expanded polystyrene shall be individually molded to have a minimum density of 1.0 P.C.F., and shall conform to ASTM C578-02 Standard Type 1. Used for corner and construction joint concrete block were Hi-R insulation can not be used.
 - b. HI-R Universal Insulation Inserts as manufactured by Concrete Block Insulating Systems, Inc. The expanded polystyrene shall be individually molded to have a minimum density of 1.3. P.C.F., and shall conform to ASTM C 578-04a, Type X, replacing Federal Specifications HH-I-524C, Specification for Rigid Cellular Polystyrene Thermal Insulation.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color as selected from manufacturer's standard colors.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
 1. For pigmented mortar, use a colored cement formulation as required to produce the color as selected from manufacturer's standard formulations.
 - a. Pigments shall not exceed 10 percent of Portland cement by weight for mineral oxides nor 2 percent for carbon black.

- D. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
- E. Aggregate for Grout: ASTM C 404.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.
- H. Water: Potable.
- I. Water-Repellent Admixture: Provide liquid water-repellent mortar admixture for use with all concrete masonry units with integral water-repellent.
- J. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- K. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Mortar Pigments:
 - a. True Tone Mortar Colors; Davis Colors.
 - b. Centurion Pigments; Lafarge Corporation.
 - c. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.
 - 2. Cold-Weather Admixture:
 - a. Accelguard 80; Euclid Chemical Co.
 - b. Morseled; W. R. Grace & Co., Construction Products Division.
 - c. Trimix-NCA; Sonneborn, Div. of ChemRex, Inc.

2.4 REINFORCING STEEL

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60 (Grade 400).

2.5 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A 951 and as follows:
 - 1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
 - 2. Wire Size for Side Rods: W2.8 or 0.188-inch (4.8-mm) diameter.
 - 3. Wire Size for Cross Rods: W2.8 or 0.188-inch (4.8-mm) diameter.
 - 4. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units where indicated.

- B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches (407 mm) o.c.
- C. For multiwythe masonry, provide types as follows:
 - 1. Adjustable (2-piece) type with single pair of side rods and cross ties spaced not more than 16 inches (407 mm) o.c. and with separate adjustable veneer ties engaging the cross ties. Cross ties are either U-shaped with eyes or rectangular. Space side rods for embedment within each face shell of backup wythe and size adjustable ties to extend at least halfway through outer wythe but with at least 5/8-inch (16-mm) cover on outside face.
 - a. Use where indicated and where horizontal joints of facing wythe do not align with those of backup wythe.
 - b. Use where facing wythe is of different material than backup wythe.

2.6 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- C. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.
- D. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.7 ADJUSTABLE ANCHORS FOR CONNECTING TO STEEL FRAME

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section: Crimped 1/4-inch- (6.4-mm-) diameter, hot-dip galvanized steel wire anchor section for welding to steel.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch- (6.4-mm-) diameter, hot-dip galvanized steel wire.

2.8 ADJUSTABLE MASONRY-VENEER ANCHORS

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - 1. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
- B. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie section and a metal anchor section complying with the following requirements:

1. Anchor Section: Sheet metal plate with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot between strap and plate for connection of wire tie.
 - a. Plate 1-1/4 inches (32 mm) wide by 6 inches (150 mm) long with strap 5/8 inch (16 mm) wide by 3-5/8 inches (92 mm) long; slot clearance formed between face of plate and back of strap shall not exceed diameter of wire tie by more than 1/32 inch (0.8 mm).
 2. Wire Tie Section: Triangular- shaped wire tie sized to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face.
 3. Fabricate sheet metal anchor sections and other sheet metal parts from 0.0966-inch- (2.5-mm-) thick, steel sheet, galvanized after fabrication.
 4. Fabricate wire tie sections from 0.1875-inch- (4.8-mm-) diameter, hot-dip galvanized steel wire.
- C. Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 (4.8-mm) diameter by length required to penetrate steel stud flange by not less than 3 exposed threads, and with the following corrosion protective coating:
1. Organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
- D. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- E. Products: Subject to compliance with requirements, provide one of the following:
1. Screw-Attached, Masonry-Veneer Anchors:
 - a. D/A 210 with D/A 700-708; Dur-O-Wal, Inc.
 - b. 315-D with 316; Heckman Building Products, Inc.
 - c. DW-10-X; Hohmann & Barnard, Inc.
 2. Organic-Polymer-Coated, Steel Drill Screws:
 - a. Dril-Flex; Elco Industries, Inc.
 - b. Traxx; ITW-Buildex.
- F. Z-tie Type Anchors: 9 gage Z-ties at each vertical joint of soap units covering steel lintels / beams. Weld Z-ties to web of steel beam.

2.9 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:
1. Stainless Steel: 0.0156 inch (0.4 mm) thick.

2. Fabricate through-wall metal flashing embedded in masonry from sheet metal indicated above and with ribs at 3-inch (75-mm) intervals along length of flashing to provide an integral mortar bond.
 3. Fabricate metal expansion-joint strips from sheet metal indicated above, formed to shape indicated.
 4. Fabricate metal drip edges from sheet metal indicated above. Extend at least 3 inches (75 mm) into wall and 1/2 inch (13 mm) out from wall, with a hemmed outer edge bent down 30 degrees.
 5. Fabricate metal flashing terminations from sheet metal indicated above. Extend at least 3 inches (75 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and then down into joint 3/8 inch (10 mm) to form a stop for retaining sealant backer rod.
- B. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use the following, unless otherwise indicated:
1. Copper-Laminated Flashing: Manufacturer's standard laminated flashing consisting of 5-oz./sq. ft. (1.5-kg/sq. m) sheet copper bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.
- E. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- F. Products: Subject to compliance with requirements, provide one of the following:
1. Copper-Laminated Flashing:
 - a. Copper Fabric Flashing; Advanced Building Products, Inc.
 - b. Copper Fabric; AFCO Products, Inc.
 - c. H & B C-Fab Flashing; Hohmann & Barnard, Inc.
 - d. Type FCC-Fabric Covered Copper; Phoenix Building Products.
 - e. Copper Fabric Flashing; Polytite Manufacturing Corp.
 - f. Copper Fabric Flashing; Sandell Manufacturing Co., Inc.
 - g. York Copper Fabric Flashing; York Manufacturing, Inc.
- G. Single wythe walls: Use end dam flashings at ends of all lintels and wall penetrations.
- 2.10 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, urethane, or PVC.

- B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
 - 1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
 - 2. PVC: ASTM D 2287, Type PVC-65406.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Rectangular Plastic Weep/Vent
 - 1. Tubing: color to match grout, 3/8 by 1-1/2 by 3-1/2 inches (9 by 38 by 89 mm).
 - 2. Mesh type: color to match grout, 3/8 by 1-1/2 by 3-1/2 inches (9 by 38 by 89 mm).
- E. Cavity Drainage Material: 2-inch thick, free-draining mesh; made from polyethylene strands and dovetail shaped to avoid being clogged by mortar droppings.
- F. Available Products: Subject to compliance with requirements, cavity drainage materials that may be incorporated into the Work include, but are not limited to, the following:
- G. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Weep Hole/Vent:
 - a. #342 W/S; Hohmann & Barnard, Inc.
 - b. CavClear @ www.cavclear.com
 - 2. Cavity Drainage Material:
 - a. Mortar Net; Mortar Net USA, Ltd.
 - b. CavClear @ www.cavclear.com

2.11 CAVITY-WALL INSULATION

- A. Extruded-Polystyrene Board Insulation: Rigid, cellular, polystyrene thermal insulation with closed cells and integral high-density skin; formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type IV.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.12 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of 1/2-cup (0.14-L) dry measure tetrasodium polyphosphate and 1/2-cup (0.14-L) dry measure laundry detergent dissolved in 1 gal. (4 L) of water.
- B. 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 Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cleaners for Red and Light-Colored Brick Not Subject to Metallic Staining with Mortar Not Subject to Bleaching:
 - 1) 202 New Masonry Detergent; Diedrich Technologies, Inc.
 - 2) Sure Klean No. 600 Detergent; ProSoCo, Inc.
 - b. Cleaners for Red and Dark-Colored Brick Not Subject to Metallic Staining:
 - 1) 200 Lime Solv; Diedrich Technologies, Inc.
 - 2) Sure Klean No. 101 Lime Solvent; ProSoCo., Inc.
 - c. Cleaners for Brick Subject to Metallic Staining:
 - 1) 202V Vana-Stop; Diedrich Technologies, Inc.
 - 2) Sure Klean Vana Trol; ProSoCo, Inc.

2.13 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. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
 1. Extended-Life Mortar for Unit Masonry: Mortar complying with ASTM C 1142 may be used instead of mortar specified above, at Contractor's option.
 2. Limit cementitious materials in mortar to portland cement and lime.
 3. For masonry below grade, in contact with earth, and where indicated, use Type M.
 4. For reinforced masonry and where indicated, use Type S.
 5. For interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 6. Water-Repellent Admixture: Provide liquid water-repellent mortar admixture for use with all concrete masonry units with integral water-repellent. Mortar admixture to match product used for concrete masonry units.
- D. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit pigments to the following percentages of cement content by weight:

1. For mineral-oxide pigments and portland cement-lime mortar, not more than 10 percent.
2. For carbon-black pigment and portland cement-lime mortar, not more than 2 percent.
3. Color: as selected by Architect from manufacturer's complete line of colors.

E. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143.

2.14 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 meet specified requirements shall be done at Contractor's expense.
- B. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

2.15 EXPANSION / CONTROL JOINT MATERIALS

A. Expansion/Control Joints for Concrete Masonry Walls: (intended primarily for use between backup walls and within other masonry walls where joints are required; space expansion joints maximum 50'-0" o.c. interior walls and 35'-0" o.c. in exterior walls.)

1. Manufacturer shall be equal to:

- a. Dur-O-Wal rapid control joint for block thickness used. D/A 2000 to D/A 2007 as needed
- b. Hohmann & Barnard, Inc. – Standard to wide flange VS1118 as needed
- c. AA Wire Products – AA-2000 or AA-2005 as needed
- d. National Wire Products – Ty-Wal PVC 001 to PVC 012 as needed
- e. Everlastic – Slot seal and slot seal wide flange as applicable
- f. Wire Bond - #2901/2902/2903 PVC joints as needed

2. Materials: Resilient control joint fillers shall be a regular or wide flange (full block width) factory molded product of rubber conforming to ASTM D-2000 (2AA-805) with a compressible neoprene compound edge conforming to ASTM 2BC-310 C12 with a durometer hardness of 30. Cross members shall maintain block wall alignment.

B. Expansion/Control Joints for Brick Walls: Intended for use primarily in exterior exposed masonry walls and/or as shown on drawings. Space face brick control joints at maximum of 30'-0" o.c. or as shown.

1. Manufacturer shall be equal to:

- a. Williams Products Company – Neo-Seal IV neoprene control joint or closed cell sponge neoprene Type NNI, or Neo-Seal IV extruded control joints.
- b. Emseal USA Inc. – Polyurethane with oxidized asphalt. Provide back-up and caulk joint where exposed per Division 7.
- c. Will-Seal – Construction Foams (Div. Illbruck):
 - 1) 250 black – below grade
 - 2) 150 gray – above grade
 - 3) 50/50 membrane sealant system – large joints
- d. AA Wire Products – AA3400 Will Seal or AA3405 Joint Tite, AA3410 Joint Tite
- e. Wire Bond – Horizontal or vertical expansion joint
- f. Hohmann & Barnard – Closed cell in panels 3” wide x ¼”, ⅜” or ½” thick x length needed.
- g. Dur-O-Wal – D/A 2010 Rapid Soft Joint

2.16 FIELD APPLIED WATER REPELLANT COATING

- A. Penetrating Water Repellent: Clear, consisting of 1 or several different resins (silanes or siloxanes), polymers, stearates, or oils plus other compounds or products of components; and with 3.3 lb/gal. (400 g/L) or less of VOCs.
 1. Available Products:
 - a. Hydrozo, a division of ChemRex; Enviroseal Double 7 HD (Basis of Design)
 - b. L&M Construction Chemicals, Inc.; Aquapel Plus.
 - c. Textured Coatings of America, Inc.; Rainstopper 100.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- F. Field applied water repellant coating: Upon completion of all exterior concrete masonry unit walls, apply two coats of clear water repellant sealer as specified. Apply sealer per manufactures' recommendation.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.
- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.
- E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
- F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
 - 1. One-half running bond with vertical joint in each course centered on units in courses above and below, unless otherwise indicated on Drawings.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 - 3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

- B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
 - 1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.6 BONDING OF MULTI-WYTHE MASONRY

- A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties as shown, but not less than one metal tie for 1.77 sq. ft. (0.16 sq. m) of wall area spaced not to exceed 16 inches (406 mm) o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (915 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.
- B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.
 - 1. Provide continuity with masonry joint reinforcement at corners by using prefabricated "L" units as well as masonry bonding.
- C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
 - 1. Provide continuity with masonry joint reinforcement by using prefabricated "T" units.

3.7 CAVITIES

- A. Keep cavities clean of mortar droppings and other materials during construction.
 - 1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.
 - 2. Provide temporary opening by omitting 1 brick every 48 inches (1200 mm) at bottom of cavity and in first course above flashing. After wall has been built to top of cavity and mortar has set, clean out cavity and then close temporary opening.
- B. Coat cavity face of backup wythe to comply with Division 7 Section "Bituminous Dampproofing."

- C. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) 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.

3.8 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.
 - a. Reinforcement above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.9 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 - 1. Provide an open space not less than 1 inch (25 mm) in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
 - 2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.10 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten each anchor section through sheathing to wall framing with two metal fasteners of type indicated.

2. Embed pintel portion of veneer anchors into horizontal courses of concrete masonry backup.
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 (407 mm) o.c. vertically and 16 inches (407 mm) o.c. horizontally, with not less than 1 anchor for each 1.77 sq. ft. (0.16 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 8 inches (203 mm), around the perimeter.

3.11 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 1. Install preformed control-joint gaskets designed to fit standard sash block.
- C. Form expansion joints in brick made from clay or shale as follows:
 1. Form open joint of width indicated, but not less than 3/8 inch (10 mm) for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Keep joint free and clear of mortar.
- D. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants."
 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

3.12 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.
 1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by the same method used for concrete masonry units.
- C. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.
- D. Provide 9 gage Z-ties at each vertical joint of soap units covering steel lintels. Weld Z-ties to web of steel lintel.

3.13 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- C. Install flashing as follows:
 - 1. At multiwythe masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up a minimum of 8 inches (200 mm), and through inner wythe to within 1/2 inch (13 mm) of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through inner wythe and turn flashing up approximately 2 inches (50 mm), unless otherwise indicated.
 - 2. At masonry-veneer walls, extend flashing from exterior face of veneer, through veneer, up face of sheathing at least 8 inches (200 mm), and behind air-infiltration barrier or building paper.
 - 3. At lintels and shelf angles, extend flashing a minimum of 4 inches (100 mm) into masonry at each end. At heads and sills, extend flashing 4 inches (100 mm) at ends and turn flashing up not less than 2 inches (50 mm) to form a pan.
 - 4. Extend sheet metal flashing 1/2 inch (13 mm) beyond face of masonry at exterior and turn flashing down to form a drip.
 - 5. Cut flashing off flush with face of wall after masonry wall construction is completed.
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
 - 1. Use weep hole/vents to form weep holes.
 - 2. Space weep holes 16 inches (406 mm) o.c.
 - 3. Place cavity drainage material immediately above flashing in cavities.
- E. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.14 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
 - 1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

- B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
 - 1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches (1520mm).

3.15 FIELD QUALITY CONTROL

- A. Owner will engage a qualified independent testing agency to perform field quality-control testing indicated below.
 - 1. Payment for these services will be made by Owner.
 - 2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
- B. Testing Frequency: Will be specified by the Engineer-of-Record in the Statement of Special Inspections filed with the Building Official at the time of application for building permit.
- C. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

3.16 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

3.17 MASONRY WASTE DISPOSAL

- A. Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 04 20 00

SECTION 04 21 13 - BRICK MASONRY (SITE)

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. The work of this Section consists of the furnishing and installing brick facing using brick that matches the existing site brick in every respect. The Contractor will provide all material, labor and equipment required to complete the work of this section.
- B. Work includes the following:
 - 1. Brick facing for school sign

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 03 45 00 - Precast Architectural Concrete
- C. Section 04 05 01 - Mortar and Grout (Site)

1.3 QUALITY ASSURANCE

- A. Standards: American Society of Testing and Materials (ASTM).
- B. Workmanship:
 - 1. The Contractor or subcontractor who will perform the work specified in this section must, within the last five (5) consecutive years, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work in the New England region.

The Contractor shall maintain a steady work crew consisting of skilled craftspeople who are experienced with the materials and methods specified and familiar with the design requirements. The Contractor shall confirm that all workers under its direction fully understand the requirements of the job.
 - 2. Foreperson shall submit resume demonstrating a minimum of three (3) years of experience working on similar projects. Foreperson shall be employed full time at the project site and shall speak and read the English language fluently.
 - 3. Masons shall have skill and experience of sufficient level to accomplish the work described. Brickwork shall be executed by skilled masons, thoroughly trained and

familiar with the methods required. Skilled masons shall be employed at the site to do necessary field cutting. Masons shall be carefully supervised to ensure that the work is accomplished to meet or exceed the highest standards of the trade.

4. In acceptance or rejection of this work, no account shall be taken for incompetence or lack of skill on the part of the masons and/or craftsman completing the work.
- C. Source of Materials: Obtain materials for brick masonry work from a single source for each type of material required to ensure a match in quality, color and texture.
- D. Field Supervised Construction: Contractor shall notify Engineer before beginning masonry work.

1.4 COORDINATION

Contractor shall coordinate work of all trades related to the successful completion of this work.

1.5 SUBMITTALS

- A. Product Literature: The Contractor shall submit three (3) copies of the manufacturer's technical data for each product including their recommendations for application and use. Include test reports and certificates that verify the product's compliance with the specification's requirements.
- B. Manufacturers Data:
 1. Certification of Brick Properties.
 2. Reports verifying brick properties and product compliance.
- C. Samples:
 1. Submit sample of all brick types specified.
 2. Submit six bricks demonstrating range of color and texture of each type.

1.6 JOB CONDITIONS/ ENVIRONMENTAL REQUIREMENTS

- A. Do not proceed with ordering, delivery or installation of brick until brickwork techniques and brick samples have been approved in writing by the Engineer.
- B. Cold weather protection: Do not proceed with brick masonry work when air or masonry temperature is below 40 degrees Fahrenheit or when it is expected to drop below 40 degrees Fahrenheit within 48 hours of work. The Contractor shall take all necessary precautions to protect the construction and materials from freezing during treatment. No work shall begin when any part of the wall, or materials in use are frozen, or subject to

freezing temperatures. Remove all pointing damaged by freezing conditions and repoint following these specifications.

- C. Cold weather construction shall adhere to the published guidelines in "Cold Weather Masonry Construction and Protection Requirements," Brick Institute of America, latest edition.
- D. Protect completed masonry in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry temperature ranges the following apply to anticipated minimum night temperatures:
 - 1. 40° F to 32° F: Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.
 - 2. 32° F to 20° F: Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.
 - 3. 20° F and below: Except as otherwise indicated, maintain masonry temperature above 32° F for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40° F for 48 hours.
- E. The work shall be protected during hot weather from premature or rapid curing by the use of dampened fabric coverings or, if different, according to manufacturers specifications.
- F. Materials shall be used only at the manufacturer's recommended temperature tolerances for masonry materials.
- G. Protection from rain: Protect brick masonry with heavy water-proof sheeting from any direct attack by rain or other precipitation for at least 24 hours after mortar has been applied.

1.7 PRODUCT HANDLING

- A. Deliver packaged material in original unbroken packages with the manufacturer's name, brand, and material standard indicated plainly thereon.
- B. Store and handle all material in a manner as to prevent damage by water or water vapor. Store building materials on a clean, dry, surface or platform as required to protect from deterioration and to prevent inclusion of foreign matter. Store no packaged materials directly on the ground.

PART 2 - PRODUCTS

2.1 MORTAR MATERIALS

- A. Conform to Section 04 05 01 – Mortar and Grout (Site)

2.2 MORTAR MIX

- A. Conform to Section 04 05 01 – Mortar and Grout (Site)

2.3 BRICK

Contractor shall select only those bricks that are in good, usable condition and shall ascertain whether the proper shapes and sizes are present for constructing the work in question. Contractor shall use bricks from the middle of the pallets and avoid bricks that appear wet, cracked, or show signs of salt accretions.

- A. Brick Color '1': Brick material selection shall match new building brick in color, texture and size.

2.4 ANCHORING SYSTEM

- A. Description: Use a self-tapping, dry set, helical stainless steel brick tie for the work of this section.
- B. Product: Blok-Lok, Helical Wall Tie System or approved equal. Available from Blok-Lok Limited, 30 Millwick Drive Western, Ontario M9L 1Y3. (416) 749 – 1010.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine all areas scheduled for brick masonry work to determine whether existing conditions will adversely affect execution of the work of this section. Report any such conditions in writing to the Engineer.

3.2 MORTAR PREPARATION

- A. Conform to Section 04 05 01 – Mortar and Grout (Site)

3.3 SETTING BRICKS

- A. Brick shall be set in a solidly and evenly filled bed of mortar, with bed, head and collar joints filled.
- B. Bricks are to be set true and level.
- C. Brick should be adequately (nearly saturated but surface dried when laid) pre-wetted prior to installation.
- D. Brick Ties:
 - 1. Brick ties shall be securely attached to existing masonry back-up, placed as much as possible on brick centers and not at edges or in mortar joints.
 - 2. Use a self-tapping, dry set, helical stainless steel brick tie for the work of this section.
 - 3. Place ties as recommended by manufacturer's representative.

3.4 JOINT FINISHING

- A. Joints are to be squeezed tight so that mortar adheres well to the masonry on all sides of the joints and forms a dense surface.
- B. All joint widths are to be 1/4 inch to 3/8 inch in width. Tool the joints as indicated on the Drawings.
- B. Tool final layer of mortar after it has become thumb-print hard, to slightly exceed depth of recess of adjacent sound joints.
- D. Remove excess mortar from masonry immediately after set but before it has dried to prevent smearing. As needed, use natural bristle brush and/or wood paddle, with water. Use of muriatic acid or any acid-based masonry cleaners may be used with the approval of the Engineer.

3.5 CURING

- A. Keep new joints damp for at least 48 hours after masonry work is completed. Do not apply a direct stream of water to joints for at least 24 hours after mortar has been placed.
- B. Keep joints damp for at least 48 hours, or until surface is cured.
- C. Maintain temperature as required until joint is cured.

3.6 CLEANING OF MORTAR JOINTS

- A. All mortar joints shall be washed with plain clean water to remove mortar debris from masonry surfaces. Washing shall be done within 48 hours following completion of masonry work. Chemical cleaning shall be used where mortar stains are persistent. Conduct chemical cleaning only with prior approval of the Engineer. The following procedure shall be employed for chemical cleaning:
1. Pre-wet wall with water.
 2. Brush or spray specified cleaner evenly until both the brick and mortar joints obtain a uniform effect.
 3. Rinse wall with water pumped at 300 psi or less to remove all traces of chemical, and without damaging mortar or masonry.
 4. Follow manufacturer's directions for proper dilution, application, and protection for the use of this product.
 5. Water shall be filtered through size 20 micron particulate cartridge filters to remove particulate matter from the water supply. Water shall be taken from the building water supply.
 6. Water run-off shall be collected in a manner approved by the Engineer at the base of each wall and troughed to a drain or sewer. Water shall not be permitted to collect or pond.
- B. As the cleaning progresses, examine all joints in the work to locate cracks, holes and other defects in same and carefully point up and fill with mortar such defects. Where necessary, in the opinion of the Engineer, cut out faulty joints and reset with pointing mortar exercising extreme care to insure the same color with that of the original work.
- C. Do not use wire brushes for cleaning.
- D. All exposed surfaces shall be free from protruding mortar, holes in mortar joints and similar defects.

3.7 CORRECTIVE MEASURES

- A. Should any cracks occur in the surface of the joint, cut out the mortar and repoint to the satisfaction of the Engineer.

3.8 PROTECTION/CLEAN-UP

- A. Protect work completed until acceptance of project. Replace or repair the surfaces if damaged prior to acceptance.

- B. As work proceeds, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris related to this work.

END OF SECTION

SECTION 04 23 00 – GLASS UNIT MASONRY ASSEMBLIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Glass block, hollow.

1.2 RELATED SECTIONS

- A. Metal Fabrications: Steel channels, sills, lintels, and jambs.
- B. Joint Sealers.

1.3 REFERENCES

- A. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
- B. ASTM A 153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
- D. ASTM C 150 - Standard Specification for Portland Cement.
- E. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry purposes.
- F. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
- G. ASTM D 1187 - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
- H. ASTM D 1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
- I. ASTM E 163 - Standard Methods of Fire Tests of Window Assemblies.
- J. CAN 4-S106 - Fire Test of Window and Glass Block Assemblies.
- K. UL 9 - Standard for Fire Tests of Window Assemblies.

1.4 SUBMITTALS

- A. Submit under provisions of Division 1.
- B. Product Data: Manufacturer's literature on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.

- C. Verification Samples:
 - 1. Two glass block units of each type specified, showing size, design, and pattern of faces.
 - 2. Representative samples of panel reinforcing, panel anchors, expansion strips, and sealant, as required for project.
- D. Fire Test Reports: Submit documents verifying glass block units are classified for the specified fire exposure according to ASTM E 163, CAN 4-S106, or UL 9 "Fire Tests of Window Assemblies." Label cartons of tested units with appropriate UL label.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging in clean, cool, dry area until ready for installation.
- B. Protect opened cartons of glass block against windblown rain or water run-off with tarpaulins or plastic covering.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not install glass block units when temperature is 40 degrees F (4 degrees C) and falling.

1.7 WARRANTY

- A. Glass Block Units: Limited 5 year warranty on product.

PART 2 – PRODUCTS

1.8 MANUFACTURERS

- A. Acceptable Manufactures:
 - 1. Pittsburgh Corning
 - 2. Solaris Glasstein
 - 3. J. Weck GmbH Co.

1.9 GLASS BLOCK

- A. Glass Block: General.
 - 1. Finish: Polyvinyl butyral edge coating.
 - 2. Framing: Framed and anchored using panel anchor construction.
 - 3. Glass Block: PC Standard Premiere Series block; hollow; 3-7/8 inches (98 mm) thick.
 - 4. Physical Properties:
 - a. Face Size: Actual face size is 1/4 inch (6 mm) less than nominal.
 - b. Weight Installed With Mortar: 20 lb/sq ft (98 kg/sq m).

- c. Thermal Conductance (U Value): 0.51 Btu/hr sq ft deg F (2.9 W/sq m K); winter night.
 - d. Thermal Resistance (R Value): 1.96 deg F hr sq ft/Btu (0.35 (K sq m)/W).
 - e. Visible Light Transmission: 75 percent.
 - f. Shading Coefficient: 0.65.
 - g. Fire Rating: 45 minute rated window assemblies for panels in masonry walls up to 120 sq ft (11 sq m) with maximum height or width of 12 feet (3658 mm); and for panels in non-masonry walls up to 94 sq ft (9 sq m) with maximum height or width of 10.75 feet (3277 mm); rating does not apply to all 12 inch (305 mm) by 12 inch (305 mm) blocks.
 - h. Sound Transmission: 35 for size 12 inches (305 mm) by 12 inches (305 mm), unless otherwise indicated.
5. Pattern: VUE.
- a. Face Size: 12 inches (305 mm) by 12 inches (305 mm), nominal.

2.3 PRODUCTS

- A. Operable windows are to project out.
- B. Operable windows must be designed to support six square feet of glass block above window. (Approximately 120 lbs.)
- C. Operable windows shall be installed within glass block with panel anchor type construction, with expansion material and caulking at jambs. Top of window frame shall be coated with asphalt emulsion and mortar. Similar to sill detail.
- D. One side of operable window shall be attached to jamb of overall opening. Along with expansion material and caulking.

PART 3 – EXECUTION

3.0 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer: Company must have successfully completed 5 documented glass block projects of 1,000 square feet minimum in the past 5 years.

1.10 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that structural members supporting glass blocks are designed for maximum deflection of L/600 under installed load.

- D. Verify that panel anchors or channels for support at head and jambs are properly installed.

1.11 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

1.12 INSTALLATION

- A. Install in accordance with manufacturer's instructions with glass block set in full mortar bed with joint reinforcing at 24 inches on center and in joints immediately above and below openings.
- B. Paint sills of all panels with heavy coat of asphalt emulsion and dry for minimum two hours before first mortar bed is placed.
- C. Make provision for expansion and movement at jambs and heads of all panels; do not allow structural loads to bear on glass blocks.
- D. Mix mortar and apply in accordance with manufacturer's recommendations.

1.13 CLEANING

- A. Remove excess sealer from glass surfaces immediately following application.
- B. Remove excess mortar from faces of glass block at time joints are struck or tooled.

1.14 PROTECTION

- A. Protect installed products until completion of project.
- B. Maintain temperature of glass unit masonry above 40 degrees Fahrenheit (4 degrees Celsius) for first 48 hours after construction.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 04 23 00

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Structural steel.
 - 2. Steel lintels and shelf angles (whether or not attached to structural steel).
 - 3. Grout.
- B. Related Sections include the following:
 - 1. Division 1 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Division 5 Section "Steel Deck" for field installation of shear connectors.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand ASD-service loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Allowable Stress Design," Part 4.
 - 2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 2. Include embedment drawings.
 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 5. For structural-steel connections indicated to comply with design loads, include structural analysis data prepared by the qualified professional.
- C. Welding certificates.
- D. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
1. Structural steel including chemical and physical properties.
 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 3. Direct-tension indicators.
 4. Tension-control, high-strength bolt-nut-washer assemblies.
 5. Shear stud connectors.
 6. Shop primers.
 7. Nonshrink grout.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CASE.
- B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Cbd.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- E. Comply with applicable provisions of the following specifications and documents:
1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
 3. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
 4. AISC's "Specification for the Design of Steel Hollow Structural Sections."
 5. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
 6. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.8 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL SHAPES

- A. As indicated in general structural notes on drawings.

2.2 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.3 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
 - 1. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
 - 2. Mark and match-mark materials for field assembly.
 - 3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- F. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.4 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 - 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

2.5 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.
 - 1. Fill vent holes and grind smooth after galvanizing.
 - 2. Galvanize lintels and shelf angles.

2.6 SOURCE QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

- C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
 - 1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

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- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of base plate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
 4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.
 1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 painting Sections.

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Open-web K-series steel joists.
 - 2. Joist accessories.

1.3 DEFINITIONS

- A. SJI "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product indicated.
- B. Shop Drawings: Show layout, mark, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, accessories; splice and connection locations and details; and attachments to other construction.
- C. Welding Certificates: Copies of certificates for welding procedures and personnel.
- D. Manufacturer Certificates: Signed by manufacturers certifying that joists comply with requirements.
- E. Mill certificates signed by manufacturers of bolts certifying that their products comply with specified requirements.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

- G. Research/Evaluation Reports: Evidence of steel joists' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. SJI Specifications: Comply with standard specifications in SJI's "Specifications" that are applicable to types of joists indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Comply with SJI's "Specifications" for web and steel-angle chord members.
- B. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Plain, uncoated.
- C. High-Strength Bolts and Nuts: ASTM A 325, Type 1, heavy hex steel structural bolts, ASTM A 563 heavy hex carbon-steel nuts, and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain, uncoated.
- D. Welding Electrodes: Comply with AWS standards.
- E. Galvanizing Repair Paint: SSPC-Paint 20.

2.2 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.3 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- D. Do not camber joists.
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.4 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.
- C. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.5 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories to be primed by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Apply one shop coat of primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.
- C. Field weld joists to supporting steel framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Field welds will be visually inspected according to AWS D1.1.
- C. Bolted connections will be visually inspected.
 - 1. High-strength, field-bolted connections will be tested and verified according to procedures in RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts."
- D. Correct deficiencies in Work that inspections and test reports have indicated are not in compliance with specified requirements.
- E. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.4 REPAIRS AND PROTECTION

- A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, and abutting structural steel.
 - 1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
 - 2. Apply a compatible primer of the same type as the shop primer used on adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100

SECTION 053100 - STEEL DECKING

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. Roof deck.
 - 2. Composite floor deck.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for concrete fill.
 - 2. Division 5 Section "Structural Steel" for shop- and field-welded shear connectors.
 - 3. Division 5 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
 - 4. Division 9 painting Sections for repair painting of primed deck.

1.3 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- C. Product Certificates: For each type of steel deck, signed by product manufacturer.
- D. Welding certificates.
- E. Field quality-control test and inspection reports.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.
- B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

- C. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steel Deck:
 - a. Canam Steel Corp.;The Canam Manac Group.
 - b. Epic Metals Corporation.
 - c. Nucor Corp.; Vulcraft Division.
 - d. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

2.2 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 - 2. Deck Profile: As indicated.
 - 3. Profile Depth: As indicated.
 - 4. Design Uncoated-Steel Thickness: As indicated.
 - 5. Span Condition: As indicated.
 - 6. Side Laps: Overlapped.

2.3 COMPOSITE FLOOR DECK

- A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: As indicated.

2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- H. Galvanizing Repair Paint: ASTM A 780.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.

- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members as indicated on drawings.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals indicated on drawings.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions and as indicated on drawings. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds as indicated on drawings.

1. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals indicated on drawings.
- B. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 1. End Joints: Butted.
- C. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
- D. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

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 prepare test reports.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
1. Exterior non-load-bearing wall framing.
 2. Ceiling joist framing.
- B. Related Sections include the following:
1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
 2. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
 3. Division 9 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 Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
 - b. Ceiling Joist Framing: Vertical deflection of 1/240 of the span.
 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 3/4 inch.

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- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
 - 2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding certificates.
- D. Qualification Data: For testing agency.
- E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
 - 1. Expansion anchors.
 - 2. Power-actuated anchors.
 - 3. Mechanical fasteners.
 - 4. Vertical deflection clips.
 - 5. Miscellaneous structural clips and accessories.
- F. Research/Evaluation Reports: Evidence of cold-formed metal framing's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

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. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
 - 1. Clark Steel Framing.
 - 2. Dale/Incor.
 - 3. Dietrich Metal Framing; a Worthington Industries Company.
 - 4. MarinoWare; a division of Ware Industries.
 - 5. Super Stud Building Products, Inc.
 - 6. Unimast, Inc.
 - 7. 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: 33 for minimum uncoated steel thickness of 0.0428 inch and less; 50, Class 3 for minimum uncoated steel thickness of 0.0538 inch and greater.
 2. Coating: G60.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0329 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.
 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard bypass or infill clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dietrich Metal Framing; a Worthington Industries Company.
 - b. MarinoWare, a division of Ware Industries.
 - c. The Steel Network, Inc.
- D. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0538 inch.
 - b. Flange Width: 2 inches.
 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: 0.0538 inch.

- b. Flange Width: 3 inches

2.4 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with enlarged service holes, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0329 inch.
 - 2. Flange Width: 1-5/8 inches, minimum.

2.5 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. End clips.
 - 5. Hole reinforcing plates.
 - 6. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- E. 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.

- F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 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 PREPARATION

- A. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 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. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. 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.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and 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 double deep-leg deflection tracks and anchor outer track to building structure.
 - 2. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated 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 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
 - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
 - 1. Joist Spacing: 16 inches.
- D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 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.

END OF SECTION 054000END OF SECTION 054000

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Steel ladders.
 - 2. Folding ships ladders
 - 3. Loose steel lintels.
 - 4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 - 5. Miscellaneous metal trim.
- B. Related Sections include the following:
 - 1. Division 5 Section "Structural Steel" for structural-steel framing system components.
 - 2. Division 6 Section "Miscellaneous Carpentry" for metal framing anchors and other rough hardware.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.
- B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 1. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Samples for Verification: For each type and finish of extruded nosing and tread.
- D. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
- E. Welding Certificates: Copies of certificates for welding procedures and personnel.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project

names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.3, "Structural Welding Code--Sheet Steel."
 - 3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: For metal fabrications 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.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- E. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- F. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.
- G. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 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.
 - 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. ZRC Cold Galvanizing Compound; ZRC Worldwide.
- 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.

2.4 FASTENERS

- A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36.

- D. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
- G. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).
- H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).
- I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).
- J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.5 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.

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Shear and punch metals cleanly and accurately. Remove burrs.
- C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. 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.

- E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- J. Remove sharp or rough areas on exposed traffic surfaces.
- K. 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.

2.7 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated, for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels to provide minimum bearing length at each side of opening equal to 8 inches (203 mm), unless otherwise indicated.
- D. Hot dip galvanize loose lintel fabrications for use in exterior walls after fabrication, to comply with G60 (Z180) requirements.

2.8 STEEL LADDERS

- A. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.
 - 1. Comply with ANSI A14.3, unless otherwise indicated.
 - 2. For elevator pit ladders, comply with ASME A17.1.
 - 3. For fixed ladders, comply with OSHA 1910.27.

- B. Folding Ships Ladders:
 - 1. Alaco Ladder Co., Model # 465 (Basis of Design)
 - 2. Okeeffe's , Inc., Model – Equivalent to Basis of Design
 - 3. Precision Ladders, LLC, Model – Equivalent to Basis of Design
- C. Siderails: Continuous, 1/2-by-2-1/2-inch (12-by-64-mm) steel flat bars, with eased edges, spaced 18 inches (457 mm) apart.
- D. Channel Rungs: perforated galvanized steel channel shaped sections; the web of the channel to be covered with 3 rows of small perforated dimples, produced by a cold forming process. Channel to be 1.5 lbs / LF. Rungs spaced 12 inches (300 mm) o.c.
- E. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
- F. Support each ladder at top and bottom and not more than 48 inches (1219 mm) o.c. with welded or bolted steel brackets. Size brackets to support design loads specified in ANSI A14.3.
- G. Galvanize ladders, including brackets and fasteners, in the following locations:
 - 1. Exterior.

2.9 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates after fabrication.

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.
- B. General: Provide steel framing and supports indicated and as necessary to complete the Work.
- C. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long at 24 inches (600 mm) o.c., unless otherwise indicated.
 - 3. Furnish inserts if units must be installed after concrete is placed.
- D. Fabricate supports for operable partitions as follows:

1. Beams: Continuous steel shapes of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

E. Galvanize miscellaneous framing and supports where indicated.

2.11 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural-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. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.

C. Galvanize miscellaneous steel trim in the following locations:

1. Exterior.
2. Interior, where indicated.

2.12 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.13 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. 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. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.
- B. 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.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 SETTING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 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, if any.

- B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

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 (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 05 51 00 - METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Preassembled steel stairs with concrete-filled treads.
 2. Industrial-type stairs with steel grating treads.
 3. Steel tube railings attached to metal stairs and to walls adjacent to metal stairs.
- B. See Division 5 Section "Pipe and Tube Railings" for pipe and tube railings.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Stairs: Provide metal stairs capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
 2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
 3. Uniform and concentrated loads need not be assumed to act concurrently.
 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.
- B. Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Handrails:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 2. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 3. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).

- b. Uniform load of 25 lbf/sq. ft. (1.2 kN/sq. m) applied horizontally.
- c. Infill load and other loads need not be assumed to act concurrently.

1.3 SUBMITTALS

- A. Product Data: For metal stairs.
- B. Shop Drawings: 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.

1.4 COORDINATION

- A. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500 (cold formed).
- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

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- E. Wire Rod for Grating Crossbars: ASTM A 510 (ASTM A 510M).
 - F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30 (Grade 205).

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
- C. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.
- D. Welded Wire Fabric: ASTM A 185, 6 by 6 inches (152 by 152 mm)--W1.4 by W1.4, unless otherwise indicated.

2.4 FABRICATION

- A. Provide complete stair assemblies, including metal framing, hangers, struts, 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. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. At exposed connections, finish exposed welds smooth and blended.
 - 2. Use connections that maintain structural value of joined pieces.
 - 3. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
 - 4. Form bent-metal corners to smallest radius possible without impairing work.
 - 5. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
- B. Stair Framing: Fabricate stringers of steel plates or channels. Construct platforms of steel plate or channel headers and miscellaneous framing members.
 - 1. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.
 - 2. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.0677 inch (1.7 mm).

1. At Contractor's option, provide stair assemblies with metal-pan subreads filled with reinforced concrete during fabrication.
- D. Metal Floor Plate Stairs: Form treads and platforms from rolled-steel floor plate of thickness needed to comply with performance requirements but not less than 1/4 inch (6.4 mm). Form treads with integral nosing and back edge stiffener. Weld steel supporting brackets to stringers and weld treads to brackets.
- E. Metal Bar-Grating Stairs: Comply with NAAMM MBG 531, "Metal Bar Grating Manual."
1. Fabricate treads and platforms from steel grating with 1-1/4-by-3/16-inch (32-by-5-mm) bearing bars at 15/16 inch (24 mm) o.c. and crossbars at 4 inches (100 mm) o.c.
 2. Fabricate treads and platforms from steel grating with 1-by-3/16-inch (25-by-5-mm) bearing bars at 11/16 inch (17 mm) o.c. and crossbars at 4 inches (100 mm) o.c.
 3. Fabricate grating treads with rolled-steel floor plate nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
- F. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
1. Configuration: 1-5/8-inch- (41-mm-) diameter] top and bottom rails, 1-1/2-inch- (38-mm-) square posts, and 1/2-inch- (13-mm-) square pickets spaced less than 4 inches (100 mm) clear.
 2. Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose.
 3. Form curves by bending members in jigs to produce uniform curvature without buckling.
 4. Close exposed ends of railing members with prefabricated end fittings.
 5. Provide wall returns at ends of wall-mounted handrails.
 6. Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
 7. Connect posts to stair framing by direct welding.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal stairs after assembly.
- B. Hot-dip galvanize items indicated to be galvanized. Comply with ASTM A 123/A 123M or ASTM A 153/A 153M as applicable.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below for environmental exposure conditions of installed products:
1. Exterior Stairs (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Interior Stairs (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

- D. Apply shop primer to uncoated surfaces of metal stair components. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- B. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.
- C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints. 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.
- D. Place and finish concrete fill for treads and platforms to comply with Division 3 Section "Cast-in-Place Concrete."
 - 1. Install abrasive nosings with anchors fully embedded in concrete.
- E. Install precast treads with adhesive supplied by manufacturer.
- F. Attach handrails to wall with wall brackets.
 - 1. Use type of bracket with predrilled hole for exposed bolt anchorage.
- G. Adjusting and Cleaning:
 - 1. 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.
 - 2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 51 00

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

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. Aluminum pipe and tube handrails - interior and exterior.
- B. Related Sections include the following:
 - 1. Division 5 Section "Metal Stairs" for steel pipe guard railings included with metal stairs.

1.3 PERFORMANCE REQUIREMENTS

- A. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:
 - 1. Aluminum: AA 30, "Specifications for Aluminum Structures."
- B. Structural Performance of Handrails: Provide handrails and railings capable of withstanding structural loads required by Section 4.4 of ASCE 7 without exceeding allowable design working stresses of materials for handrails, railings, anchors, and connections.
- C. Thermal Movements: Provide handrails that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 60 deg F (33 deg C), ambient; 60 deg F (33 deg C), material surfaces.
- D. Control of Corrosion: 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 the following:
 - 1. Manufacturer's product lines of mechanically connected handrails.
 - 2. Grout, anchoring cement, and paint products.

- B. Shop Drawings: Show fabrication and installation of handrails. Include plans, elevations, sections, component details, and attachments to other Work.
 - 1. For installed handrails indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Coordinate with structural design of guardrails under Division 5 "Metal Stairs" to ensure that entire system of handrails and guards complies with structural loading requirements of Section 4.4 of ASCE 7.
- C. Samples for Verification: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
 - 1. 6-inch- (150-mm-) long sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.
- D. 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.
- E. Product Test Reports: From a qualified testing agency indicating products comply with requirements, based on comprehensive testing of current products.
- F. Product Test Reports: From a qualified testing agency indicating handrails and railings comply with ASTM E 985, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

- A. 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 handrails that are similar to those indicated for this Project in material, design, and extent.
- B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain each type of handrail through one source from a single manufacturer.

1.6 STORAGE

- A. Store handrails in a dry, well-ventilated, weathertight place.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify handrail dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate installation of anchorages for handrails. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.9 SCHEDULING

- A. Schedule installation so handrails are mounted only on completed walls or supports. Do not support temporarily by any means that does not satisfy structural performance requirements.

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. Aluminum Pipe and Tube Railings:
 - a. Alumaguard.
 - b. Aluminum Tube Railings, Inc.
 - c. Architectural Art Mfg., Inc.
 - d. Blum: Julius Blum & Co., Inc.
 - e. Moultrie Manufacturing Co.
 - f. Newman Bros., Inc.
 - g. Sterling Fabricated Systems, Inc.
 - h. Superior Aluminum Products, Inc.
 - i. Thompson Fabricating Company.
 - j. Wagner: R & B Wagner, Inc.

2.2 METALS

- A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

- B. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
 - 1. Extruded Bar and Tube: ASTM B 221 (ASTM B 221M), alloy 6063-T5/T52.
 - 2. Extruded Structural Pipe and Tube: ASTM B 429, alloy 6063-T6.
 - 3. Drawn Seamless Tube: ASTM B 210 (ASTM B 210M), alloy 6063-T832.
 - 4. Plate and Sheet: ASTM B 209 (ASTM B 209M), alloy 6061-T6.
 - 5. Die and Hand Forgings: ASTM B 247 (ASTM B 247M), alloy 6061-T6.
 - 6. Castings: ASTM B 26/B 26M, alloy A356-T6.
- C. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.3 WELDING MATERIALS, FASTENERS, AND ANCHORS

- A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.
 - 1. For aluminum handrails and railings, use fasteners fabricated from Type 304 or Type 316 stainless steel.
 - 2. For stainless-steel handrails and railings, use fasteners fabricated from Type 304 or Type 316 stainless steel.
 - 3. For steel handrails, railings, and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- C. Fasteners for Interconnecting Handrail Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
 - 1. Provide concealed fasteners for interconnecting handrail components and for attaching them to other work, unless otherwise indicated.

2.4 FABRICATION

- A. General: Fabricate handrails to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble handrails in the 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. Use connections that maintain structural value of joined pieces.
- C. Form changes in direction of railing members as follows:

1. By bending.
 2. By radius bends of radius indicated.
 3. By flush radius bends.
 4. By mitering at elbow bends.
 5. By inserting prefabricated flush-elbow fittings.
 6. By any method indicated above, applicable to change in direction involved.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- E. Welded Connections: Fabricate handrails for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove flux immediately.
 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- F. Nonwelded Connections: Fabricate handrails by connecting members with concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
1. Fabricate splice joints for field connection using an epoxy structural adhesive where this is manufacturer's standard splicing method.
- G. Welded Connections for Aluminum Pipe: Fabricate pipe handrails to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.
- I. Provide inserts and other anchorage devices for connecting handrails to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
- J. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- K. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- L. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

- M. 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.
- N. Fabricate joints that will be exposed to weather in a watertight manner.
- O. Close exposed ends of handrail members with prefabricated end fittings.
- P. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.
- Q. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.5 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.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of handrails.

2.6 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
- B. 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 607.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required to install handrails. Set handrails accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.
 - 1. Do not weld, cut, or abrade surfaces of handrail components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).
- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- D. Adjust handrails before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of handrails and railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ATTACHING HANDRAILS TO WALLS AND SUPPORTS

- A. Attach handrails to wall with wall brackets, and to guard railings with brackets suitable for the application. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.

3.5 CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

3.6 PROTECTION

- A. Protect finishes of handrails from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 52 13

SECTION 06 10 53 - MISCELLANEOUS CARPENTRY

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. Wood blocking, cants, and nailers.
 - 2. Wood furring.
 - 3. Miscellaneous lumber and plywood.
- B. Related Sections include the following:
 - 1. Division 6 Section "Interior Architectural Woodwork" for interior woodwork not specified in this Section.

1.3 DEFINITIONS

- A. 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 - Southern Pine Inspection Bureau.
 - 4. WCLIB - West Coast Lumber Inspection Bureau.
 - 5. WWPA - Western Wood Products Association.

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, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
 - 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. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Power-driven fasteners.
 4. Powder-actuated fasteners.
 5. Expansion anchors.
 6. Metal framing anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place 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 lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 4. Provide dressed lumber, S4S, unless otherwise indicated.
 5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.
- B. Wood Structural Panels:
1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
 2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
 3. Comply with "Code Plus" provisions in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial."
 4. Factory mark panels according to indicated standard.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWA C2 (lumber) and AWWA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWWA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWWA C20 (lumber) and AWWA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
 2. Use treatment that does not promote corrosion of metal fasteners.
 3. Use Exterior type for exterior locations and where indicated.
- B. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Cants.
 3. Nailers.

4. Furring.
- B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and any of the following species:
1. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
 2. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.
 3. Eastern softwoods; NELMA.
 4. Northern species; NLGA.
 5. Western woods; WCLIB or WWPA.
- C. For exposed boards, provide lumber with 15 percent maximum moisture content and the following species and grades:
1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Finish or 1 Common (Colonial) grade; NELMA, NLGA, WCLIB, or WWPA.
 2. Hem-fir or Hem-fir (north), Superior or C & Btr Finish grade; NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or Spruce-pine-fir, 1 Common grade; NELMA, NLGA, WCLIB, or WWPA.
 4. Western red cedar, A grade; NLGA or WWPA.
- D. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Hem-fir or Hem-fir (north), Standard or 3 Common grade; NLGA, WCLIB, or WWPA.
 2. Spruce-pine-fir (south) or Spruce-pine-fir, Standard or 3 Common grade; NELMA, NLGA, WCLIB, or WWPA.
 3. Eastern softwoods, No. 3 Common grade; NELMA.
 4. Northern species, No. 3 Common grade; NLGA.
 5. Western woods, Standard or No. 3 Common grade; WCLIB or WWPA.

2.5 PANEL PRODUCTS

- A. Miscellaneous Concealed Plywood: Exterior sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch (13 mm).
- B. Miscellaneous Exposed Plywood: DOC PS 1, A-D Interior, thickness as indicated but not less than 5/8 inch (16 mm).
- C. 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 5/8 inch (16 mm) thick.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.7 METAL FRAMING ANCHORS

- A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and acceptable to authorities having jurisdiction.
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

- C. Apply field treatment complying with AWP A M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- E. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.
- F. Use fasteners of appropriate type and length. Pre-drill members when necessary to avoid splitting wood.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
 - 1. Fire block furred spaces of walls, at each floor level and at ceiling, with wood blocking or noncombustible materials accurately fitted to close furred spaces.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring horizontally at 24 inches (610 mm) o.c. and vertically at 48 inches (1220 mm) o.c.

END OF SECTION 06 10 53

SECTION 061800 - STRUCTURAL GLUED-LAMINATED TIMBER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes framing using structural glued-laminated timber.
- B. Related Sections:
 - 1. Division 6 Section "Rough Carpentry" for dimension lumber items associated with structural glued-laminated timber.

1.3 DEFINITIONS

- A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Structural glued-laminated timber and connectors shall withstand the effects of structural loads shown on Drawings without exceeding allowable design working stresses listed in AITC 117 or determined according to ASTM D 3737 and acceptable to authorities having jurisdiction.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include data on lumber, adhesives, fabrication, and protection.
 - 2. For connectors, include installation instructions.
- B. Shop Drawings:
 - 1. Show layout of structural glued-laminated timber system and full dimensions of each member.
 - 2. Indicate species and laminating combination, adhesive type, and other variables in required work.

- C. Samples: Full width and depth, 24 inches long, showing the range of variation to be expected in appearance of structural glued-laminated timber.
 - 1. Apply specified factory finish to three sides of half length of each Sample.

1.6 QUALITY ASSURANCE

- A. Quality Standard: Comply with AITC A190.1.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with provisions in AITC 111.
- B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLUED-LAMINATED TIMBER

- A. General: Provide structural glued-laminated timber that complies with AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.
 - 1. Provide structural glued-laminated timber made from single species.
 - 2. Provide structural glued-laminated timber made with wet-use adhesive complying with ASTM D 2559.
- B. Species and Grades for Structural Glued-Laminated Timber: Southern Pine, Smooth Face.
- C. Appearance Grade: Architectural; Manufactured in accordance with ANSI/AITC A190.1-Latest Edition, and AITC 117-Latest Edition, and AITC 110.
 - 1. Use clear wood inserts, of matching grain and color, for filling voids and knot holes more than 1/4 inch wide.
- D. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.
- E. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.2 TIMBER CONNECTORS

- A. General: Unless otherwise indicated, fabricate from the following materials:
 - 1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36/A 36M.

- B. Fabricate beam seats from steel with 3/16-inch bearing plates, 3/4-inch- diameter-by-12-inch-long deformed bar anchors, and 0.239-inch side plates.
- C. Fabricate beam hangers from steel with 0.179-inch stirrups and 0.239-inch top plates.
- D. Provide bolts, 3/4 inch unless otherwise indicated, complying with ASTM A 307, Grade A; nuts complying with ASTM A 563; and, where indicated, flat washers.
- E. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil dry film thickness.

2.3 FABRICATION

- A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.
 - 1. Dress exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
- B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.
- C. End-Cut Sealing: Immediately after end cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.
- D. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

2.4 FACTORY FINISHING

- A. Wiped Stain Finish: Manufacturer's standard, dry-appearance, penetrating acrylic stain and sealer; oven dried and resistant to mildew and fungus.
 - 1. Color: As selected by Architect from manufacturer's full range.
- B. Clear Finish: Manufacturer's standard, two-coat, clear conversion varnish finish; oven dried and resistant to mildew and fungus.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of structural glued-laminated timber.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Erect structural glued-laminated timber true and plumb, and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
 - 1. Lift with padded slings and protect corners with wood blocking.
 - 2. Install structural glued-laminated timber to comply with Shop Drawings.
- B. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.
 - 1. Predrill for fasteners using timber connectors as templates.
 - 2. Dress exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
 - 3. Coat cross cuts with end sealer.
- C. Cutting: Avoid cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

3.3 ADJUSTING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

3.4 PROTECTION

- A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose including protection from weather, sunlight, soiling, and damage from work of other trades.
 - 1. Coordinate wrapping removal with finishing work specified in Division 9. Retain wrapping where it can serve as a painting shield.

END OF SECTION 061800

SECTION 06 20 13 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Exterior wood soffits.

- B. Related Sections include the following:

- 1. Division 6 Section "Miscellaneous Carpentry" for furring, blocking, and other carpentry work not exposed to view.

1.3 DEFINITIONS

- A. Lumber grading agencies, and the abbreviations used to reference them, include the following:

- 1. NeLMA: Northeastern Lumber Manufacturers' Association.
- 2. NLGA: National Lumber Grades Authority.
- 3. RIS: Redwood Inspection Service.
- 4. SPIB: The Southern Pine Inspection Bureau.
- 5. WCLIB: West Coast Lumber Inspection Bureau.
- 6. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

- 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical treatment manufacturer's written instructions for finishing treated material.
- 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Samples for Initial Selection: For each type of wood indicated.
- C. Samples for Verification:
 1. For each species and cut of lumber and panel products, with 1/2 of exposed surface finished; 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels.
- D. Compliance Certificates:
 1. For lumber that is not marked with grade stamp.
 2. For preservative-treated wood that is not marked with treatment quality mark.
 3. For fire-retardant-treated wood that is not marked with classification marking of testing and inspecting agency.
- E. Warranties: Special warranties specified in this Section or 2 years from substantial completion.

1.5 QUALITY ASSURANCE

- A. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1.6 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.

1.7 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 wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

2.2 WOOD SOFFITS

- A. Grade: Exterior, Grade A.
- B. Thickness: 19/32 inch, min.
- C. Face Species: Cedar
- D. Type: Tongue and groove with 6" wide nominal face.
- E. Surface: Smooth

2.3 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 applications not otherwise indicated, provide hot-dip galvanized steel fasteners.
- B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.
- C. Insect Screening for Soffit Vents: Aluminum, 18-by-16
- D. Continuous Soffit Vents: Aluminum hat channel shape with perforations, 2 inches (51 mm) wide, and in lengths not less than 96 inches.

2.4 FABRICATION

- A. Back out or kerf backs of standing and running trim wider than 5 inches (125 mm), except members with ends exposed in finished work.
- B. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime lumber to be painted, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Division 9 Section "Exterior Painting."

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 (3 mm in 2438 mm) for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) 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 CLEANING

- A. Clean exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.5 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 13

SECTION 06 20 23 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Wood Paneling and Trim.
- 2. Plastic-laminate cabinets
- 3. Plastic-laminate countertops
- 4. Closet and utility shelving
- 5. Shop finishing of interior woodwork.
- 6. Metal Grilles set in Millwork
- 7. Solid Surfacing for Window Sills

- B. Related Sections include the following:

- 1. Division 6 Section "Miscellaneous Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, including, cabinet hardware and accessories handrail brackets 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 faucets and other items installed in architectural woodwork.
3. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples for Initial Selection:

1. Shop-applied transparent finishes
2. Plastic laminates

D. Samples for Verification:

1. Lumber with or for transparent finish, not less than 50 sq. in. (300 sq. cm) 5 inches (125 mm) wide by 24 inches (600 mm) long, for each species and cut, finished on 1 side and 1 edge.
2. Veneer-faced panel products with or for transparent finish, 8 by 10 inches (200 by 250 mm) 12 by 24 inches (300 by 600 mm), for each species and cut. Include at least one face-veneer seam and finish as specified.
3. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.
4. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
 - b. Miter joints for standing trim.
5. Exposed cabinet hardware and accessories, one unit for each type and finish.

E. Product Certificates: For each type of product, signed by product manufacturer.

F. Qualification Data: For Installer and Fabricator.

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: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers
- C. Quality Standard: Quality of architectural woodwork shall meet or exceed AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, structural integrity, and other requirements.

- 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.
- 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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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.
- B. Hardware Coordination: Wardrobe unit locks shall be keyed to match classroom door lock. Coordinate with Finish Hardware supplier.

- C. Coordinate this section with all Mechanical and Electrical work.

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: Red oak, plain sliced, book matched.
- C. Wood Species for Opaque Finish: Poplar
- D. 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 M-2-Exterior Glue.
 4. Softwood Plywood: DOC PS 1, Medium Density Overlay.
 5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
- E. 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 semi exposed edges.
- F. 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:
 2. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
 - a. Formica Corporation
 - b. Nevamar Company, LLC; Decorative Products Division.
 - c. Wilsonart International; Division of Premark International, Inc.
- G. Clear Tempered Float Glass for Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3; manufactured by horizontal (roller hearth) process, with exposed edges seamed before tempering, 6mm thick, unless otherwise indicated.
- H. Clear Tempered Float Glass for Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3; with exposed edges seamed before tempering, 6mm thick, unless otherwise indicated.

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.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets. Wardrobe units keying to match classroom door locks. Coordinate with Division 8.
- B. Hinges: Provide 5 knuckle hospital tip institutional grade quality, 0.83, offset type hinges for swinging doors. Hinges shall be 2 ½" long with a non-removable pin and be satin finish stainless steel.
 - a. Doors under 48" in height shall receive two (2) hinges.
 - b. Doors exceeding 48 " in height shall receive three (3) hinges.
 - c. Hinges shall be mounted using four (4) flat head screws to the cabinet end and five (5) flat head screws to the door resulting in a minimum weight load capacity of 200 pounds minimum.
- C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081 or with shelf brackets, B04112.
- F. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- G. 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.
- H. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.
- I. Locks: all cabinet locks to be keyed alike.
 - 1. Door Locks: BHMA A156.11, E07121.
 - 2. Drawer Locks: BHMA A156.11, E07041.

- J. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Product: Subject to compliance with requirements, provide "OG series" by Doug Mockett & Company, Inc.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.
- M. Metal grilles in radiation enclosures and countertops:
 - 1. Model CT-PP-O, 0 deg. deflection, extruded aluminum supplied with type 13 border, manufactured by Titus Products- Div. Phillips Industries in lengths and widths as indicated on the drawings or as otherwise required. Finish: Color as selected from manufacturer's full range.
- N. Metal grills in toe space of millwork unit and where otherwise required:
 - 1. Model 2000 FP pencil proof linear bar floor grille, 0 deg. deflection, extruded aluminum manufactured by Metal Industries, Inc. in lengths and widths indicated or as required. Finish color: As selected from manufacturer's full range.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Contact Adhesive: 250 g/L.
- E. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive.

2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium 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 $\frac{3}{4}$ Inch (19 mm) Thick or Less: $\frac{1}{16}$ inch (1.5 mm).
 2. Edges of Rails and Similar Members More Than $\frac{3}{4}$ Inch (19 mm) Thick: $\frac{1}{8}$ inch (3 mm).
 3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: $\frac{1}{16}$ inch (1.5 mm).
- 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.
 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- 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.
- G. Install glass to comply with applicable requirements in Division 8 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.6 PLASTIC-LAMINATE CABINETS

- A. Grade: Premium
- B. AWI Type of Cabinet Construction: Flush overlay
- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.
 - 4. Edges: Grade HGS.
- D. Materials for Semiexposed Surfaces:
 - 1. Surfaces other than Door and Drawer Bodies: Melamine
 - a. Edges of Plastic-Laminate Doors and Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber
 - 3. Drawer Bottoms: Hardwood plywood
 - 4. Door Fronts and Backs: High-pressure decorative laminate
- E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- F. 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 Laminate Manufacturer's full range.
- G. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.7 PLASTIC-LAMINATE COUNTERTOPS

- A. Grade: Premium
- B. High-Pressure Decorative Laminate Grade: HGS
- C. 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.

- D. Grain Direction: Parallel to cabinet fronts.
- E. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- F. Core Material: Particleboard made with exterior glue.
- G. Core Material at Sinks: Exterior-grade plywood.
- H. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

2.8 CLOSET AND UTILITY SHELVING

- A. Grade: Custom
- B. Shelf Material: 3/4-inch veneer-faced panel product with solid-lumber edge.
- C. Cleats: 3/4-inch solid lumber.
- D. Wood Species: Any closed-grain hardwood.

2.9 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Grade: Premium
- B. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building, unless otherwise indicated.
 - 1. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
- C. For trim items wider or thicker than available lumber, use veneered construction, Do not glue for width or thickness.
- D. For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.
- E. Back out or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- F. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- G. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.

2.10 FLUSH WOOD PANELING

- A. Grade: Premium
- B. Wood Species and Cut: Maple, plain sliced.
 - 1. Lumber Trim and Edges: At fabricator's option, trim and edges indicated as solid wood (except moldings) may be either lumber or veneered construction compatible with grain and color of veneered panels.
- C. Matching of Adjacent Veneer Leaves: Book match.
- D. Panel Sizes: ¾" x 60" x 60"

2.11 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- C. General: Shop finish transparent-finished interior architectural woodwork at fabrication shop.
- D. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished items specified to be field finished. Refer to Division 9 painting Sections for material and application requirements.
- E. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. 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.
- F. Transparent Finish:
 - 1. Grade: Premium
 - 2. AWI Finish System: Polyurethane
 - 3. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

2.12 SOLID SURFACE FABRICATIONS

- A. A. Solid polymer components (Corian by Dupont – Basis of Design)

1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.
3. Thickness: ¾" minimum.

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 (3 mm in 2400 mm).
- 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 or finishing screws 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 covered by trim.

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. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 2. Maintain veneer sequence matching of cabinets with transparent finish.
 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
- I. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 4. Caulk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."
- J. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- K. Refer to Division 9 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.
- 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 06 20 23

SECTION 07 11 13 - BITUMINOUS DAMPPROOFING

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 cold-applied, emulsified- asphalt dampproofing applied to the following surfaces:
 - 1. Exterior face of inner wythe of exterior masonry cavity walls.
- B. Related Sections include the following:
 - 1. Division 4 Section "Unit Masonry Assemblies" for erection of exterior masonry cavity walls.

1.3 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.

1.4 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.

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt 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 thoroughly cured.

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. Cold-Applied, Emulsified-Asphalt Dampproofing:
 - a. Euclid Chemical Company (The).
 - b. Karnak Corporation.
 - c. Koppers Industries, Inc.
 - d. Meadows, W. R., Inc.
 - e. Sonneborn, Div. of ChemRex, Inc.
 - f. Tremco, Inc..

2.2 BITUMINOUS DAMPPROOFING

- A. Odor Elimination: For interior and concealed-in-wall uses other than exterior face of inner wythe of cavity walls, provide dampproofing material warranted by manufacturer to be substantially odor free after drying for 24 hours under normal conditions.
- B. Cold-Applied, Emulsified-Asphalt Dampproofing:
 - 1. Trowel Coats: ASTM D 1227, Type II, Class 1.
 - 2. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
 - 3. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.3 MISCELLANEOUS MATERIALS

- A. Cut-Back Asphalt Primer: ASTM D 41.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
 - 1. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

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.

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 required to achieve coverages indicated.
 - 2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.
- B. 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 (6 mm) 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 (6 mm) onto shelf angles supporting veneer.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).
- B. On Interior Face of Single-Wythe Exterior Masonry Walls: Where above grade and indicated to be furred and finished, apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

3.5 CLEANING

- A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION 07 11 13

SECTION 07 21 00 - BUILDING INSULATION

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. Insulation under slabs-on-grade.
- 2. Concealed building insulation.
- 3. Vapor retarders.
- 4. Foundation insulation.

- B. Related Sections include the following:

- 1. Division 3 Section "Cast-in-Place Concrete."
- 2. Division 4 Section "Unit Masonry Assemblies" for insulation installed in cavity walls and masonry cells.
- 3. Division 7 Section "Bituminous Dampproofing" for insulation installed with Dampproofing.
- 4. Division 7 Section "EPDM Roofing" for insulation specified as part of roofing construction.
- 5. Division 7 Section "SBS-Modified Bituminous Membrane Roofing".
- 6. Division 9 Section "Gypsum Board Assemblies" and "Gypsum Board Shaft-Wall Assemblies" for installation in metal-framed assemblies of insulation specified by reference to this Section.
- 7. Division 15 Sections "Duct Insulation," "Equipment Insulation," and "Pipe Insulation."

1.3 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.
- D. Research/Evaluation Reports: For foam-plastic insulation.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source.

- 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.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.
 - 4. Approved For Plenums.

1.5 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.
- B. Protect plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Extruded-Polystyrene Board Insulation:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company.
 - c. Owens Corning.
 - d. Tenneco Building Products.
 - 2. Glass-Fiber Insulation:
 - a. CertainTeed Corporation.
 - b. Johns Manville Corporation.
 - c. Knauf Fiber Glass.
 - d. Owens Corning.

2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
 - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:
 - 1. Type IV, 1.60 lb/cu. ft. (26 kg/cu. m), unless otherwise indicated.
- C. Unfaced Mineral-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from glass; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- D. Faced Mineral-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame spread 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 one face; consisting of fibers manufactured from glass.

2.3 VAPOR RETARDERS

- 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. Reinforced-Polyethylene Vapor Retarders:
 - a. Raven Industries, Inc.; DURA-SKRIM 6WW.
 - b. Reef Industries, Inc.; Griffolyn T-65.
- B. Reinforced-Polyethylene Vapor Retarders: 2 outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft. (12 kg/100 sq. m), with maximum permeance rating of 0.0507 perm (2.9 ng/Pa x s x sq. m).
- C. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations 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 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 on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
 - 1. If not indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection board. Set in adhesive according to insulation manufacturer's written instructions.
- C. Protect top surface of horizontal insulation from damage during concrete work by applying protection board.

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. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

- C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
 - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- D. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
 - 1. Use blanket 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 blankets 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 (2438 mm), support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.
- E. Stuff glass-fiber, loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.6 INSTALLATION OF VAPOR RETARDERS

- A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (406 mm) o.c.
- C. Seal overlapping joints in vapor retarders with adhesives or vapor-retarder tape according to vapor-retarder manufacturer's instructions. Seal butt joints and fastener penetrations with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- D. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor-retarder manufacturer.
- E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
- F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.7 PROTECTION

- A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 42 13 - METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Factory-formed and field-assembled, exposed fastener and concealed-fastener, lap-seam metal wall panels.
2. Metal liner panels.
3. Metal soffit panels.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Capable of withstanding the effects of gravity loads and the following loads and stresses, based on testing according to ASTM E 1592:

1. Wind Loads: Minimum design wind pressure of 30 lbf/sq. ft., acting inward or outward.
2. Deflection Limits: Withstand test pressures with deflection no greater than 1/180 of the span and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span.
 - a. Test Pressures: 150 percent of inward and outward wind-load design pressures.

B. Seismic Performance: Provide metal wall panel assemblies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1.3 SUBMITTALS

A. Product Data: For each type of metal wall panel and accessory indicated.

B. Shop Drawings: Show layouts of metal wall panels, including plans, elevations, sections, details, and attachments to other work.

1. Include details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories.
2. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Coordination Drawings: Drawn to scale and coordinating metal wall panel installation with penetrations and wall-mounted items.

- D. Samples: For each exposed finish.
- E. Material certificates.
- F. Product test reports.
- G. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
 - 1. Installer's responsibilities include fabricating and installing metal wall panel assemblies and providing professional engineering services needed to assume engineering responsibility.
- B. Surface-Burning Characteristics: Provide insulated metal wall panels having insulation-core 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:
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal 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, metal finishes, 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 wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluorocarbon Finish Warranty Period: 20 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 for 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, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified – Centria Architectural Systems (basis of design)

2.2 PANEL MATERIALS

A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) 18 Gauge Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
2. Surface: Smooth, flat finish.
3. Exposed Finishes:
 - a. High-Performance Organic Finish: Three-coat (0.8 mils per coat), thermocured system with fluoropolymer coats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2605, except as modified below:
 - 1) Humidity Resistance: 2000 hours.
 - 2) Salt-Spray Resistance: 2000 hours.
4. Concealed Finish: White or light-colored acrylic or polyester backer finish.
5. Colors: Provide custom colors to match architect's sample.

B. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; as recommended in writing by metal wall panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.3 MISCELLANEOUS MATERIALS

A. 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 wall panels by means of plastic caps or factory-applied coating.

1. Fasteners for Wall Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

2.4 LAP-SEAM METAL WALL PANELS

- A. Lap-Seam Metal Wall Panels: Factory-formed, un-insulated, designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using fasteners and factory-applied sealant in side laps. Include accessories required for weather-tight installation.
1. Manufacturers:
 - a. CENTRIA Architectural Systems.
 - b. MBCI; Div. of NCI Building Systems.
 - c. Morin Corporation; a Metecno Group Company.
 - d. Petersen Aluminum Corporation.
 2. Type 1 - Vertical Panel Profile (Concealed Fasteners): CS-260, Concept series by Centria. Refer to drawings for various custom colors required.
 3. Type 2 - Vertical Panel Profile (Exposed Fasteners): TR4-36, Profile Series by Centria. Custom color.
 4. Material: Metallic-coated steel sheet.
 5. Mitered Corners: Microseam trimless corners as manufactured by Centria.
 6. Integrated Trim: Microline extrusions as manufactured by Centria.

2.5 METAL LINER PANELS

- A. General: Provide factory-formed metal liner panels designed for interior side of metal wall panel assemblies and field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners **and factory-applied sealant** in side laps. Include accessories required for a complete installation.
- B. Flush-Profile Metal Liner Panels **Solid** panels formed with vertical panel edges and **intermediate stiffening ribs symmetrically spaced** between panel edges; with flush joint between panels.
1. Material: Aluminum sheet, **0.040 inch (1.02 mm)** thick.
 - a. Exterior Finish: **2-coat fluoropolymer**
 - b. Color: **As selected by Architect from manufacturer's full range.**
 2. Panel Coverage: As shown on Drawings
 3. Panel Height: As shown on Drawings
 4. Acoustical Performance: Where sound-absorption requirement is indicated, fabricate interior liner panels with 1/8-inch- (3-mm-) diameter holes uniformly spaced approximately 1000 holes/sq. ft. (10 750 holes/sq. m).

- a. NRC of not less than **0.85** when tested according to ATM C 423

2.6 METAL SOFFIT PANELS

- A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners **and factory-applied sealant** in side laps. Include accessories required for weathertight installation.
- B. Flush-Profile Metal Soffit Panels **Perforated** panels formed with vertical panel edges and **intermediate stiffening ribs symmetrically spaced** between panel edges; with flush joint between panels.
 1. Material: Aluminum sheet, **0.040 inch (1.02 mm)** thick.
 - a. Exterior Finish: **3-coat fluoropolymer**
 - b. Color: **As selected by Architect from manufacturer's full range.**

2.7 ACCESSORIES

- A. Wall Panel Accessories: Provide components required for a complete metal 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 wall panels, unless otherwise indicated.
 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
 2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Formed from 0.0179-inch- (0.45-mm-) thick, metallic-coated steel sheet. 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 wall panels.

2.8 FABRICATION

- A. General: Fabricate and finish metal 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.
 1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
 2. Fabricate wall panels with panel stiffeners as required to maintain fabrication tolerances and to withstand design loads.

- B. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Where indicated, fabricate metal wall panel joints with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.
- E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
- F. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Substrate Board: Install substrate board over wall sheathing on entire wall surface. Attach with substrate-board fasteners.
 - 1. Install substrate board with long joints in continuous straight lines, perpendicular to direction of metal wall panel seams with end joints staggered between rows. Tightly butt substrate boards together.
 - 2. Comply with UL requirements for fire-rated construction.
- B. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."
- C. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

3.2 METAL WALL PANEL INSTALLATION, GENERAL

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Field cutting of metal wall panels by torch is not permitted.
 - 2. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Pre-drill panels.
 - 3. Install screw fasteners in pre-drilled holes.

4. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
5. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
6. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners:

1. **Steel Wall Panels:** Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.
2. **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 by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.

1. Coat back side of aluminum wall panels with bituminous coating where wall panels will contact wood, ferrous metal, or cementitious construction.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.3 FIELD-ASSEMBLED METAL WALL PANEL INSTALLATION

A. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal wall panels.
3. Provide sealant tape at lapped joints of metal wall panels and between panels and protruding equipment, vents, and accessories.
4. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps, and on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.
5. At panel splices, nest panels with minimum 6-inch (150-mm) end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

B. Metal Liner Panels: Install panels on as 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 wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 2. 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.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
- B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

END OF SECTION 07 42 13

SECTION 07 42 43 – ALUMINUM COMPOSITE SYSTEMS

PART 1: GENERAL

1.01 SCOPE

A. SECTION INCLUDES

1. The extent of panel system work is indicated on the drawings and in these specifications.
2. Panel system requirements include the following components:
 - a. Aluminum faced composite panels with mounting system. Panel mounting system including anchorages, shims, furring, fasteners, gaskets and sealants, related flashing adapters, and masking (as required) for a complete installation.
 - b. Provide panels and filler items indicated as integral components of the panel system and as shown on drawings.

B. RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and Technical Specification Divisions 2 through 16 apply to this Section.

C. RELATED WORK SPECIFIED ELSEWHERE

1. Structural steel
2. Metal Framing
3. Insulation
4. Metal flashing and counter flashing
5. Caulking and sealants
6. Interior wall finishes

1.02 QUALITY ASSURANCE

1. Composite Panel Manufacturer shall have a minimum of 5 years experience in the manufacturing of this product.
2. Composite Panel Manufacturer shall be solely responsible for panel manufacture and application of the finish.
3. Fabricator/installer shall be acceptable to the composite panel manufacturer.
4. Fabricator/Installer shall have a minimum 5 years experience of metal panel work similar in scope and size to this project.

5. Field measurements should be taken prior to the completion of shop fabrication whenever possible. However, coordinate fabrication schedule with construction progress as directed by the Contractor to avoid delay of work. Field fabrication may be allowed to ensure proper fit. However, field fabrication shall be kept to an absolute minimum with the majority of the fabrication being done under controlled shop conditions.
6. Shop drawings shall show the preferred joint details providing a structurally sound wall panel system that allows no uncontrolled water penetration on the inside face of the panel system as determined by ASTM E 331. Systems not utilizing a construction sealant at the panel joints (i.e. Rout and Return Dry and Rear Ventilated System) shall provide a means of concealed drainage with baffles and weeps for water which may accumulate in members of the system.
7. Maximum deviation from vertical and horizontal alignment of erected panels: 6mm (1/4") in 6m (20') non-accumulative.
8. Panel fabricator/installer shall assume undivided responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.
9. Composite panel manufacturer shall have established a Certification Program acceptable to the local Code Authorities.

1.03 REFERENCES

A. ALUMINUM ASSOCIATION

1. AA-M12C22A41: Anodized - Clear Coating
2. AA-M12C22A44: Anodized - Color Coating

B. AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION

1. AAMA 508-05: Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems

C. AMERICAN SOCIETY FOR TESTING AND MATERIALS

1. E 330 Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads
2. E 283 Rate of Leakage through Exterior Windows, Curtain Walls, and Doors
3. D 1781 Climbing Drum Peel Test for Adhesives
4. E 84 Surface Burning Characteristics of Building Materials
5. D 1929 Standard Test for Ignition Properties of Plastics
6. D 3363 Method for Film Hardness by Pencil Test
7. D 2794 Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
8. D 3359 Methods for Measuring Adhesion by Tape Test

9. D 2247 Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
10. B 117 Method of Salt Spray (Fog) Testing
11. D 2244 Calculation of Color Differences from Instrumentally Measured Color Coordinates
12. D 4214 Evaluating the Degree of Chalking of Exterior Paint Films
13. D 822 Practice for Operating Light and Water Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products
14. D 1308 Effect of Household Chemicals on Clear and Pigmented Organic Finishes.

1.04 SUBMITTALS

A. SUBMITTALS SHALL BE IN CONFORMANCE WITH DIVISION 1

B. SAMPLES

1. Panel System Assembly: Two samples of each type of assembly. 304mm (12") x 304mm (12") minimum.
2. Two samples of each color or finish selected, 76mm (3") x 102mm (4") minimum.

C. SHOP DRAWINGS

Submit shop drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants, and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.

D. AFFIDAVIT CERTIFYING MATERIAL MEETS REQUIREMENTS SPECIFIED.

E. TWO COPIES OF MANUFACTURER'S LITERATURE FOR PANEL MATERIAL.

F. CODE COMPLIANCE

Documents showing product compliance with the national and local building code shall be submitted prior to the bid. These documents shall include, but not be limited to, appropriate Evaluation Reports and/or test reports supporting the use of the product.

G. ALTERNATE MATERIALS MUST BE APPROVED BY THE ARCHITECT PRIOR TO THE BID DATE.

1.05 DELIVERY, STORAGE AND HANDLING

1. Protect finish and edges in accordance with panel manufacturer's recommendations.
2. Store material in accordance with panel manufacturer's recommendations.

PART 2: PRODUCTS

2.01 PANELS

A. COMPOSITE PANEL MANUFACTURERS

1. Subject to compliance with the Contract Documents and Specifications, provide Aluminum Composite Systems as manufactured by ALPOLIC manufactured by Mitsubishi Chemical FP America, Inc. or a comparable product from the following manufactures.
2. ALUCOBOND Plus material manufactured by Alcan Composites USA, Inc. 208 West 5th Street Benton, KY 42025 Phone: (800)-626-3365 or 270-527-4200)
3. REYNOBOND (FR) manufactured by Alcoa Incorporated, 201 Isabella St., Pittsburgh, PA 15212 , Phone: (412) 553-4545.

B. THICKNESS: 4MM (0.157")

C. PRODUCT PERFORMANCE

1. Bond Integrity

When tested for bond integrity, in accordance with ASTM D 1781 (simulating resistance to panel delamination), there shall be no adhesive failure of the bond a) between the core and the skin nor b) cohesive failure of the core itself below the following values:

Peel Strength: 100 N·mm/mm (22.5 in lb/in) as manufactured
100 N·mm/mm (22.5 in lb/in) after 21 days soaking in water at 70°F (21°C)

2. Fire Performance

ASTM E 84 Max. Flame Spread 25, Max. Smoke Developed 450
NFPA 285 Panels shall meet requirements of the Intermediate Scale Multi Story Test

D. FINISHES

1. Coil coated KYNAR® 500 in conformance with the following general requirements of AAMA 2605.

a. Color:

- 1) Custom colors as selected by the architect.

b. Coating Thickness:

- 1) Colors: 1.0 mil (±0.2 mil)

c. Hardness: ASTM D 3363; HB minimum using Eagle Turquoise Pencil.

- d. Impact:
 - 1) Test method: ASTM D 2794; Gardner Variable Impact Tester with 5/8" (15.9mm) mandrel.
 - 2) Coating shall withstand reverse impact of 1.5 in-lb per mil substrate thickness (0.681 m·kg per mm substrate).
 - 3) Coating shall adhere tightly to metal when subjected to #600 Scotch Tape pick-off test. Slight minute cracking permissible. No removal of film to substrate.

- e. Adhesion:
 - 1) Test Method: ASTM D 3359.
 - 2) Coating shall not pick off when subjected to a grid of 11 cuts x 11 cuts, 1/16" apart, and taped with #600 Scotch Tape.

- f. Humidity Resistance
 - 1) Test Method: ASTM D 2247.
 - 2) No formation of blisters when subjected to condensing water fog at 100% relative humidity and 100°F (37.8°C) for 4000 hours.

- g. Salt Spray Resistance:
 - 1) Test Method: ASTM B 117; Expose coating system to 4000 hours, using 5% NaCl solution.
 - 2) Corrosion creepage from scribe line: 1/16" max. (1.6mm).
 - 3) Minimum blister rating of 8 within the test specimen field.

- h. Weather Exposure
 - 1) Outdoor:
 - a. Ten-year exposure at 45° angle facing south Florida exposure.
 - b. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D 2244.
 - c. Maximum chalk rating of 8 in accordance with ASTM D 4214.
 - d. No checking, crazing, adhesion loss.

- i. Chemical Resistance:
 - 1) ASTM D 1308 utilizing 10% Muriatic Acid for an exposure time of 15 minutes. No loss of film adhesion or visual change when viewed by the unaided eye.
 - 2) ASTM D 1308 utilizing 20% Sulfuric Acid for an exposure time of 18 hours. No loss of film adhesion or visual change when viewed by the unaided eye.
 - 3) AAMA 2605 utilizing 70% reagent grade Nitric Acid vapor for an exposure time of 30 minutes. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D 2244.

2.02 PANEL FABRICATION

A. COMPOSITION:

Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.

B. ALUMINUM FACE SHEETS:

Thickness: 0.5mm (0.0197") (nominal)
Alloy: AA3000 Series (Painted material)

C. PANEL WEIGHT:

4mm (0.157"): 7.57 kg/m² (1.55 lb/ft²)

D. TOLERANCES

1. Panel Bow: Maximum 0.8% of any 1828mm (72") panel dimension.
2. Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.
3. Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.
4. Maximum deviation from panel flatness shall be 1/8" (3.2mm) in 5'0" (1.52m) on panel in any direction for assembled units. (Non-accumulative - No Oil Canning)

E. SYSTEM CHARACTERISTICS

1. Plans, elevations, details, characteristics, and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers, receiving prior approval, may be acceptable, provided their details and characteristics comply with size and profile requirements, and material/performance standards.
2. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.
3. System shall comply with the applicable provisions of the "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.
4. Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 70°F (21°C).
5. Fabricate panel system so that no restraints can be placed on the panel, which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature change and at all times remain air and water tight.
6. The finish side of the panel shall have a removable plastic masking applied prior to fabrication, which shall remain on the panel during fabrication, shipping, and erection to protect the surface from damage.

F. SYSTEM TYPE

1. **Rout and Return Dry:**
System must provide a perimeter aluminum extrusion with integral weather-stripping as detailed on drawings.

No field sealant required in joints unless specifically noted on drawings.

G. SYSTEM PERFORMANCE

1. Composite panels shall be capable of withstanding building movements and weather exposures based on the following test standards required by the Architect and/or the local building code.

- a. **Wind Load**

If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory, which show compliance to the following minimum standards:

Panels shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 20 lb/ft² (959 N/m²) and 30 lb/ft² (1438 N/m²) on parapet and corner panels. Wind load testing shall be conducted in accordance with ASTM E 330 to obtain the following results.

Normal to the plane of the wall between supports, deflection of the secured perimeter-framing members shall not exceed L/175 or 3/4" (19mm), whichever is less.

Normal to the plane of the wall, the maximum panel deflection shall not exceed L/60 of the full span.

Maximum anchor deflection shall not exceed 1/16" (1.6mm).

At 1-1/2 times design pressure, permanent deflections of framing members shall not exceed L/100 of span length and components shall not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed 1/16" (1.6mm).

- b. **Air/Water System Test**

If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory, which show compliance to the following minimum standards:

Air Infiltration - When tested in accordance with ASTM E 283, air infiltration at 1.57 lb/ft² (75 Pa) must not exceed 0.06 ft³/min. per ft² of wall area (305 cm³/s per m² of wall area).

Water Infiltration - Water infiltration is defined as uncontrolled water leakage through the exterior face of the assembly. Systems not using a construction sealant at the panel joints (i.e. Rout and Return Dry and Rear Ventilated Systems) shall be designed to drain any water leakage occurring at the joints. No water infiltration

shall occur in any system under a differential static pressure of 6.24 lb/ft² (300 Pa) after 15 minutes of exposure in accordance with ASTM E 331.

2.03 ACCESSORIES

1. Extrusions, formed members, sheet, and plate shall conform with ASTM B 209 and the recommendations of the manufacturer.
2. Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.
3. Sealants and gaskets within the panel system shall be as per manufacturer's standards to meet performance requirements.
4. Fabricate flashing materials from 0.030" (0.76mm) minimum thickness aluminum sheet painted to match the adjacent curtain wall / panel system where exposed. Provide a lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.
5. Fasteners (concealed/exposed/non-corrosive): Fasteners as recommended by panel manufacturer. Do not expose fasteners except where unavoidable and then match finish of adjoining metal.

PART 3: EXECUTION

3.01 INSPECTION

1. Surfaces to receive panels shall be even, smooth, sound, clean, dry and free from defects detrimental to work. Notify contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with erection until unsatisfactory conditions have been corrected.
2. Surfaces to receive panels shall be structurally sound as determined by a registered Architect/Engineer.

3.02 INSTALLATION

1. Erect panels plumb, level, and true.
2. Attachment system shall allow for the free and noiseless vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of -20°F to +180°F (-29°C to +82°C). Buckling of panels, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement will not be permitted.
Fabrication, assembly, and erection procedure shall account for the ambient temperature at the time of the respective operation.
3. Panels shall be erected in accordance with an approved set of shop drawings.

4. Anchor panels securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.
5. Conform to panel fabricator's instructions for installation of concealed fasteners.
6. Do not install component parts that are observed to be defective, including warped, bowed, dented, abraded, and broken members.
7. Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in visual imperfection or a failure in performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement with new parts.
8. Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

3.03 ADJUSTING AND CLEANING

1. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the General Contractor.
2. Repair panels with minor damage.
3. Remove masking (if used) as soon as possible after installation. Masking intentionally left in place after panel installation on an elevation, shall become the responsibility of the General Contractor.
4. Any additional protection, after installation, shall be the responsibility of the General Contractor.
5. Make sure weep holes and drainage channels are unobstructed and free of dirt and sealants. Final cleaning shall not be part of the work of this section.

END OF SECTION 07 42 43

SECTION 07 44 23 – CERAMIC TILE CLADDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Metal anchors to structural wall substrate.
- B. Compartmenting pressure equalized air space behind tile cladding.

1.2 RELATED SECTIONS

- A. Concrete supporting wall capable of resisting imposed loads on the full wall assembly and for supporting cladding anchors.
- B. Masonry supporting wall capable of resisting imposed loads on the full wall assembly and for supporting cladding anchors.
- C. Structural Steel: Structural steel framing members capable of resisting imposed loads on the full wall assembly and for supporting cladding members.
- D. Cold Formed Metal Framing: Formed steel framed wall capable of resisting imposed loads on the full wall assembly and for supporting cladding anchors.
- E. Metal Fabrications:
 - 1. [Shelf angles and supports.]
 - 2. Metal fabricated supports for attaching cladding anchors
- F. Sheet Metal Flashing and Trim: Coping and sill flashings.
- G. Joint Sealers: Sealant for perimeter joints and incidental junctions with other materials.

1.3 REFERENCES

- A. ASTM A36 – Structural Steel.
- B. ASTM A123 – Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Froged Steel Shapes, Plates, Bars, and Strip.
- C. ASTM A167 – Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

1.4 PERFORMANCE REQUIREMENTS

- A. System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall as calculated in accordance with current building codes.
- B. Seismic Loads: Design and size components to withstand seismic loads and away displacement as calculated in accordance with current building codes.
- C. Deflection: Limit deflection to flexure limit of tile with full recovery of components.
- D. Full Wall Assembly: Accommodate without damage to tile cladding, components or deterioration of seals, movement within assembly, movement between tile and support framing components, dynamic loading and release of loads, deflection of structural support framing, tolerance or supporting components, shortening of building concrete structural columns, creep of concrete structural members, inter-story drift, and mid-span slab edge deflections.
- E. Air Space Drainage: Drain water entering joints, condensation occurring, or migrating moisture occurring within assembly, to the exterior by a weep drainage network.
- F. Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or component of full wall assembly.

1.5 SUBMITTALS

- A. Submission procedures.
- B. Shop Drawings: Indicate layout, pertinent tile dimensions, anchorages, head, jamb, and sill joint space details and measurements, jointing methods, and related details.
- C. Product Data: Provide data and properties on tile units, colors and surface sheens available, and anchor configuration.
- D. Submit two samples, 4 x 4 inch in size min., illustrating tile sizes, color range and texture, markings, and surface finish.
- E. Submit tile manufacturer's installation instructions and field erection or setting drawings.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with manufacturer's instructions.
- B. Maintain two copies of manufacturer's instructions, on site.

1.7 QUALIFICATIONS

- A. Tile Installer: Company specializing in performing the work of this section and approved by tile manufacturer with minimum 5 years documented experience.

- B. Design anchors and supports under direct supervision of a registered Professional Structural Engineer, registered in Connecticut.

1.8 MOCK-UP

- A. Provide mock-up of tile wall cladding.
- B. Construct wall mock-up, 4 feet long by 4feet wide, including tile anchors and accessories, sill and head finishings, and corner condition.
- C. Locate where directed.
- D. Mock-up may not remain as part of the Work.

1.9 PRE-INSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this section.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site.
- B. Protect tile from breakage or discoloration.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. During temporary storage on site, at the end of working day, or during rainy weather, cover tile work exposed to weather with non-staining waterproof coverings, securely anchored.

1.12 SEQUENCING

- A. Sequence work to coordinate the installation of tile work with installation of adjacent construction.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Deutsche Steinzeug America Inc., (DSA) Agrob-Buchtal: (Basis of Design)
 - 1. Product: Kera Twin K3,
 - 2. Phone: 1-800-584-5501; Facsimile: 1-770-442-5502,
 - 3. Web site: www.dsa-ceramics.com
 - 4. With concealed-from-view anchorage components.

- B. Shildan, Inc., Product: Equivalent to Basis of Design.
- C. NBK Keramik, Product: Equivalent to Basis of Design.

2.2 TILE

- A. Tile: KeraTwin K3, ceramic stoneware panels.
 - 1. Color: Custom multiple colors.
 - 2. Surface Texture: Glazed.
 - 3. Surface Coating: Specially coated with a hydrophilic (water friendly) antibacterial biocidal coating with self-washing and self-cleaning properties.
 - 4. Tile Thickness: 5/8 inch nominal.
 - 5. Tile Face Size:
 - a. As shown on drawings.

2.3 ACCESSORIES

- A. Attachment Device Assembly:
 - 1. Angle Brackets: Extruded aluminum, intermittent spaced, for bolting to structural building wall or framing, adjustable fittings to suit anchorage to building structure.
 - 2. Vertical T-girts: Extruded aluminum structural member, continuous, fastened to angle brackets.
 - 3. Horizontal U-channel: Extruded aluminum structural member, hat-shaped channel design, fitted with tempered flat steel springs, fitted to ceramic panels, [powder coated to color match exterior finish of ceramic panels].
 - 4. Device assembly to support panel weight, anchor devices, and applicable superimposed wind/suction loads, plus safety factors.
- B. Bolts, Washers and Nuts: Stainless steel to ASTM A167.
- C. Cavity Space Damming: Special glass fiber insulation with plastic facing, of thickness and profile to suit damming air space at building corners.
- D. Flashings: Stainless steel type.
- E. Bond Breaker Behind Sealant: Sheet 0.25 mm (10 mil) thick plastic.
- F. Sealant: Silicone type specified in Division 7; sealant color to match tile color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that support work, substrate work, and site conditions are ready to receive work of this section.

- B. Establish lines and levels. Protect from disturbance.

3.2 PREPARATION

- A. Verify that items built-in, under other sections, are properly located, sized, and secure.
- B. Clean tile prior to erection.

3.3 INSTALLATION

- A. Install flashings of longest practical length and seal water tight to back-up.
 - 1. Lap end joint minimum 150 mm (6 inches) and seal watertight.
 - 2. Slope horizontal sill surface flashings for natural wash.
- B. Erect ceramic panels, support anchor device assembly, and building corner air space damming insulation in accordance with tile manufacturer's instructions and erection drawings.
- C. Place air dam insulation at building corners:
 - 1. for full vertical height of air space and at horizontal junctions with roof construction,
 - 2. ensure complete compartmentalization of the cavity air space behind the cladding, at each building façade flat surface.
- D. Arrange tile pattern to provide a consistent joint width in both horizontal and vertical positions.
- E. Install sealant and [backing rod] [and] [bond breaker] at joints.
- F. Ensure air space venting within compartment cavity spaces, below shelf angles, and at bottom of walls.

3.4 TOLERANCES

- A. Maximum Variation from Flat Plane of Wall: ¼ inch in 10 feet.
- B. Maximum Variation Between Face Planes of Adjacent Ceramic Panels: 1/16 inch.
- C. Maximum Variation from Plumb: 1/14 inch per story non-cumulative; 1/2 inch in any two stories.
- D. Maximum Variation of Joint Spaces: 1/8 inch in 3 feet.

3.5 CUTTING AND FITTING

- A. Obtain approval prior to cutting or fitting any item not so indicated on Drawings.
- B. Do not impair appearance or strength of tile work by cutting.

3.6 CLEANING

- A. Remove excess sealant upon completion of work.
- B. Clean soiled surfaces with cleaning solution.
- C. Use non-metallic tools in cleaning operations.

END OF SECTION 07 44 23

SECTION 07 52 16 - SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

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. SBS-modified bituminous membrane roofing.
 - 2. Vapor retarder.
 - 3. Roof insulation.
 - 4. Substrate Board
- B. Related Sections include the following:
 - 1. Division 5 Section "Steel Deck" for furnishing acoustical deck rib insulation.
 - 2. Division 6 Section "Rough Carpentry" for wood nailers, cants, curbs, and blocking and for wood-based, structural-use roof deck panels.
 - 3. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
 - 4. Division 15 Section "Plumbing 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.

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 manufacturer based on testing and field experience.
- C. Roofing System Design: Provide a roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7.

- D. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a 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. Contractor is required to register online with RoofNav and provide RoofNav Assembly Number.
 - 2. Contractor shall complete FM Global Form 2688, application for acceptance of roofing system, and submit for approval prior to commencing any work.
 - E. Roofing System Design: Provide a roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist the factored design uplift pressures calculated according to SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems."
 - F. Fire/Windstorm Classification: Class 1A-90 per FM Bulletin 1-29.
 - G. Wind Resistance: Roofing system shall resist wind load pressures for cladding as required by Chapter 16 of the 2005 Connecticut State Building Code and shall be tested in accordance with FM 4450, FM 4470, UL 580 or UL 1897.
 - H. Edge Securement: Comply with ANSI/SPRI ES-1.
 - I. Physical Properties: Roofing system shall demonstrate physical integrity over the working life of the roof based upon 2,000 hours of exposure to accelerated weathering tests conducted in accordance with ASTM G 152, ASTM G 155 or ASTM G 154.
 - J. Impact resistance: Roofing system shall resist impact damage based on the results of tests conducted in accordance with ASTM D 3746, ASTM D 4272, CGSB 37-GP-52M or FM 4470.
- 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, cants, and membrane terminations.
 - 2. Tapered insulation, including slopes.
 - 3. Crickets, saddles, and tapered edge strips, including slopes.
 - 4. Insulation fastening patterns.
 - C. Samples for Verification: For the following products:
 - 1. 12-by-12-inch (300-by-300-mm) square of base sheet

2. 12-by-12-inch (300-by-300-mm) square of mineral-granule-surfaced roofing membrane cap sheet, of color specified.
 3. 12-by-12-inch (300-by-300-mm) square of vapor retarder.
 4. 12-by-12-inch (300-by-300-mm) square of roof insulation.
 5. 12-by-12-inch (300-by-300-mm) square of walkway pad or walkway cap sheet.
 6. Six 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. Qualification Data: For Installer and manufacturer.
- G. Maintenance Data: For roofing system to include in maintenance manuals.
- H. Warranties: Special warranties specified in this Section.

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 UL listing for roofing system identical to that used for this project, with 5 years min. of documented history of making and installing the specified roofing system.
- C. 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. Source Limitations: Obtain all components for roofing system from one roofing system manufacturer.
- E. Fire-Test-Response Characteristics: Provide 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. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.
- F. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner, Owner's Representative, Construction Manager, 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 storage.
- 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 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 membrane accessories, roof insulation, fasteners, substrate board, vapor retarder, walkway products and other components of roofing system.
 - 2. Warranty Period: 20 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. SBS-Modified Bituminous Membrane Roofing:
 - a. Johns Manville Roofing Systems
 - b. GAF Roofing
 - c. Soprema Roofing and Waterproofing Inc.
- B. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 SBS-MODIFIED ASPHALT-SHEET MATERIALS

- A. Roofing Membrane Base-Sheet: ASTM D 6162, Grade S, Type I or II, composite polyester- and glass-fiber-reinforced, SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified.
- B. Roofing Membrane Cap Sheet: ASTM D 6162, Grade G, Type I or II, composite polyester- and glass-fiber-reinforced, SBS-modified asphalt sheet; granular surfaced; suitable for application method specified, and as follows:
 - 1. Granule Color: White

2.3 FLASHING BASE-SHEET MATERIALS

- A. Base Sheet: ASTM D 4601, Type II, JSBS-modified asphalt-impregnated and -coated sheet, with glass-fiber-reinforcing mat, dusted with fine mineral surfacing on both sides.
 - 1. Weight 75 lb/100 sq. ft. (3.7 kg/sq. m), minimum.

2.4 FLASHING CAP SHEET MATERIALS

- A. Flashing Sheet: ASTM D 6162, Grade G, Type I or II, composite polyester-flashing cap sheet and glass-fiber-reinforced, SBS-modified asphalt sheet; granular surfaced; suitable for application method specified, and as follows:
 - 1. Granule Color: White

2.5 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.
- B. Cold-Applied Adhesive: Roofing cold applied system manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with roofing membrane and base flashings.
- C. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- E. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.6 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C 728, Invinga, or 1/4" DensDeck as shown on drawings.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening substrate panel to roof deck.

2.7 VAPOR RETARDER

- A. Polyethylene-Sheet Vapor Retarder: ASTM D 4397, 6 mils (0.15 mm) thick, minimum, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).

1. Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

- a. Available products: Griffolyn TX-1200FR and Griff tape FR.

2.8 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, 20 psi minimum.

1. Available Manufacturers:

- a. Firestone Building Products Company.

- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/2 inch per foot, unless otherwise indicated.
 - D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.9 INSULATION ACCESSORIES

- A. General: 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.
- C. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate or a two component polyurethane foam adhesive.
- D. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.
- E. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

2.10 WALKWAYS

- A. Walkway Pads: Polymer-modified, reconstituted solid-rubber, surface-textured, slip-resisting pads, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 3/8 inch thick, minimum.

2.12 EXPANSION JOINTS:

- B. Expansion Joints: Sheet metal expansion joint cover with high-domed, capped, gasketed fasteners. Provide unreinforced EPDM membrane closure to provide waterproof seal across joint.

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 cants, 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 5 Section "Steel Deck."

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.

3.3 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 - 1. Full bed adhere to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturer's written instructions.

3.4 VAPOR-RETARDER INSTALLATION

- A. Loosely lay polyethylene-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches (50 mm) and 6 inches (150 mm), respectively.
 - 1. Seal side and end laps with tape
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.5 INSULATION INSTALLATION

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- B. Nailer Strips: Mechanically fasten 4-inch nominal- (89-mm actual-) width wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:
 - 1. 16 feet (4.88 m) apart for roof slopes greater than 1 inch per 12 inches (1:12) but less than 3 inches per 12 inches (3:12).
 - 2. 48 inches (1220 mm) apart for roof slopes greater 3 inches per 12 inches (3:12).
- C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.
- D. Install tapered insulation under area of roofing to conform to slopes indicated.
- E. 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 (6 mm) with insulation.
 - 1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
- F. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches (50 mm) or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.
- G. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- H. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- I. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
 - 1. Set each layer of insulation in a cold fluid-applied adhesive.

3.6 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
- B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- C. Where roof slope exceeds 1/2 inch per 12 inches (1:24) ,install roofing membrane sheets parallel with slope.
- D. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.

- E. Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.
- F. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.7 BASE-SHEET INSTALLATION

- A. Install lapped base sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:
 - 1. Adhere to substrate in a uniform coating of cold-applied adhesive.
- B. Install a second lapped base sheet course, extending sheet over and terminating beyond cants. Attach base sheet as follows:
 - 1. Adhere to substrate in a uniform coating of cold-applied adhesive.
- C. Verify base-sheet installation is complete.
- D. Allow it to set for min. 48 hours.
- E. Clean, repair voids, wrinkles, inconsistencies, air pockets, etc. prior to installation of cap sheet.

3.8 SBS-MODIFIED BITUMINOUS BASE & CAP MEMBRANES INSTALLATION

- A. Install modified bituminous roofing base sheet, and cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
 - 1. Adhere to substrate in cold-applied adhesive.
 - 2. Unroll roofing membrane sheets and allow them to relax for minimum 30 minute time period required by manufacturer.
- B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
 - 1. Repair tears and voids in laps and lapped seams not completely sealed.
- C. Install roofing membrane sheets so side and end laps shed water.

3.9 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
- B. Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above roofing membrane and 4 inches (100 mm) onto field of roofing membrane.
- C. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.
- D. Roof Drains: Set 48 by 48 inch metal flashing in bed of asphalt roofing cement on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 6 inches (150 mm) beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
 - 1. Install stripping according to roofing system manufacturer's written instructions.

3.10 WALKWAY INSTALLATION

- A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.
 - 1. Set walkway pads in cold-applied adhesive.

3.11 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 roofing system where test results or inspections indicate that they do not comply with specified requirements.

3.12 PROTECTING AND CLEANING

- A. Protect 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 roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 52 16

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following sheet metal flashing and trim:
 - 1. Manufactured reglets.
 - 2. Formed low-slope roof flashing and trim.
 - 3. Formed wall flashing and trim.
 - 4. Formed equipment support flashing.
- B. Related Sections include the following:
 - 1. Division 4 Section "Unit Masonry Assemblies" for installing through-wall flashing, reglets, and other sheet metal flashing and trim.
 - 2. Division 5 Section "Architectural Joint Systems" for manufactured sheet metal expansion-joint covers.
 - 3. Division 6 Section "Miscellaneous Carpentry" for wood nailers, curbs, and blocking.
 - 4. Division 7 Section "Metal Roof Panels" for factory-formed metal roof panels and flashing and trim not part of sheet metal flashing and trim.
 - 5. Division 7 Section "EPDM Roofing" for installing sheet metal flashing and trim integral with roofing membrane.
 - 6. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
 - 7. Division 7 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. 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. (0.48 to 0.96 kPa): 40-lbf/sq. ft. (1.92-kPa) perimeter uplift force, 60-lbf/sq. ft. (2.87-kPa) corner uplift force, and 20-lbf/sq. ft. (0.96-kPa) outward force.

C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

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.

B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
4. Details of expansion-joint covers, including showing direction of expansion and contraction.

C. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12 inches (300 mm) long. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
3. Accessories: Full-size Sample.

1.5 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1. Copper Standard: Comply with CDA's "Copper in Architecture Handbook."

- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

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. Basis-of-Design Product: The design for each flashing product specified 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 SHEET METALS

- A. Lead-Coated Copper Sheet: ASTM B 101, Temper H00 and H01, cold-rolled copper sheet, of weight (thickness) indicated below, coated both sides with lead weighing not less than 12 lb/100 sq. ft. (0.59 kg/sq. m) nor more than 15 lb/100 sq. ft. (0.73 kg/sq. m) of copper sheet (total weight of lead applied equally to both sides).

- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14, finished as follows:
1. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605. Provide custom colors as follows:
 - 1) Fascia Color 1 – Custom color typical for entire building unless noted otherwise below.
 - 2) Fascia Color 2 – Custom color to match Brick Type 'B' at Building 'D'.
 - 3) Fascia Color 3 – Custom color to match metal wall panels at Kitchen/Café.
 - 4) Coping Color 1 – Custom color to match Brick Type 'C' at Building 'E'.
 - 5) Coping Color 2 – Custom color to match Architectural Precast Concrete Panels.

2.3 UNDERLAYMENT MATERIALS

- A. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
- B. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- C. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
 1. Nails for Copper Sheet: Copper or hardware bronze, 0.109 inch (2.8 mm) minimum and not less than 7/8 inch (22 mm) long, barbed with large head.
 2. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.

3. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
 4. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
 5. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
- C. Solder for Lead-Coated Copper: ASTM B 32, Grade Sn60, 60 percent tin and 40 percent lead.
- D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polysulfide polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

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, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

- E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
 - 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Metal Fascias: Basis of design product: The design of the Metal Fascias is based on Anchor-Tite coping by Metal-Era. Subject to compliance with the requirements, provide the named product or a comparable product by one of the following: Cheney Flashing Company; Heckmann Building Products. The system shall consist of the following components:
 - 1. Anchor Bar: Extruded aluminum 6063-T6 alloy, in 12-ft (3.66 m) lengths.
 - 2. Fasteners: Corrosion-resistant #12 by 1-5/8 in (4.13 mm) fasteners.
 - 3. Snap-on Fascia Cover: .040 Aluminum with custom color finish. Fascia cover factory-notched to provide a 1-in (2.54 mm) lap joint. In 12-ft (3.66 m) lengths.
 - 4. Anchor Bar Splice Plates: .025 aluminum with factory-applied, closed-cell compression gasket.
- B. Metal Copings: Basis of design product: The design of the Metal Copings is based on Anchor-Tite coping by Metal-Era. Subject to compliance with the requirements, provide the named product or a comparable product by one of the following: Cheney Flashing Company; Heckmann Building Products. The system shall consist of the following components:
 - 1. Anchor-Tite Anchor Clip: Extruded aluminum, 12 in (30 mm) wide, intermittent bars spaced 4'-0" (120 mm) o.c., with 12 in. (30 mm) wide quarter-hard aluminum anchor clips.
 - 2. Perma-Tite Anchor Clip: 20-gauge, G-90 galvanized steel with hardened stainless steel springs in 12 in (30 mm) wide sections, spaced 6 ft (1.8 m) o.c.
 - 3. Splice Plate: 8 in (20 mm) wide with dual, non-curing sealant strips factory applied. Match finish of coping system.
 - 4. Coping Cover: .063 aluminum with custom color finish.
- C. Roof-Drain Flashing: Fabricate from the following material:
 - 1. Lead: 4.0 lb/sq. ft. (1.6 mm thick), hard tempered.

2.7 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- (2400-mm-) long, but not exceeding 12 foot (3.6 m) long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm)

beyond each side of wall openings. Form with 2-inch- (50-mm-) high end dams. Fabricate from the following material:

1. Lead-Coated Copper: 17.2 oz./sq. ft. (0.60 mm thick).

B. Openings Flashing in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high end dams. Fabricate from the following material:

1. Lead-Coated Copper: 17.2 oz./sq. ft. (0.60 mm thick).

2.8 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Torch cutting of sheet metal flashing and trim is not permitted.

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 fabricator or manufacturers of dissimilar metals.

1. Coat side of 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 underlayment.
 3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
1. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.
1. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.
 2. Aluminum: Use aluminum or stainless-steel fasteners.
 3. Copper Use copper or stainless-steel fasteners.
 4. Stainless Steel: Use stainless-steel fasteners.
- H. Seal joints with butyl sealant as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm) except where pretinned surface would show in finished Work.
1. Do not solder prepainted, metallic-coated steel sheet.

2. Pretinning is not required for lead-coated copper.
3. Lead-Coated Copper Soldering: Wire brush edges of sheets before soldering.
4. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.

J. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.

3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. 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.
 1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at 24-inch (600-mm) 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.

3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Through-Wall Flashing: Installation of formed through-wall flashing is specified in Division 4 Section "Unit Masonry Assemblies."
- C. Openings Flashing in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

3.5 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with butyl sealant to equipment support member.

3.6 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.

- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 72 00 - ROOF ACCESSORIES

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. Roof hatches.
- B. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For each type of exposed factory-applied finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.
- C. Warranty: Special warranty specified in this Section.

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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
 - 1. With Architect's approval, adjust location of roof accessories that would interrupt roof drainage routes or roof expansion joints.

1.8 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer 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: **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, manufacturers listed in other Part 2 articles.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

- A. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coated.

2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 (Class AZM150) coated.

B. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized to comply with ASTM A 123/A 123M, unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

A. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, 1 inch (25 mm) thick.

B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWWA C2; not less than 1-1/2 inches (38 mm) thick.

C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

D. Polyethylene Sheet: 6-mil- (0.15-mm-) thick, polyethylene sheet complying with ASTM D 4397.

E. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

1. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).

F. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C 920, polyurethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, and heavy bodied for hooked-type expansion joints with limited movement.

J. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.4 ROOF HATCHES

A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated single-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. Available Manufacturers:
 - a. Bilco Company (The).
 - b. Hi Pro International, Inc.
 - c. J. L. Industries, Inc.
 - d. Roof Products & Systems Corporation.
 - e. Wasco Products, Inc.
2. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
3. Type and Size: Single-leaf lid, Sizes as indicated on Drawings
4. Curb and Lid Material: Galvanized steel sheet, 0.079 inch thick.
 - a. Finish: Powder coat.
5. Insulation: Cellulosic-fiber 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. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
9. Fabricate units to minimum height of 12 inches unless otherwise indicated.
10. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate hatch curbs with height tapered to match slope to level tops of units.
11. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
12. Railing System: "Bil-Guard" fixed railing system as manufactured by Bilco or approved equal. Non-penetrating attachment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
 2. Verify dimensions of roof openings for roof accessories.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory

installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

- B. Install roof accessories to fit substrates and to result in watertight performance.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum or stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.
- D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
- E. 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.
- F. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

3.3 TOUCH UP

- A. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 9 painting Sections.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 CLEANING

- A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 07 72 00

SECTION 07 81 16 – SPRAYED CEMENTITIOUS FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Concealed spray fire resistive materials.
 - 2. Exposed spray fire resistive materials
 - 3. Topcoats for exposed materials.

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: Indicated by design 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. All Products shall be FM Global approved.
- F. 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."
- G. Preinstallation Conference: Conduct conference at Project site.
- 1.4 PROJECT CONDITIONS
- A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperature is 40 deg F (4 deg C) 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 roof deck substrates until concrete topping, if any, has been completed. For metal roof decks without concrete topping, do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.
5. Do not apply fire-resistive material to metal floor deck substrates until concrete topping has been completed.
6. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
7. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
8. 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.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace sprayed fire-resistive materials that fail in materials or workmanship within two years from date of Substantial Completion.
 1. Failures include, but are not limited to, cracking, flaking, spalling, eroding in excess of specified requirements; peeling; or delaminating of sprayed fire-resistive materials from substrates.
 2. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel and other causes not reasonably foreseeable under conditions of normal use.

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:
- C. Products: Subject to compliance with requirements, provide one of the following:
 1. Cementitious Sprayed Fire-Resistive Material:
 - a. Grace, W. R. & Co.--Conn., Construction Products Div.; Monokote Type MK-6s.
 - b. Isolatek International Corp., Cafco Products; Cafco 300.
 - c. Carbolite Co., Fireproofing Products Div.; Equal Products.

- D. Material Composition: Either of the following:
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.
- E. 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. (240 kg/cu. m) 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 (9 mm), per ASTM E 605:
 - a. Where the referenced fire-resistance design lists a thickness of 1 inch (25 mm) or greater, the minimum allowable individual thickness of sprayed fire-resistive material is the design thickness minus 0.25 inch (6 mm).
 - b. Where the referenced fire-resistance design lists a thickness of less than 1 inch (25 mm) but more than 0.375 inch (9 mm), the minimum allowable individual thickness of sprayed fire-resistive material is the greater of 0.375 inch (9 mm) 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. (240 kg/cu. m).
 3. Bond Strength: 150 lbf/sq. ft. (7.2 kPa) 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. If surfaces of structural steel receiving sprayed fire-resistive material are primed or otherwise painted for coating materials, perform series of bond tests specified in UL's "Fire Resistance Directory." Provide bond strength indicated in referenced UL fire-resistance criteria, but not less than 150 lbf/sq. ft. (7.2 kPa) minimum per ASTM E 736.
 - c. Minimum thickness of sprayed fire-resistive material tested in laboratory shall be 0.75 inch (19 mm).
 4. Compressive Strength: 5.21 lbf/sq. in. (35.9 kPa) as determined in the laboratory per ASTM E 761. Minimum thickness of sprayed fire-resistive material tested shall be 0.75

inch (19 mm) and minimum dry density shall be as specified, but not less than 15 lb/cu. ft. (240 kg/cu. m).

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. (0.270 g/sq. m) in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistive material is 0.75 inch (19 mm), maximum dry density is 15 lb/cu. ft. (240 kg/cu. m), 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.
10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

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. Topcoat: Type recommended in writing by manufacturer of each sprayed fire-resistive material for application over exposed sprayed fire-resistive materials.

2.3 EXPOSED CEMENTITIOUS SPRAYED FIRE-RESISTIVE MATERIALS

- A. General: For exposed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated for material composition and for minimum physical properties of each product listed, measured by standard test methods referenced with each property.
- B. Available Products:
 1. Exposed Cementitious Sprayed Fire-Resistive Material:
 - a. Carbolite Co., Fireproofing Products Div.; Pyrocrete 40.
 - b. Grace, W.R & Co.--Conn., Construction Products Div.; Monokote Type PK140.
 - c. Isolitek International Corp., Cafco Products.; Cafco 800.
- C. Exposed Cementitious Sprayed Fire-Resistive Material: Factory-mixed, dry, cement aggregate formulation; or chloride-free formulation of gypsum or Portland cement binders, additives, and

inorganic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application, complying with the following requirements.

1. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Section 5.4.5, "Displacement Method," but with an average density of not less than 39 lb/cu. Ft. (625 kg/cu.m).
2. Bond Strength: 1000 lbf/sq. ft. (48 kPa) minimum per ASTM E 736.
3. Compressive Strength: 300 lbf/sq. in. (2067 kPa) per ASTM E 761.
4. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
5. Deflection: No cracking, spalling, or delamination per ASTM E 759.
6. Effect of Impact on Bonding: No cracking, spalling, or delamination per ASTM E 760.
7. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.270 g/sq.m) per ASTM R 859.
8. Combustion Characteristics: Passes ASTM E 136.
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: 0
 - b. Smoke-Developed Index: 0
10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates, areas, and conditions, with Installer present, to determine whether they are in satisfactory condition to receive sprayed fire-resistive material and to verify the following:
 1. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.
 2. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 3. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.
- B. 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. 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.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.
- F. Coat substrates with adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by sprayed fire-resistive material manufacturer for material and application indicated.
- G. 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.
- H. 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.
- I. 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.
- J. Apply topcoat to exposed sprayed fire-resistive material.
- K. 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.
- L. Repair or replace work that has not been successfully protected.

3.2 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. 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.

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1. Thickness for Floor, Roof, and Wall Assemblies: For each 1000-sq. ft. (93-sq. m) area, or partial area, on each floor, from the average of 4 measurements from a 144-sq. in. (0.093-sq. m) sample area, with sample width of not less than 6 inches (152 mm) per ASTM E 605.
 2. 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.
 3. Density for Floors, Roofs, Walls, and 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."
 4. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: For each 10,000-sq. ft. (929 sq. m) area, or partial area, on 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.

END OF SECTION 07 81 16

SECTION 07 84 13 - THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
 - 1. Roofs.
 - 2. Walls and partitions.
 - 3. Smoke barriers.
 - 4. Construction enclosing compartmentalized areas.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for construction of openings in concrete slabs and walls.
 - 2. Division 4 Section "Unit Masonry Assemblies" for construction of openings in masonry walls.
 - 3. Division 7 Section "Building Insulation" for safig insulation and accessories.
 - 4. Division 9 Section "Gypsum Board Assemblies" for construction of openings in gypsum walls.
 - 5. Division 15 Sections specifying duct and piping penetrations.
 - 6. Division 16 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
 - 1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
 - 2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
- B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
- C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems

protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

1. Penetrations into storage areas containing combustible materials.
- D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- E. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. Product Data: For each type of through-penetration firestop system product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.
1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit engineering judgment drawing, developed by through-penetration firestop system manufacturer's fire-protection engineer in accordance with the provisions of the International Firestop Council.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.
- E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1. Classified System drawings from the Underwriters Laboratories Fire Resistance Directory, Volume 2.

1.5 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who specializes in the installation of Firestop products. The installer's personnel shall be certified, licensed, or otherwise qualified by the firestopping manufacturer as having satisfactorily completed the necessary training to select and install products in accordance with the manufacturer's requirements. A manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.
- B. **Source Limitations:** Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.
- C. **Fire-Test-Response Characteristics:** Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:
 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
 - 1) UL in "Fire Resistance Directory."
- D. **Preinstallation Conference:** Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
- E. **Installer Training:** Individuals performing the installation of Firestop systems shall be trained by a direct representative of the Firestop materials manufacturer, not by a distributor or agent.

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 size and location of cats-in-place Firestop devices to accommodate planned pipe and cable runs. Ensure proper placement of devices before placement of concrete.
- B. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- C. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- D. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
- E. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated in the "Through-Penetration Firestop System Schedule" that are produced by one of the following manufacturers:
 - 1. Hilti Construction Chemicals, Inc.
 - 2. RectorSeal Corporation (The).
 - 3. 3M Fire Protection Products.
 - 4. United States Gypsum Company.

2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.

2.3 FILL MATERIALS

- A. 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 reference to the types of materials described in this Article. Fill materials are those referred to in directories of the 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: Moisture-curing, 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. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.
- L. Intumescent Acrylic Sealant: Firestop sealant that expands when exposed to heat. Protects penetrations containing combustible and non-combustible penetrants.
- M. Foam Blocks: Re-penetratable, "sponge-like" intumescent blocks that may be friction fit, deformed, or cut to fit in through-penetration openings.

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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Firestop system manufacturer's installation instructions shall be followed. In situations where the requirements of this Section differ from those of the manufacturer, the more conservative requirements shall govern.

3.2 PREPARATION

- A. **Surface Cleaning:** Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. **Priming:** Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. **Masking Tape:** Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. **General:** Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of

each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. Designation/indication that the penetration is fire-rated.
2. Through-penetration firestop system designation of applicable testing and inspecting agency.
3. Date of installation.
4. Through-penetration firestop system manufacturer's name.
5. Installing contractor's name, address, and telephone number.

3.5 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

3.6 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to the alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Pipes (plastic or metal), conduit in vertical runs, installed through cast-in-place Firestop devices:
 1. UL-Classified Systems: Design Basis: FA 1016, FA 1017, FA 2053, FA 2054.
- C. Firestop Systems with No Penetrating Items FS-1: Comply with the following:
 1. UL-Classified Systems: Design Basis: CAJ0055, CAJ0070.
 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Acrylic sealant.
 - d. Intumescent putty.
 - e. Mortar.
 - f. Preformed intumescent blocks.
- D. Firestop Systems for Metallic Pipes, Conduit, or Tubing, FS-2: Comply with the following:
 1. UL-Classified Systems: Design Basis: CAJ1184, CAJ1226, CAJ1277, CAJ1291, FC1009, WL1054.
 2. Type of Fill Materials: One or more of the following:

- a. Latex sealant.
 - b. Silicone sealant.
 - c. Acrylic sealant.
 - d. Intumescent putty.
 - e. Mortar.
- E. Firestop Systems for Non-Metallic Pipes, Conduit, or Tubing, FS-3: Comply with the following:
- 1. UL-Classified Systems: Design Basis: CAJ2109, FA2053, FA2054, WL2078, WL2128.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Intumescent sealant
 - b. Intumescent putty
 - c. Intumescent wrap strips.
 - d. Firestop device.
- F. Firestop Systems for Electrical Cables, FS-4: Comply with the following:
- 1. UL-Classified Systems: Design Basis: CAJ3095, FC3012, WL3065, WL3112..
 - 2. Type of Fill Materials: One or more of the following:
 - a. Intumescent sealant.
 - b. Intumescent putty.
 - c. Silicone foam.
- G. Firestop Systems for Cables Trays, FS-5: Comply with the following:
- 1. UL-Classified Systems: Design Basis: CAJ4035, WL4011.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Intumescent sealant.
 - b. Intumescent putty.
 - c. Silicone foam.
 - d. Pillows/bags.
 - e. Foam blocks.
 - f. Firestop mortar.
- H. Firestop Systems for Insulated Pipes, FS-6: Comply with the following:
- 1. UL-Classified Systems: Design Basis: CAJ5091, WL5029.
 - 2. Type of Fill Materials: One or more of the following:
 - a. Intumescent sealant.
 - b. Silicone foam.
 - c. Intumescent wrap strips.
 - d. Pre-formed intumescent blocks.
- I. Firestop Systems for Miscellaneous Electrical Penetrants, FS-7: Comply with the following:

1. UL-Classified Systems: Design Basis: CAJ6006, CAJ6017.
 2. Type of Fill Materials: One or more of the following:
 - a. Intumescent sealant.
 - b. Intumescent putty.
 - c. Mortar.
- J. Firestop Systems for Miscellaneous Mechanical Penetrations, FS-8: Comply with the following:
1. UL-Classified Systems: Design Basis: CAJ7021, CAJ7040, CAJ7046, CAJ7051.
 2. Type of Fill Materials: One or both of the following:
 - a. Intumescent sealant.
 - b. Mortar.
 - c. Acrylic sealant.
 - d. Silicone sealant.
- K. Firestop Systems for Groupings of Penetrations, FS-9: Comply with the following:
1. UL-Classified Systems: Design Basis: CAJ8056, WJ8007, WL8014.
 2. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Acrylic sealant.
 - c. Mortar.
 - d. Intumescent wrap strips.
 - e. Firestop device.
 - f. Intumescent composite sheet.
 - g. Pre-formed intumescent blocks.

END OF SECTION 07 84 13

SECTION 07 84 43 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes fire-resistive joint systems for the following:
 - 1. Floor-to-floor joints.
 - 2. Floor-to-wall joints.
 - 3. Head-of-wall joints.
 - 4. Wall-to-wall joints.
 - 5. Joints between perimeter edge of fire-resistance-rated floor assemblies and back of non-fire-resistance-rated, exterior, glazed aluminum curtain walls.

- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for construction of openings in concrete slabs and walls.
 - 2. Division 4 Section "Unit Masonry Assemblies" for construction of openings in masonry walls.
 - 3. Division 7 Section "Architectural Joint Systems" for fire-resistive joint systems consisting of metal frames and covers, preformed seals, strip seals, and compression seals.
 - 4. Division 7 Section "Building Insulation" for perimeter fire-containment systems if not specified in this Section.
 - 5. Division 7 Section "Roof Expansion Assemblies" for fire-resistive roof expansion assemblies.
 - 6. Division 7 Section "Through-Penetration Firestop Systems" for systems installed in openings in walls and floors with and without penetrating items.
 - 7. Division 7 Section "Joint Sealants" for non-fire-resistive joint sealants.
 - 8. Division 9 Section "Gypsum Board Assemblies" for construction of openings in gypsum walls.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For joints in the following constructions, 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:
 - 1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.

2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
3. Fire-resistance-rated floor assemblies.
4. Exterior curtain-wall assemblies and fire-resistance-rated floor assemblies.

B. Fire Resistance of Joint Systems: Assembly ratings indicated, but with assembly ratings not less than that equaling or exceeding fire-resistance rating of constructions in which joints are located, as determined by UL 2079.

1. Load-bearing capabilities as determined by evaluation during the time test.

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 and 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.
2. Where Project conditions require modification of qualified testing and inspecting agency's listed assembly to suit a particular fire-resistive joint condition, submit engineering judgment drawing developed by Firestop system manufacturer's fire protection engineer in accordance with provisions of the International Firestop Council.

C. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

D. Qualification Data: For Installer.

E. Compatibility and Adhesion Test Reports: From fire-resistive joint system manufacturer indicating the following:

1. Materials forming joint substrates have been tested for compatibility and adhesion with fill materials.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. 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 "Performance Requirements" Article:
1. Fire-resistance 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 fire-resistive joint systems acceptable to authorities having jurisdiction.
 2. Fire-resistive joint systems are identical to those tested per UL 2079. Provide rated systems complying with the following requirements:
 - 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 listed by the following:
 - 1) UL in its "Fire Resistance Directory."
- C. Installer Training: Individuals performing installation of Firestop systems shall be trained by a direct representative of the Firestop materials manufacturer, not by a distributor or agent.

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, if required by authorities having jurisdiction, have examined each installation.

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. Products: Subject to compliance with requirements, provide one of the products specified.
 - a. Fire-Resistive Joint Systems:
 - 1) Hilti, Inc.
 - 2) 3M Fire Protection Products.
 - 3) Tremco, Inc.
 - b. Perimeter Fire-Containment Systems:
 - 1) Hilti, Inc.
 - 2) Specified Technologies Inc.
 - 3) 3M Fire Protection Products.
 - 4) United States Gypsum Company.

2.2 FIRE-RESISTIVE JOINT SYSTEMS, GENERAL

- 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 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.

2.3 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where UL-classified fire-resistive joint systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.
- B. Floor-to-Floor, Fire-Resistive Joint System FRJS-1:
 1. UL-Classified Products:
 - a. FF-D-0000-0999.

2. Assembly Rating: 1 hour.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class I - 50 percent compression, extension, or horizontal shear.

C. Floor-to-Wall, Fire-Resistive Joint System FRJS-2:

1. UL-Classified Products:
 - a. FW-D-000-0999.
2. Assembly Rating: 1 hour.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class I - 25 percent compression, extension, or horizontal shear.

D. Head-of-Wall, Fire-Resistive Joint System FRJS-3:

1. UL-Classified Products:
 - a. HW-D-000-0999.
2. Assembly Rating: 1 hour.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class I - 25 percent compression or extension.

E. Wall-to-Wall, Fire-Resistive Joint System FRJS-4:

1. UL-Classified Products:
 - a. WW-D-000-0999.
2. Assembly Rating: .As indicated
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class I - 25 percent compression or extension.

2.4 PERIMETER FIRE-CONTAINMENT SYSTEMS

A. Where fire-resistance rated floor assemblies are required, seal voids at intersection of exterior wall and floor assembly with an approved material in accordance with requirements of Connecticut Building Code, 1999 edition with 2000 amendments.

B. Perimeter Fire-Containment System PFCS-1:

1. UL-Classified Products:
 - a. CW-S-1001, CW-S-2001, or CW- S-2002.
2. Integrity Rating: 1 hour.
3. Insulation Rating: 1 hour.
4. Linear Opening Width: As 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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
 - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
 - 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.

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. Proceed with enclosing fire-resistive joint systems with other construction only after architect has inspected and approved installed fire-resistive joint systems.
- B. If deficiencies are found, repair or replace fire-resistive joint systems so they comply with requirements.

3.5 CLEANING AND PROTECTION

- 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.

END OF SECTION 07 84 43

SECTION 07 92 00 - 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 joint sealants for the following applications, including those specified by reference to this Section:
 - 1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints between different materials listed above.
 - d. Perimeter joints between materials listed above and frames of doors windows and louvers.
 - e. Other joints as indicated.
 - 2. Exterior joints in the following horizontal traffic surfaces:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - b. Other joints as indicated.
 - 3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - f. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - g. Other joints as indicated.
 - 4. Interior joints in the following horizontal traffic surfaces:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - c. Other joints as indicated.

B. Related Sections include the following:

1. Division 2 Section "Pavement Joint Sealants" for sealing joints in pavements, walkways, and curbing.
2. Division 4 Section "Unit Masonry Assemblies" for masonry control and expansion joint fillers and gaskets.
3. Division 7 Section "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
4. Division 8 Section "Glazing" for glazing sealants.
5. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
6. Division 9 Section "Ceramic Tile" for sealing tile joints.
7. Division 9 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

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.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant 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.
- C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- E. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- F. Qualification Data: For Installer.
- G. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.

- H. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- I. Field Test Report Log: For each elastomeric sealant application.
- J. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
- K. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint 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 joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.
 - 1. 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 joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

3. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of nonelastomeric sealant and joint substrate indicated.
 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 5. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

- A. 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 or are below 40 deg F (5 deg C).
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

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.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric 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.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Single-Component Neutral-Curing Silicone Sealant (For use at joints in ceramic tile and at plumbing fixtures):
 - 1. Available Products:
 - a. Dow Corning Corporation; 799.
 - b. GE Silicones; UltraGlaze SSG4000.
 - c. Tremco; Proglaze SG.
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 25.
 - 4. Use Related to Exposure: NT (nontraffic).
 - 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
- F. Multicomponent Nonsag Urethane Sealant (For use at exterior joints and interior joints unless otherwise indicated):
 - 1. Available Products:
 - a. Pecora Corporation; Dynatrol II.
 - b. Tremco; Dymeric 511.
 - c. Tremco; Vulkem 922.
 - 2. Type and Grade: M (multicomponent) and NS (nonsag).
 - 3. Class: 50.
 - 4. Fire Rating: ASTM E119 Standard for Fire Testing of Building Construction Materials.
 - 5. Uses Related to Exposure: NT (nontraffic) and T (traffic).

6. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating, brick, and ceramic tile.

2.4 ACOUSTICAL JOINT SEALANTS

- A. 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.
 - c. Tremco; Acoustical Sealant

2.5 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 C (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. 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.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, 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 to 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 after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates 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. Nonporous joint substrates include the following:
 - 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 preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant 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 in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. 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.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
- 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. 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 sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each type of elastomeric sealant and joint substrate.
 - b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab; Method B, Exposed Surface Finish Hand Pull Tab; or Method C, Field-Applied Sealant Joint Hand Pull Flap, in Appendix X1 in ASTM C 1193, as appropriate for type of joint-sealant application indicated.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
4. Inspect tested joints and report on the following:
 - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 - b. Whether sealants filled joint cavities and are free of voids.
 - c. Whether sealant dimensions and configurations comply with specified requirements.
5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints

were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

- B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 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 original work.

END OF SECTION 07 92 00

SECTION 07 95 00 - ARCHITECTURAL JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Types of joints for which architectural joint systems are specified include the following:
 - 1. Exterior wall joints.
 - 2. Interior wall and ceiling joints.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for block-outs and cast-in anchorage and frames for architectural joint systems in concrete floors, parking decks, and walls.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for sheet metal roof and wall joint systems.
 - 3. Division 7 Section "Roof Expansion Assemblies" for factory-fabricated roof joint systems.
 - 4. Division 7 Section "Joint Sealants" for elastomeric sealants and preformed compressed-foam sealants without metal frames.

1.3 DEFINITIONS

- A. Architectural Joint System: Any filler or cover used to span, fill, cover, or seal a joint, except expanding foam seals and poured or foamed in-place sealants.
- B. Cyclic Movement: Periodic change between widest and narrowest joint widths in an automatically mechanically controlled system.
- C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist passage of flame and hot gases through a movement joint.
- D. Maximum Joint Width: Widest linear gap a joint system tolerates and performs its designed function without damaging its functional capabilities.
- E. Minimum Joint Width: Narrowest linear gap a joint system tolerates and performs its designed function without damaging its functional capabilities.

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- F. **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 of nominal value of joint width.
 - G. **Nominal Joint Width:** Width of linear gap indicated as representing the conditions existing when architectural joint systems will be installed or, if no nominal joint width is indicated, a width equal to the sum of maximum and minimum joint widths divided by two.

1.4 PERFORMANCE REQUIREMENTS

- A. **General:** Provide factory-fabricated architectural joint systems capable of withstanding the types of loads and of accommodating the kinds of movement, and the other functions for which they are designed including those specified below, without failure. Types of failure include those listed in Appendix X3 of ASTM E 1399.
 - 1. **Pedestrian Traffic Joints:** Support pedestrian traffic across joint.
 - 2. **Exterior Joints:** Maintain continuity of weather enclosure.
 - 3. **Joints in Fire-Resistance-Rated Assemblies:** Maintain fire-resistance ratings of assemblies.
 - 4. **Joints in Smoke Barriers:** Maintain integrity of smoke barrier.
 - 5. **Joints in Acoustically Rated Assemblies:** Inhibit passage of airborne noise.
 - 6. **Other Joints:** Where indicated, provide joint systems that prevent penetration of water, moisture, and other substances deleterious to building components or content.
 - 7. **Seismic Joints:** Remain in place on exposure to seismic activity (movement).
 - 8. **Joints in Surfaces with Architectural Finishes:** Serve as finished architectural joint closures.

1.5 SUBMITTALS

- A. **Product Data:** Include manufacturer's product specifications, construction details, material and finish descriptions, and dimensions of individual components and seals.
- B. **Shop Drawings:** For each joint system specified, provide the following:
 - 1. **Placement Drawings:** Include line diagrams showing entire route of each joint system, plans, elevations, sections, details, joints, splices, locations of joints and splices, and attachments to other Work. Where joint systems change planes, provide Isometric Drawings depicting how components interconnect to achieve continuity of joint covers and fillers.
- C. **Samples for Initial Selection:** Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each exposed metal and elastomeric material of joint system indicated.
 - 1. Include similar Samples of material for joints and accessories involving color selection.

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- D. Samples for Verification: Full-size units 6 inches (150 mm) long of each type of joint system indicated; in sets for each finish, color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
 - E. Product Test Reports: From a qualified testing agency indicating architectural joint systems comply with requirements, based on comprehensive testing of current products.
 - F. Research/Evaluation Reports: Evidence of architectural joint system's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain architectural joint systems through one source from a single manufacturer. Coordinate compatibility with adjoining joint systems specified in other Sections.
- B. Fire-Test-Response Characteristics: Where indicated, provide joint systems incorporating fire barriers that are identical to those of assemblies tested for fire resistance per ASTM E 119 and ASTM E 814, including hose-stream test of vertical wall assemblies, by a testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of architectural joint systems and are based on the specific systems indicated. Other manufacturers' systems complying with requirements may be considered. 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.

PART 2 - PRODUCTS

2.1 EXPANSION JOINT SYSTEMS MANUFACTURERS

- A. Basis-of-Design Products: Furnish as indicated on drawings, interior expansion joint covers as manufactured by Conspec Systems, Inc., CS Group, Muncy, PA or approved equal. Finish aluminum cover plate and center plate with satin clear anodized finish unless otherwise noted. Exterior covers black in color. Install in accordance with manufacturers standard details. See drawings for joint width. These items are installed by the trade of the work which the item is attached or supported. Other Acceptable Manufacturers: MM Systems, Watson Bowman
 - 1. Floor to Floor Covers: Model ALS with FB-88. Fasten with fire barrier mastic and masonry anchors 24" o.c.

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2. Fire Barrier (Floor to Wall): Model FB-88. Fasten with fire barrier waste and expansion bolt anchors 24" o.c.
 3. Wall to Wall Cover: Model SGW.
 4. Wall to Wall Inside Corner Covers: Model AFWC.
 5. Floor to Wall Covers: Model ALSW with FB-88. Fasten with fire barrier mastic and masonry anchors 24" o.c.
 6. Ceiling to Ceiling Covers: Model SGC. Color to be white.
 7. Ceiling to Wall Covers: Model SMC/SMC-N. Color to be white.
 8. Exterior Brick to Brick: Model SF-200. Provide custom color as selected by architect.
 9. Surface mounted (where indicated): Model SM/SM-N.
 10. Exterior Metal to Metal: Model SF-200. Provide custom color as selected by architect.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to architectural joint system manufacturer's written instructions.
- B. Coordinate and furnish anchorages, Placement Drawings, and instructions for installing joint systems to be embedded in or anchored to concrete or to have recesses formed into edges of concrete slab for later placement and grouting-in of frames.
- C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure joint systems to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for handling and installing architectural joint assemblies and materials, unless more stringent requirements are indicated.
- B. Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.
- C. Terminate exposed ends of exterior architectural joint assemblies with factory-fabricated termination devices to maintain waterproof system.
- D. Install factory-fabricated transitions between building expansion-joint cover assemblies and roof expansion-joint assemblies, specified in Division 7 Section "Roof Expansion Assemblies," to provide continuous, uninterrupted, watertight construction.
- E. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required to install joint systems.

1. Install joint cover assemblies in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 2. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.
 3. Set covers in horizontal surfaces at elevations that place exposed surfaces flush with adjoining finishes.
 4. Locate wall, ceiling, and soffit covers in continuous contact with adjacent surfaces.
 5. Securely attach in place with required accessories.
 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.
- F. Continuity: Maintain continuity of joint systems with a minimum number of end joints and align metal members. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials, if any, to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- G. Extruded Preformed Seals: Install seals to comply with manufacturer's written instructions and with minimum number of end joints.
1. For straight sections, provide preformed seals in continuous lengths.
 2. Vulcanize or heat-weld field splice joints in preformed seal material to provide watertight joints using procedures recommended by manufacturer.
 3. Apply adhesive, epoxy, or lubricant adhesive approved by manufacturer to both frame interfaces before installing preformed seals.
 4. Seal transitions according to manufacturer's written instructions.
 5. Install foam seals with adhesive recommended by manufacturer and heat seal all splices.
- H. Joint Systems with Seals: Seal end joints within continuous runs and joints at transitions according to manufacturer's written instructions to provide a watertight installation.
- I. Seismic Seals: Install interior seals in continuous lengths. Install exterior seal in standard lengths and vulcanize or heat-weld field splice joints to provide watertight joints using manufacturer's recommended procedures. Seal transitions and end joints according to manufacturer's written instructions.
- J. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and end joints.

3.3 CLEANING AND 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.

END OF SECTION 07 95 00

SECTION 08 11 19 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Steel doors.
- 2. Steel door frames.
- 3. Sidelight frames
- 4. Borrowed-light frames.
- 5. Fire-rated door and frame assemblies.

- B. Related Sections include the following:

- 1. Division 4 Section "Unit Masonry Assemblies" for installing anchors and grouting frames in masonry construction.
- 2. Division 8 Section "Flush Wood Doors" for wood doors installed in steel frames.
- 3. Division 8 Section "Door Hardware" for door hardware and weather stripping.
- 4. Division 8 Section "Glazing" for glass in glazed openings in doors and frames.
- 5. Division 9 Section "Gypsum Board Assemblies" for spot-grouting frames installed in steel-framed gypsum board partitions.
- 6. Division 9 Section "Painting" for field painting factory-primed doors and frames.

1.3 DEFINITIONS

- A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

1.4 SUBMITTALS

- A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.

- B. Shop Drawings: Show the following:

- 1. Elevations of each door design.
- 2. Details of doors including vertical and horizontal edge details.
- 3. Frame details for each frame type including dimensioned profiles.
- 4. Details and locations of reinforcement and preparations for hardware.

5. Details of each different wall opening condition.
 6. Details of anchorages, accessories, joints, and connections.
 7. Coordination of glazing frames and stops with glass and glazing requirements.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for factory-finished doors and frames.
- D. Samples for Verification: For each type of exposed finish required, prepare a sample not less than 3 by 5 inches (75 by 125 mm) and of same thickness and material indicated for final unit of Work.
- E. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.
- F. Oversize Construction Certificates: For door assemblies required to be fire-protection rated and exceeding size limitations of labeled assemblies.

1.5 QUALITY ASSURANCE

- A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
1. Test Pressure: Test at atmospheric pressure.
 2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 3. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.
- C. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a

humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to permit air circulation.

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. Steel Doors and Frames:
 - a. Amweld Building Products, Inc.
 - b. Ceco Door Products; a United Dominion Company.
 - c. Copco Door Co.
 - d. Kewanee Corporation (The).
 - e. Pioneer Industries Inc.
 - f. Republic Builders Products.
 - g. Steelcraft; a division of Ingersoll-Rand.

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
- C. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 (ZF120) zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.
- D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

2.3 DOORS

- A. General: Provide doors of sizes, thicknesses, and designs indicated.
- B. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 3 (Stile and Rail).

- C. Exterior Doors: Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 3 (Stile and Rail).
- D. Vision Lite Systems: Manufacturer's standard kits consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.

2.4 FRAMES

- A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
- B. Frames of 0.067-inch- (1.7-mm-) thick steel sheet for:
 - 1. Level 3 steel doors, unless otherwise indicated.
 - 2. Wood doors, unless otherwise indicated.
- C. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.
- D. Plaster Guards: Provide 0.016-inch- (0.4-mm-) thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.
- E. Supports and Anchors: Fabricated from not less than 0.042-inch- (1.0-mm-) thick, electrolytic zinc-coated or metallic-coated steel sheet.
 - 1. Wall Anchors in Masonry Construction: 0.177-inch- (4.5-mm-) diameter, steel wire complying with ASTM A 510 (ASTM A 510M) may be used in place of steel sheet.
- F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

2.5 FABRICATION

- A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
- B. Exterior Door Construction: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch- (1.3-mm-) thick, metallic-coated steel channels with channel webs placed even with top and bottom edges.
- C. Interior Door and Panel Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from the following material:

1. Cold-rolled steel sheet, unless otherwise indicated.
 2. Metallic-coated steel sheet where indicated.
- D. Core Construction: One of the following manufacturer's standard core materials that produce a door complying with SDI standards:
1. Resin-impregnated kraft/paper honeycomb.
 2. Polyurethane.
 3. Polystyrene.
 4. Vertical steel stiffeners.
 5. Rigid mineral-fiber board.
- E. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between pairs of doors. Not more than 3/4 inch (19 mm) at bottom.
- F. Clearances for Fire-Rated Doors: As required by NFPA 80.
- G. Single-Acting, Door-Edge Profile: Beveled edge, unless square edge is indicated.
- H. Double-Acting, Door-Edge Profile: Round vertical edges with 2-1/8-inch (54-mm) radius.
- I. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- J. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- K. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- L. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
1. Unless otherwise indicated, provide thermal-rated assemblies with U-value of 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) or better.
- M. Sound-Rated (Acoustical) Assemblies: Where shown or scheduled, provide door and frame assemblies fabricated as sound-reducing type, tested according to ASTM E 1408, and classified according to ASTM E 413.
1. Unless otherwise indicated, provide acoustical assemblies with STC sound ratings of 33 or better.
- N. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.

1. For concealed overhead door closers, provide space, cutouts, reinforcement, and provisions for fastening in top rail of doors or head of frames, as applicable.
- O. Frame Construction: Fabricate frames to shape shown.
 1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
 2. Provide welded frames with temporary spreader bars.
- P. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- Q. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
- R. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- (0.8-mm-) thick steel sheet.
 1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
 2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.
- S. Astragals: As required by NFPA 80 to provide fire ratings indicated.

2.6 FINISHES

- A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
 2. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
 3. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.

4. Install fire-rated frames according to NFPA 80.
 5. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.
- C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.
1. Fire-Rated Doors: Install within clearances specified in NFPA 80.

3.2 ADJUSTING AND CLEANING

- A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08 11 19

SECTION 08 14 16 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Solid-core doors with wood-veneer, faces.
 - 2. Factory finishing flush wood doors.
 - 3. Factory machining for hardware.

- B. Related Sections include the following:
 - 1. Division 8 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, louvers, 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 requirements for veneer matching.
 - 4. Indicate doors to be factory finished and finish requirements.
 - 5. Indicate fire ratings for fire doors.

- C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:
 - 1. Faces of Factory-Finished Doors: Show the full range of colors available for stained finishes.

- D. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), 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 (200 by 250 mm), with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
3. Louver blade and frame sections, 6 inches (150 mm) long, for each material and finish specified.
4. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
 1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 1. Test Pressure: Positive Pressure fire test to comply with UL10C.
 2. Oversize, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide oversize fire door label or certificate of inspection, from a testing and inspecting agency acceptable to authorities having jurisdiction, stating that doors comply with requirements of design, materials, and construction.
 3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic wrappers and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span.
1. Warranty shall also include installation and finishing that may be required, including replacement of glass, due to repair or replacement of defective doors.
 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Warranty Period: 5 years.
 - b. Solid-Core Interior Doors: Life of installation.

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. Flush Wood Doors:
 - a. Algoma Hardwoods Inc.
 - b. Eggers Industries; Architectural Door Division.
 - c. VT Industries
 - d. Marshfield Door Systems
 2. Metal Louvers for Doors:
 - a. Air Louvers, Inc.
 - b. Hiawatha, Inc.
 - c. Leslie-Locke, Inc.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Doors for Transparent Finish:
1. Grade: Premium, with Grade A faces.
 2. Species and Cut: White Maple, plain sliced.
 3. Match between Veneer Leaves: Book match.
 4. Assembly of Veneer Leaves on Door Faces: Balanced match.
 5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 6. Transom Match: Continuous match.
 7. Stiles: Same species as faces or a compatible species like White Birch.

8. Thickness: 1-3/4"
9. Face Veneer thickness: 1/32" minimum.

2.3 SOLID-CORE DOORS

A. Interior Veneer-Faced Doors:

1. Core: Solid wood particleboard with density of 28-32 lbs. per cu. ft. Core shall comply with ANSI A208.1.
2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

B. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking as required by the hardware to allow a secure application, with improved screw-holding capability, and without the use of through bolts, and approved for use in doors of fire ratings indicated as dictated by the following minimums:
 - a. 5-inch (125-mm) top-rail blocking.
 - b. 5-inch (125-mm) bottom-rail blocking, in doors indicated to have protection plates.
 - c. 5-inch (125-mm) midrail blocking, in doors indicated to have armor plates.
 - d. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
4. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.
5. Provide door construction with no visible intumescent material on door edges.

C. Acoustical Doors: Doors shall comply with all applicable requirements for solid core flush interior doors and in addition shall comply with requirements as hereinafter specified.

1. Thickness: 1-3/4.
2. STC: 42 Minimum, tested in accordance with ASTM E-903. Submit test report certificate to the Authority.
3. Finish of door: as indicated on the Drawings.
4. Contractor shall submit test report to the Architect certifying that the sound proof door proposed to be installed will provide rating range as noted above.

5. Stop Beads
 - a. Adjustable type, matching hardwood (same specie as finish veneer) face with soft neoprene gasket.
 - b. Secure beads to metal jambs with metal cup bead adjusters and self tapping sheet metal screws spaced at a maximum of 8" o.c.
6. Threshold Seal: Plunger operated, self retracting neoprene gasket sweep. Mechanism may be let into face with a metal cover plate, or be completely housed in bottom of door.
7. Provide cutout for glazing to receive double glazed combination of 1/4" polished wire glass as specified under Division 8.
8. Hardware: Stop bead adjusters and threshold seal, to be furnished under this section; finish shall match door hardware specified.

2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors:
 1. Wood Species: Same species as door faces.
 2. Profile: Manufacturer's standard shape.
 3. At 20-minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.
- B. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet; factory primed and approved for use in doors of fire rating indicated.
- C. Wood-Veneered Beads for Light Openings in Fire Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. 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 measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 2. Drill pilot holes for all butt hinge and lock front screws at the factory.
- C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
1. Light Openings: Trim openings with moldings of material and profile indicated.

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.
- B. Finish doors at factory.
- C. Transparent Finish:
1. Grade: Premium.
 2. Finish: AWI System TR-6 catalyzed polyurethane.
 3. Staining: As selected by Architect from manufacturer's full range.
 4. Effect: Filled finish.
 5. Sheen: Satin.
- D. Seal the top and bottom of all doors at the factory.

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 8 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, 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 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 08 14 16

SECTION 08 30 00 – SPECIAL DOORS

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.1 SECTION INCLUDES

- A. Fiberglass reinforced polyester (FRP) flush doors.
- B. Corrosion Resistant Doors

1.2 RELATED SECTIONS

- A. Door Hardware.

1.3 REFERENCES

- A. AAMA 1503-98 - Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- B. ANSI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.
- B. Air Infiltration: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 283 at pressure differential of 6.24 psf. Door shall not exceed 0.90 cfm per linear foot of perimeter crack.
- C. Water Resistance: For a single door 3'-0" x 7'-0", test specimen shall be tested in accordance with ASTM E 331 at pressure differential of 7.50 psf. Door shall not have water leakage.
- D. Indoor air quality testing per ASTM D 6670-01: GREENGUARD Environmental Institute Certified including GREENGUARD for Children and Schools Certification.
- E. Hurricane Test Standards, Single Door with Single-Point Latching:
 - 1. Uniform Static Load, ASTM E 330: Plus or minus 75 pounds per square foot.
 - 2. Forced Entry Test, 300 Pound Load Applied, SFBC 3603.2 (b)(5): Passed.

3. Cyclic Load Test, SFBC PA 203: Plus or minus 53 pounds per square foot.
 4. Large Missile Impact Test, SFBC PA 201: Passed.
- F. Swinging Door Cycle Test, Doors and Frames, ANSI A250.4: Minimum of 25,000,000 cycles.
- G. Swinging Security Door Assembly, Doors and Frames, ASTM F 476: Grade 40.
- H. Salt Spray, Exterior Doors and Frames, ASTM B 117: Minimum of 500 hours.
- I. Sound Transmission, Exterior Doors, STC, ASTM E 90: Minimum of 25.
- J. Thermal Transmission, Exterior Doors, U-Value, AAMA 1503-98: Maximum of 0.29 BTU/hr x sf x degrees F. Minimum of 55 CRF value.
- K. Surface Burning Characteristics, FRP Doors and Panels, ASTM E 84:
 1. Flame Spread: Maximum of 200, Class C.
 2. Smoke Developed: Maximum of 450, Class C.
- L. Surface Burning Characteristics, Class A Option On Interior Faces of FRP Exterior Panels and Both Faces of FRP Interior Panels, ASTM E 84:
 1. Flame Spread: Maximum of 25.
 2. Smoke Developed: Maximum of 450.
- M. Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 256: 15.0 foot-pounds per inch of notch.
- N. Tensile Strength, FRP Doors and Panels, Nominal Value, ASTM D 638: 14,000 psi.
- O. Flexural Strength, FRP Doors and Panels, Nominal Value, ASTM D 790: 21,000 psi.
- P. Water Absorption, FRP Doors and Panels, Nominal Value, ASTM D 570: 0.20 percent after 24 hours.
- O. Indentation Hardness, FRP Doors and Panels, Nominal Value, ASTM D 2583: 55.
- P. Gardner Impact Strength, FRP Doors and Panels, Nominal Value, ASTM D 3029: 120 in-lb.
- S. Abrasion Resistance, Face Sheet, Taber Abrasion Test, 25 Cycles at 1,000 Gram Weight with CS-17 Wheel: Maximum of 0.029 average weight loss percentage.
- T. Stain Resistance, ASTM D 1308: Face sheet unaffected after exposure to red cabbage, tea, and tomato acid. Stain removed easily with mild abrasive or FRP cleaner when exposed to crayon and crankcase oil.
- U. Chemical Resistance, ASTM D 543. Excellent rating.
 1. Acetic acid, Concentrated.
 2. Ammonium Hydroxide, Concentrated.
 3. Citric Acid, 10%.
 4. Formaldehyde.
 5. Hydrochloric Acid, 10%

- 6. Sodium hypochlorite, 4 to 6 percent solution.
 - V. Compressive Strength, Foam Core, Nominal Value, ASTM D 1621: 79.9 psi.
 - W. Compressive Modulus, Foam Core, Nominal Value, ASTM D 1621: 370 psi.
 - X. Tensile Adhesion, Foam Core, Nominal Value, ASTM D 1623: 45.3 psi.
 - Y. Thermal and Humid Aging, Foam Core, Nominal Value, 158 Degrees F and 100 Percent Humidity for 14 Days, ASTM D 2126: Minus 5.14 percent volume change.
- 1.5 SUBMITTALS
- A. Comply with Submittal Procedures.
 - B. Product Data: Submit manufacturer's product data, including description of materials, components, fabrication, finishes, and installation.
 - C. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
 - D. Samples:
 - 1. Door: Submit manufacturer's sample of door showing face sheets, core, framing, and finish.
 - 2. Color: Submit manufacturer's samples of standard colors of doors and frames.
 - E. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
 - F. Manufacturer's Project References: Submit list of successfully completed projects including project name and location, name of architect, and type and quantity of doors manufactured.
 - G. Maintenance Manual: Submit manufacturer's maintenance and cleaning instructions for doors, including maintenance and operating instructions for hardware.
 - H. Warranty: Submit manufacturer's standard warranty.
- 1.6 QUALITY ASSURANCE
- A. Manufacturer's Qualifications:
 - 1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years successful experience.
 - 2. Door and frame components from same manufacturer.
 - 3. Evidence of a compliant documented quality management system.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying opening door mark and manufacturer.

- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- C. Handling: Protect materials and finish from damage during handling and installation.

1.8 WARRANTY

- A. Warrant doors, frames, and factory hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
- B. Warranty Period: Ten years starting from date of substantial completion.

PART 2 PRODUCTS

2.1 FRP FLUSH DOORS

- A. Acceptable Manufactures
 - 1. Basis of Design : Special-Lite, Inc., PO Box 6, Decatur, Michigan 49045.
 - 2. Cline Doors – Equivalent product to Basis of Design.
 - 3. Commercial Door Systems – Equivalent product to Basis of Design.

2.2 GENERAL

- A. Model: SL-17 Flush Doors with SpecLite3 fiberglass reinforced polyester (FRP) face sheets.
- B. Door Opening Size: As indicated on the Drawings.
- C. Construction:
 - 1. Door Thickness: 1-3/4 inches.
 - 2. Stiles and Rails: Aluminum Alloy 6063-T5, minimum of 2-5/16-inch depth.
 - 3. Corners: Mitered.
 - 4. Provide joinery of 3/8-inch diameter full-width tie rods through extruded splines top and bottom as standard tubular shaped stiles and rails reinforced to accept hardware as specified.
 - 5. Securing Internal Door Extrusions: 3/16-inch angle blocks and locking hex nuts for joinery. Welds, glue, or other methods are not acceptable.
 - 6. Furnish extruded stiles and rails with integral reglets to accept face sheets. Lock face sheets into place to permit flush appearance.
 - 7. Rail caps or other face sheet capture methods are not acceptable.
 - 8. Extrude top and bottom rail legs for interlocking continuous weather bar.
 - 9. Meeting Stiles: Pile brush weatherseals. Extrude meeting stile to include integral pocket to accept pile brush weatherseals.

10. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.
11. Glue: Use of glue to bond sheet to core or extrusions is not acceptable.

D. Face Sheet:

1. Material: SpecLite3 FRP, 0.120-inch thickness, finish color throughout. Abuse-resistant engineered surface.
2. Texture: Pebble.
3. Color: To be selected from manufacturers full range of standard colors.

E. Core:

1. Material: Poured-in-place polyurethane foam.
2. Density: Minimum of 5 pounds per cubic foot.
3. R-Value: Minimum of 9.

F. Cutouts:

1. Manufacture doors with cutouts for required vision lites, louvers, and panels.
2. Factory install vision lites, louvers, and panels.

G. Hardware:

1. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
2. Factory install hardware.

2.3 MATERIALS

A. Aluminum Members:

1. Extrusions: ASTM B 221.
2. Sheet and Plate: ASTM B 209.
3. Alloy and Temper: As required by manufacturer for strength, corrosion resistance, application of required finish, and control of color.

B. Components: Door and frame components from same manufacturer.

C. Fasteners:

1. Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.
2. Compatibility: Compatible with items to be fastened.
3. Exposed Fasteners: Screws with finish matching items to be fastened.

2.4 FABRICATION

A. Sizes and Profiles: Required sizes for door and frame units, and profile requirements shall be as indicated on the Drawings.

B. Coordination of Fabrication: Field measure before fabrication and show recorded measurements on shop drawings.

C. Assembly:

1. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
2. Remove burrs from cut edges.

- D. Welding: Welding of doors or frames is not acceptable.
- E. Fit:
 - 1. Maintain continuity of line and accurate relation of planes and angles.
 - 2. Secure attachments and support at mechanical joints with hairline fit at contacting members.

2.7 HARDWARE

- A. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
- B. Factory install hardware.
- C. Hardware Schedule: As specified in Division 8, except as follows.
 - 1. Hinges: SL-11HD continuous hinges by Special-Lite. Hinge covers to be factory painted to match doors.
 - 2. Removal mullions: SL-60 non-electric and SL-60E pre-wired for use with electric hardware.

2.8 VISION LITES

- A. Factory Glazing: 1-inch glass insulating units.
- B. Lites in Exterior Doors: Allow for thermal expansion.
- C. Rectangular Lites:
 - 1. Size: As indicated on the Drawings.
 - 2. Factory glazed with screw-applied aluminum stops anodized to match perimeter door rails.

2.9 ALUMINUM FINISHES

- A. Anodized Finish: Class I finish, 0.7 mils thick.
 - 1. Clear 215 R1, AA-M10C12C22A41, Class I, 0.7 mils thick.

2.10 CORROSION RESISTANT DOORS

- A. Acceptable Manufactures
 - 1. Basis of Design : Chase Doors
 - 2. Stanley Access Technologies – Equivalent product to Basis of Design.
 - 3. KM Systems, Inc. – Equivalent product to Basis of Design.
- B. Model: CR1400 Pass Thru Corrosion Resistant Door
 - 1. Doors shall be constructed of 1/8” thick high density, cross-linked

- polyethylene outer skin with an extruded aluminum powder coated bottom cap and replaceable bottom wiper gasket.
2. Door shall be manufactured with an insulated core of high density foamed-in-place, non-CFC urethane.
 3. The panel "R" value = 12.
 4. Door hardware shall include three stainless steel full mortise hinges with stainless steel ball bearings and a stainless steel, non-rising removable pin.
 5. Windows are constructed with 1/4" clear, tempered glass, set in stainless steel powder coated frame. Size as shown on drawings.
 6. Frames: FRP frame - with adjustable width from 4-1/2" to 10". Weather stripping seal and fasteners provided. Doors shall be shipped pre-hung from the factory.
- C. Provide pass thru corrosion door assemblies manufactured as integral units ready for installation.
- D. 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.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.3 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Anchor frames securely in place.
- D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.

- E. Set thresholds in bed of mastic and backseal.
- F. Install exterior doors to be weathertight in closed position.
- G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- H. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.5 ADJUSTING

- A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.6 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage finish.

3.7 PROTECTION

- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION 08 30 00

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing 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. Wall access doors and frames.
- 2. Fire-rated wall access doors and frames.
- 3. Ceiling access doors and frames.
- 4. Fire-rated ceiling access doors and frames.

- B. Related Sections include the following:

- 1. Division 3 Section "Cast-in-Place Concrete" for blocking out openings for access doors and frames in concrete.
- 2. Division 4 Section "Unit Masonry Assemblies" for anchoring and grouting access door frames set in masonry construction.
- 3. Division 15 Section "Duct Accessories" for heating and air-conditioning duct access doors.

1.3 SUBMITTALS

- A. Product Data: For each type of door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.
- B. Shop Drawings: Show fabrication and installation details of customized doors and frames. Include plans, elevations, sections, details, and attachments to other Work.
- C. Samples: For each door face material, at least 3 by 5 inches (75 by 125 mm) in size, in specified finish.
- D. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.
- E. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
 - 1. Method of attaching door frames to surrounding construction.

2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain doors and frames 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 labeled and listed by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction:
 1. NFPA 252 or UL 10B for vertical access doors.
 2. ASTM E 119 or UL 263 for horizontal access doors and frames.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in "Submittals" Article.

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. Access Doors:
 - a. Karp Associates, Inc.
 - b. Milcor Limited Partnership.
 - c. Nystrom Building Products Co.

2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, and surface defects; pickled and oiled; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M.
- C. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with

minimum thickness indicated representing specified nominal thickness according to ASTM A 568/A 568M. Electrolytic zinc-coated steel sheet, complying with ASTM A 591/A 591M, Class C coating, may be substituted at fabricator's option.

- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with A60 (ZF180) zinc-iron-alloy (galvannealed) coating or G60 (Z180) mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.
- E. Drywall Beads: Edge trim formed from 0.0299-inch (0.76-mm) zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.3 PAINT

- A. 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.
- B. Shop Primer for Metallic-Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.4 ACCESS DOORS AND FRAMES

- A. Flush, Insulated, Fire-Rated Access Doors and Frames with Exposed Trim: Fabricated from metallic-coated steel sheet.
 - 1. Locations: Masonry Ceramic-tile wall surfaces.
 - 2. Fire-Resistance Rating: One hour[s].
 - 3. Temperature Rise Rating: 250 deg F (139 deg C) 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 (0.9 mm).
 - 5. Frame: Minimum 0.060-inch- (1.5-mm-) thick sheet metal with 1-inch- (25-mm-) wide, surface-mounted trim.
 - 6. Hinges: Continuous piano hinge.
 - 7. Automatic Closer: Spring type.
 - 8. Latch: Self-latching bolt operated by flush screwdriver with interior release.
 - 9. Lock: Key-operated cylinder lock with interior release.
- B. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.
 - 1. Locations: Gypsum board wall and ceiling surfaces.
 - 2. Door: Minimum 0.060-inch- (1.5-mm-) thick sheet metal, set flush with surrounding finish surfaces.
 - 3. Frame: Minimum 0.060-inch- (1.5-mm-) thick sheet metal with drywall bead.
 - 4. Hinges: Spring-loaded concealed pin type.
 - 5. Latch: Screwdriver-operated cam latch.

6. Lock: Key-operated cylinder lock.

2.5 FABRICATION

- A. General: Provide access door 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. Steel 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 to 1-1/2 inches (25 to 38 mm) wide around perimeter of frame.
 - 2. For trimless frames with drywall bead for installation in gypsum board assembly, provide edge trim for gypsum board securely attached to perimeter of frames.
 - 3. Provide mounting holes in frames to attach frames to metal or wood framing in plaster and drywall construction and to attach masonry anchors in masonry construction.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For cylinder lock, furnish two keys per lock and key all locks alike.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.7 METALLIC-COATED STEEL FINISHES

- A. Galvanizing of Steel Shapes and Plates: Hot-dip galvanize items indicated to comply with applicable standard listed below:
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. For galvanized surfaces, apply, after cleaning, a conversion coating suited to the organic coating to be applied over it. For metallic-coated surfaces, clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

- C. Factory Priming for Field-Painted Finish: Apply shop primer immediately after cleaning and pretreating.

2.8 STEEL FINISHES

- A. Surface Preparation: 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. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- B. Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Advise installers of other work about specific requirements relating to access door and floor door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

3.2 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 access doors with trimless frames flush with adjacent finish surfaces or recessed to receive finish material.

3.3 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 08 31 13

SECTION 08 31 16 – FLOOR ACCESS DOOR

I. PART ONE - GENERAL

1.01 SUMMARY

- A. Work included: Furnishing and installing factory fabricated vault access doors
- B. Related Work: adapting existing openings to accommodate new doors.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM), 100 Bar Harbor Drive, West Conshocken, PA 19428-2959; (610) 832-9585, fax (610) 832-9555
 - 1. ASTM A 36-93a: Standard Specification for Structural Steel
 - 2. ASTM E119 Standard Methods of Fire Tests of Building Construction and Materials
- B. National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 09101 (617) 770-3000, FAX (617) 770-0700
 - 1. NFPA 80 Standard for Fire Doors and Windows
 - 2. NFPA 251 Standard Methods of Fire Tests of Building Construction and Materials
- C. Underwriters Laboratories (UL), 333 Pfingsten Road, Northbrook, IL 60062, (847) 272-8800, FAX (847) 272-8129

1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's product data for all materials in this specification.
- B. Shop Drawings: Show profiles, accessories, location, and dimensions.
- C. Samples: Manufacturer to provide upon request; sized to represent material adequately.
- D. Contract Closeout: Vault access door manufacturer shall provide the manufacturer's Warranty prior to the contract closeout.

1.04 PRODUCT HANDLING

- A. All materials shall be delivered in manufacturer's original packaging.
- B. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.
- C. Remove protective wrapping immediately after installation.

1.05 PERFORMANCE REQUIREMENTS

- A. Complies with NFPA 251, NFPA 288, ASTM E119, BS476: Part 22, and UL listed for a 2-hour fire rating.

1.06 JOB CONDITIONS

- A. Verify that other trades with related work are complete before installing vault access door(s).
- B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.
- C. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.
- D. Observe all appropriate OSHA safety guidelines for this work.

1.07 WARRANTY/GUARANTEE

- A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of (5) five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge. Electrical motors, special finishes, and other special equipment (if applicable) shall be warranted separately by the manufacturers of those products.

II. PART TWO - PRODUCTS

2.01 MANUFACTURER

- A. The BILCO Company, P.O. Box 1203, New Haven, CT 06505; 1-203-934-6363, Fax: 1-203-933-8478, Web: www.bilco.com

2.02 ACCESS DOOR

- A. Furnish and install where indicated on plans vault access door Type FR, as shown on drawing. Length denotes hinge side. The vault access door shall be single leaf. The vault access door shall be pre-assembled from the manufacturer.
- B. Performance characteristics:
 - 1. Cover: shall be reinforced to support a minimum live load of 150 psf (732 kg/m²) with a maximum deflection of 1/150th of the span.
 - 2. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
 - 3. Operation of the cover shall not be affected by temperature.
 - 4. Door and frame assembly shall be tested in accordance with ASTM E119 and NFPA 251 and UL Listed as having a 2-hour fire rating when exposed to fire from the underside. In the closed position, the temperature on the unexposed surface of the door shall not exceed 325°F

(162°C) above ambient for the duration of the 2-hour period. Manufacturer shall submit a test report certifying this performance.

5. Door shall be equipped with a fusible link activated closing system that will automatically close and latch the door leaf in the event of fire when heat parts the UL Listed 165° (74°C) fusible link.
- C. Cover: Shall have a 1" (25.4mm) fillable pan to receive concrete or a combination of concrete and specified flooring material, including type, thickness, and weight. All fill material to be furnished (Note: Finish flooring material up to 1/2" (12.7mm) thick can be installed in the 1" (25.4mm) pan. The remaining depth must be filled with concrete to maintain the fire rating of the door assembly. If finish flooring is not desired, the pan must be filled with concrete.
- D. Frame: Shall be 1/4" (6.3 mm) extruded aluminum with full anchor flange around the perimeter.
- E. Lifting mechanisms: Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" (6.3 mm) gusset support plate.
- F. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the latch. The latch release shall be protected by a flush, gasketed, removable screw plug.
- G. Automatic closing system: Shall be a self-contained, pneumatic, fusible link activated, closing system that will automatically close and latch the door in the event of fire when heat parts the UL Listed 165° (74°C) fusible link.
- H. Hold-open system: Door shall be equipped with a pneumatic hold-open system to automatically hold the door in the open position (90°). A release button for the hold-open system shall be provided and shall reset itself when the cover is closed.
- I. Hardware:
 1. Hinges: Shall be a continuous heavy duty Type 316 stainless steel hinge that is accessible only when the cover is in the open position.
 2. Cover shall be fitted with the required number and size of compression spring operators. Springs shall have an electrocoated acrylic finish.
 3. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover and a cable release handle shall be provided to open the cover from the underside.
 4. Hardware: Compression spring tubes shall be an anti-corrosive composite, all fasteners shall be Type 316 stainless steel material, and all other hardware shall be zinc plated and chromate sealed.
- J. Finishes: Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.

III. PART THREE - EXECUTION

3.01 INSPECTION

- A. Verify that the vault access door installation will not disrupt other trades. Verify that the substrate is dry, clean, and free of foreign matter. Report and correct defects prior to any installation.

3.02 INSTALLATION

- A. Submit product design drawings for review and approval to the architect or specifier before fabrication.
- B. Door is designed for installation in dry interior applications only. Consult factory If door is to be exposed to exterior or high moisture or humidity conditions. Door should be protected from moisture prior to installation.
- C. The installer shall check as-built conditions and verify the manufacturer's vault access door details for accuracy to fit the application prior to fabrication. The installer shall comply with the vault access door manufacturer's installation instructions.
- D. The installer shall furnish mechanical fasteners consistent with the vault access door manufacturer's instructions.
- E. Some doors will be installed in existing conditions, replacing existing doors. Verify existing frames can be adapted to new door systems prior to installation.

END OF SECTION 08 31 16

SECTION 08 33 23 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following types of overhead coiling doors:
 - 1. Insulated motorized service doors.
 - 2. Counter doors.
- B. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications" for miscellaneous steel supports.
 - 2. Division 16 Sections for electrical service and connections for powered operators and accessories.

1.3 DEFINITIONS

- A. Operation Cycle: One complete cycle of a door begins with the door in the closed position. The door is then moved to the open position and back 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 20 lbf/sq. ft. (960 Pa), acting inward and outward.
- B. Operation-Cycle Requirements: Design overhead coiling door components and operator to operate for not less than 20,000 cycles.

1.5 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:

1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
 2. Summary of forces and loads on walls and jambs.
- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's data sheets.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied finishes.
- D. Samples for Verification: Of each type of exposed finish required, prepared on Samples of size indicated below and of same thickness and material indicated for Work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
1. Curtain Slats: 12-inch (300-mm) length.
 2. Bottom Bar: 6-inch (150-mm) length.
 3. Guides: 6-inch (150-mm) length.
 4. Brackets: 6 inches (150 mm) square.
 5. Hood: 6 inches (150 mm) square.
 6. Laminate-Clad Counter Panel Product: 6 inches (150 mm) square, for each type, color, pattern, and surface finish, laminated to core.
- E. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the overhead coiling door manufacturer 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 the overhead coiling door manufacturer.
- 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.

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. The Cookson Company.
2. Cornell Iron Works Inc.
3. McKeon Rolling Steel Door Company, Inc.
4. Overhead Door Corporation.

2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtain: 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 material thickness recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: Structural-quality, cold-rolled galvanized steel sheets complying with ASTM A 653, with G90 (ASTM A 653M, with Z275) zinc coating.
 2. Insulation: Fill slat with manufacturer's standard rigid cellular polystyrene or polyurethane-foam-type thermal insulation complying with maximum flame-spread and smoke-developed indices of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within metal slat faces.
 3. Inside Curtain Slat Face: To match material of outside metal curtain slat and as follows:
 - a. Galvanized Steel Sheet Thickness: Not less than 0.028 inch (0.7 mm).
- B. Endlocks: Malleable-iron castings 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. Windlocks: Malleable-iron castings secured to curtain slats with galvanized rivets or high-strength nylon, as required to comply with wind load.
- D. Bottom Bar: Consisting of 2 angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch (38 by 38 by 3 mm) thick, either galvanized or stainless-steel or aluminum extrusions to suit type of curtain slats.
- E. Curtain Jamb Guides: Fabricate curtain jamb guides of angles, or channels and angles of material and finish to match curtain slats, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Provide continuous integral wear strips to prevent metal-to-metal contact and minimize noise of travel and removable stops on guides to prevent overtravel of curtain.
- F. Locking Hardware:
- a. Lockset: As selected by Architect from manufacturer's full range.
 - b. Lock Cylinders: Provide cylinder standard with manufacturer and keyed to building keying system.
 - c. Keys: Three for each cylinder.

2.3 HOODS AND ACCESSORIES

- A. Hood: Form to entirely enclose coiled curtain and operating mechanism at opening head and act as weatherseal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.
 - 1. Fabricate steel hoods, for steel doors, of not less than 0.028-inch (0.7-mm) thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653 (ASTM A 653M).
 - 2. Shape: Round.
- B. Integral Sills: Fabricate sills as integral part of frame assembly of same sheet metal, but not less than 0.078 inch (2.0 mm) thick.
- C. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets fitted to bottom and at top of exterior doors, unless otherwise indicated. At door head, use 1/8-inch- (3-mm-) thick, replaceable, continuous sheet secured to inside of curtain coil hood.
 - 1. In addition, provide replaceable, adjustable, continuous, flexible, 1/8-inch- (3-mm-) thick seals of flexible vinyl, rubber, or neoprene at door jambs for a weathertight installation.
- D. Push/Pull Handles: For push-up-operated or emergency-operated doors, provide galvanized steel lifting handles on each side of door.
 - 1. Provide pull-down straps or pole hooks for doors more than 84 inches (2130 mm) high.
- E. 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.
- F. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
 - 1. Locking Bars: Single-jamb side, operable from outside only.
 - 2. Lock cylinder is specified in another Division 8 Section.
- G. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.4 COUNTER DOORS

- A. Integral Frame, Hood, and Fascia for Counter Door: Welded sheet metal assembly of the following sheet metal:
 - 1. Galvanized Steel: Nominal 0.064-inch- thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.

- B. Integral Metal Sill for Counter Door: Fabricate sills as integral part of frame assembly of Type 304 stainless steel in manufacturer's standard thickness with No. 4 finish.

2.5 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 required 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. (2.5 mm/m) 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 with bell-mouth guide groove for curtain.

2.6 FINISHES, GENERAL

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- 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.

2.7 STEEL AND GALVANIZED STEEL FINISHES

- A. Factory Primer for Field Finish: Apply manufacturer's standard primer, compatible with field-applied finish according to coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
 - 1. Apply to ferrous surfaces except zinc-coated metal.
- B. Thermoset Finish: Apply manufacturer's standard baked finish consisting of primer and thermosetting topcoat according to coating manufacturer's written instructions for cleaning, pretreatment, application, thermosetting, and minimum dry film thickness.

2.8 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
 - 1. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
- D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.
 - 1. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
 - 2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
 - 3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. 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.
 - 1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - 2. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.

- G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
 - 1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 - 2. Exterior units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified.
 - 1. Install fire-rated doors to comply with NFPA 80.

3.2 ADJUSTING

- A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

END OF SECTION 08 33 23

SECTION 08 33 26 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Manually operated overhead coiling grilles.
- B. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications" for miscellaneous steel supports.

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. Operation-Cycle Requirements: Provide overhead coiling grille components and operators capable of operating for not less than 20,000 cycles and for 10 cycles per day.

1.5 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling grille and accessory.
 - 1. Summary of forces and loads on walls and jambs.
- B. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's product data.
- C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available for units with factory-applied finishes.
- D. Samples for Verification: Of each type of exposed finish required, prepared on Samples of size indicated below.

1. Grille Curtain: 12-inch- (305-mm-) square assembly with rods, spacers, and vertical links.
2. Bottom Bar: 6 inches (150 mm) long.
3. Guides: 6 inches (150 mm) long.
4. Brackets: 6 inches (150 mm) square.
5. Hood: 6 inches (150 mm) square.

E. Qualification Data: For Installer.

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 grilles through one source from a single manufacturer.
 1. Obtain operators and controls from overhead coiling grille manufacturer.

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. Alpine Overhead Doors, Inc.
 2. Atlas Door; Div. of Clopay Building Products Company, Inc.
 3. Cornell Iron Works Inc.
 4. Mahon Door Corporation.
 5. McKeon Rolling Steel Door Company, Inc.
 6. Overhead Door Corp.

2.2 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

- A. General: Fabricate overhead coiling grille curtain consisting of a network of [1/4-inch- (6-mm-)] minimum diameter horizontal rods, or rods covered with tube spacers, spaced as indicated. Interconnect rods by vertical links approximately 5/8 inch (16 mm) wide, spaced as indicated and rotating on rods.
 1. Space rods at approximately [3 inches (76 mm)] o.c.
 2. Space links approximately [9 inches (228 mm)] apart in a [straight in-line] pattern.
 3. Aluminum Grille Curtain: ASTM B 221 (ASTM B 221M), 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, tubular shape, or two angles, finished to match grille.
 - 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 grille.
 - 2. Provide motor-operated grilles with combination bottom astragal and sensor edge.
- D. Grille Curtain Jamb Guides: Manufacturer's standard extruded-aluminum 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.

2.3 HOODS AND ACCESSORIES

- A. Hood: Form 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. Provide closed ends for surface-mounted hoods, and provide fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sagging.
 - 1. Fabricate hoods for aluminum grilles of minimum 0.032-inch- (0.8-mm-) thick aluminum, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, complying with ASTM B 209 (ASTM B 209M).
 - 2. Shape: [Square].
 - 3. Provide removable metal soffit of same material and finish as curtain if hood is mounted above ceiling, unless otherwise indicated.
- B. Push/Pull Handles: For push-up-operated or emergency-operated grilles, provide manufacturer's standard lifting handles on each side of grille.
 - 1. Provide pull-down straps or pole hooks for grilles more than 84 inches (2130 mm) high.
- C. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from coil side.
- D. Fabricate locking device assembly with lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bar to engage through slots in tracks.
 - 1. Locking Bars: Single-jamb side, operable from inside and outside.
 - 2. Lock cylinder is specified in Division 8 Section "Door Hardware."
- E. Chain Lock Keeper: Suitable for padlock.

2.4 COUNTERBALANCING MECHANISM

- A. General: Counterbalance grille curtain by means of adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to grille 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 grille curtain without distortion of curtain and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) 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 grille 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.

2.5 MANUAL GRILLE OPERATORS

- A. Push-up Operation: Design counterbalance mechanism so required lift or pull for grille operation does not exceed 25 lbf (111 N).

2.6 FINISHES, GENERAL

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- 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.

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 INSTALLATION

- A. General: Install grilles and operating equipment, complete with necessary hardware, according to Shop Drawings, manufacturer's written instructions, and as specified.

3.2 ADJUSTING

- A. Lubricate bearings and sliding parts; adjust grilles to operate easily, free of warp, twist, or distortion and with tight fit around entire perimeter.

END OF SECTION 08 33 26

SECTION 08 34 59 - CUSTOM STEEL VAULT DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel vault doors and frames

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

1. Verify opening by field measurements before fabrication and indicate measurements on Shop Drawings.

C. Schedule: For doors and frames using same reference numbers as those on Drawings.

1.3 QUALITY ASSURANCE

A. Fire-Rated Assemblies: Complying with Underwriters Laboratories Specification 155, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire ratings indicated.

1. Test Pressure: Test at atmospheric pressure.
2. Door to be equipped with an Insulated Vault Door Class 350 w/ two (2) hour label and a U.L. - listed relocking device.

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:

- a. Diebold
- b. Custom Vault Corp., Ridgefield, CT
- c. American Vault Corp.

2.2 CONSTRUCTION

A. Doors to be constructed of 14-gauge painted steel shell filled with three and one-half inches of high-density, baked vermiculite insulating material. All jamb trim and vestibule finish plates to be fabricated from painted 16-gauge steel plate. Clear opening size of doors to be 32" x 78".

2.3 LOCKS

- A. Door to be equipped with one three tumbler, key-changeable U.L. - listed Group II Combination lock.

2.4 LOCKING MECHANISM

- A. Door to be locked with 10 live bolts (five on each side) each 11.16" in diameter. All exposed boltwork to be nickel-plated and permanently lubricated. Lock to be equipped with U.L. - listed Relocking Device to reset lock bolt if lock is damaged by attack tools. Door to be equipped with a painted steel rear cover that conceals combination lock from view when the door is opened.

2.5 RELOCK MECHANISM

- A. Door to be equipped with two thermal/mechanical relock mechanisms that automatically lock the bolts in case of torch or tool attack.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install doors and frames according to manufacturer's written instructions.

END OF SECTION 08 34 59

SECTION 08 34 73 - ACOUSTICALLY RATED DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Acoustical metal door, frame, hinges and seals shall be supplied by the acoustical door manufacturer. All acoustical doors shall be the product of one manufacturer.

1.2 SUBMITTALS

- A. Before delivery of the door, contractor shall submit for approval of the Architect and Acoustical Consultant, the following documents:
 - 1. Shop drawings of the door, frame, hardware and seals showing major operating dimensions and cross-sections of doors and seals.
 - 2. Certified test reports indicating the acoustical performance of the door meets the Sound Transmission Class (STC) performance as called out in the door schedule. Test data shall be produced from an accredited independent acoustical laboratory which is a member of NVLAP (National Volunteer Laboratory Accreditation Program). Reports should indicate that the test was performed on the doors and frames of the type to be supplied in conformance with the requirements of test method ASTM E90-83, 85, 87 or 90. Earlier test reports will not be acceptable.
 - 3. Test reports by an independent Acoustical Engineer certifying a Field Sound Transmission Class (FSTC) or Noise Isolation Class (NIC), in conformance with the requirements of test method ASTM E336-84, performance of no more than five points below the laboratory STC performance on similar installations.
 - 4. Written guarantee that door is constructed in accordance with the laboratory tested door and free of defects in material and workmanship for a period of three years after installation.
 - 5. Fire label as specified in the schedule or on drawings.

1.3 APPROVED MANUFACTURERS

- A. The following firms are approved manufacturers, subject to the above:
 - 1. Noise Barriers LLC, Schaumburg, IL 800-368-6800 www.noisebarriers.com
 - 2. Krieger Steel Products Company, Pico Rivera, CA 310-695-0645
www.kriegerproducts.com
 - 3. Security Acoustics, Culver City, CA 323-772-1171 www.securityacoustics.com
 - 4. Overly Door Company, Greensburg, PA 724-834-7300 www.overly.com

PART 2 - PRODUCTS

2.1 Door Construction

- A. Door thickness shall be as scheduled below, or as required to meet STC rating. Door leaf shall be of thick flush design, cold-rolled steel construction, of the gauge indicated in the schedule at a minimum. The core shall be acoustically non-coupling and shall be non-combustible, filled with sound-absorbing and damping elements. Vision panels, where indicated, shall consist of glazing in accordance with the acoustical tested product and be supplied by the door manufacturer.

- B. Frames shall be formed to sizes and shapes indicated and shall have full welded unit-type construction at corners and other joints. Frames shall be of cold-rolled steel construction, not less than 16 gage minimum thickness. All contact edges shall be closed tight. Welds on corners and exposed surfaces shall be pressed flush and smooth. Steel frame members shall be pre-straightened, free of wind or twist. Frame shall be factory-aligned to a diagonal tolerance of + 1/16".
- C. Doors and frames shall be factory mortised, reinforced and fitted for heavy duty locksets, strikes and closers. Hardware shall be supplied by others with notification to the door manufacturer during submittal phase. The door manufacturer is to notify the Architect if scheduled hardware is incompatible with the operation and performance of the acoustical door. Manufacturer to submit alternate hardware as required. Refer to hardware schedule for models and types.
- D. Manufacturer to supply cam-lift hinges. Surface strap or butt hinges are unacceptable.
- E. Where a transom panel is required, that panel shall provide acoustical performance at least as good as the door STC rating.
- F. Door and frame shall be factory prime-finished with a rust inhibiting primer.
- G. Door must meet or exceed requirements listed in the following Door Performance Schedule:

STC Rating, dB	Thickness, In	Surface Weight, lb/ft ²	Octave Band Transmission Loss Values, dB					
			125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
49	1-3/4	14	29	40	45	47	50	51

2.2 Perimeter Treatment

- A. Clearance between frame and door shall not exceed 1/8". Raised thresholds will not be permitted. All sills shall be flush and of steel construction to insure a proper bottom seal.
- B. Hinge, lock and head of the door shall close against positive neoprene compression and/or magnetic seals that are mounted in the frame and/or leaf. Combination felt/neoprene seals are not acceptable.
- C. The door shall be supplied with a bottom neoprene seal. The seal shall be adjustable, to conform to job site sill conditions. Automatic drop bottoms will not be permitted. All screws shall be flush with the door leaf, no surface exposed screw heads or bolts are acceptable.
- D. Where a double leaf door is specified, the astragal shall be rabbeted or bevelled and contain neoprene compression and/or magnetic seals for the full height of the door. There shall be no gaps in the seals at the head and sill of the door. There shall be continuous pressure applied to the astragal to compress the seals and prevent the leaves from bowing out and disengaging the astragal seals. Double door acoustic test data shall be submitted. Single leaf test data will not be acceptable for double doors.

PART 3 - EXECUTION

3.1 Installation

- E. Door shall be installed by factory-trained or approved representatives or contractors. Door shall be installed per manufacturer's recommendations to insure a tight fit and proper seal at all joints and interfaces.
- F. The door manufacturer shall provide factory trained supervision personnel during the initial frame installation, at regular periods during the acoustic door installation, and at final inspection. The manufacturer shall issue a letter of compliance certifying the completion of a successful installation.

3.2 Field Testing Verification

- G. If required, the Owner will retain the services of an independent acoustical consultant to conduct an acoustical test at any designated door locations where noise transmission is suspected of being below the set criteria. The test shall consist of a Field Sound Transmission Class (FSTC) or Noise Isolation Class (NIC) test per ASTM E336-84. If such results indicate non-conformance with the established FSTC or NIC requirements, it shall be the responsibility of the Contractor and Manufacturer to correct, at their expense, such deficiencies by methods that shall be approved by the Acoustical Consultant and Owner prior to incorporation. Acoustical tests shall be repeated at the manufacturer's cost and corrective measures devised and incorporated until the set criteria and performance standards are met. If the Acoustical Consultant or Architect determines that the materials are not as specified herein, the door shall be replaced at no cost to the Owner.

END OF SECTION 08 34 73

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Exterior and interior aluminum-framed storefronts.
 - a. Glazing is retained mechanically with gaskets on four sides.
- 2. Exterior and interior manual-swing aluminum doors and frames.
- 3. Exterior and interior aluminum window walls and punched window openings unless noted otherwise on drawings or elsewhere in the project manual.

- B. Related Sections include the following:

- 1. Division 7 Section "Building Insulation" for insulation materials field installed with aluminum-framed systems.
- 2. Division 7 Section "Joint Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
- 3. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
- 4. Division 8 Section "Glazing" for glazing requirements to the extent not specified in this Section.
- 5. Division 8 Section "Glazed Aluminum Curtain Walls" for curtain-wall systems that mechanically retain glazing on four sides.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum-framed 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 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.

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- 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.
 - h. Failure of operating units to function properly.
- B. Structural Loads:
1. Basic Wind Speed: As indicated on Structural Drawings in 110 mph. at 33 feet (10 m) above grade. Determine wind loads and resulting design pressures applicable to Project, including Importance Factor, Exposure Category and according to the following, based on mean roof heights above grade as indicated on Drawings:
 - a. ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 6.4.2, "Analytic Procedure."
 2. Seismic Loads: As indicated on Structural Drawings.
- C. Deflection of Framing Members:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
- D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 3. Test Durations: As required by design wind velocity but not less than 10 seconds.
- E. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

- a. Test High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
 - b. Test Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
 - c. Test Interior Ambient-Air Temperature: 75 deg F (24 deg C).
- F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).
- 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. (300 Pa).
- H. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 53 when tested according to AAMA 1503.
- I. Average Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having average U-factor of not more than 0.69 Btu/sq. ft. x h x deg F (3.92 W/sq. m x K) 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: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
 - 3. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12-inch (300-mm) 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. Welding certificates.
- G. Qualification Data: For Installer.
- H. Preconstruction Sealant Test Reports: For structural-sealant-glazed systems, 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.
- I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.
- J. Field quality-control test and inspection reports.
- K. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.
- L. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.
 - 1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.
- B. 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. Accessible Entrances: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)," ICC/ANSI A117.1, and FED-STD-795, "Uniform Federal Accessibility Standards."
 - 1. In the event of a conflict between or among requirements of the above standards, the more conservative or more restrictive shall apply in each situation.
- D. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 WARRANTY

- A. Special Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Deterioration of metals, and other materials beyond normal weathering.
 - d. Adhesive or cohesive sealant failures.
 - e. Water leakage through fixed glazing and framing areas.
 - f. Failure of operating components to function properly.
 2. Warranty Period: 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: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for aluminum-framed systems is based on Kawneer Model: Trifab VG 451T. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. EFCO Corporation.
 2. Kawneer.
 3. Pittco Architectural Metals, Inc.
 4. United States Aluminum.
 5. Vistawall Architectural Products.
 6. YKK AP America Inc.

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 (ASTM B 209M).
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308/B 308M.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

- B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and with steel reinforcement as required to support imposed loads.
 - 1. Construction: Framing members are thermally broken, composite assemblies of two separate extruded-aluminum components permanently bonded by an elastomeric material of low thermal conductance.

- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. 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 requirements.

- E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

- F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.
- G. Frames shall be pre-drilled and prepared for security contacts and card readers.

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 8 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.
- D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.5 DOORS

- A. Doors: Manufacturer's standard glazed doors, for manual swing operation.
 - 1. Door Construction: 2-1/4-inch (50.8- to 57.2-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.
 - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
 - 2. Door Design: Medium stile; 3-1/2-inch (88.9-mm) nominal width, with 16-inch (40 mm) bottom rail.
 - a. Accessible Doors: Smooth surfaced for width of door in area within 16 inches (255 mm) above floor or ground plane.
 - 3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.
 - 4. Doors shall be pre-drilled and prepared for security contacts and card readers.

2.6 DOOR HARDWARE

- A. General: Provide heavy-duty units in sizes and types recommended by entrance system and hardware manufacturers for entrances and uses indicated.
 - 1. Opening-Force Requirements:
 - a. Egress Doors: Not more than 30 lbf (133 N) required to set door in motion and not more than 15 lbf (67 N) required to open door to minimum required width.

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- b. Accessible Interior Doors: Not more than 5 lbf (22.2 N).
- B. Scheduled Door Hardware: Provide door hardware according to the Division 8 and as follows:
- 1. Named Manufacturer's Products: Product designation and hardware manufacturer are listed in the Door Hardware Schedule in Division 8 to establish minimum requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware.
 - a. Named products are basis-of-design products. Provide named hardware manufacturer's products or comparable products that are equivalent in function and quality and that are recommended and supplied by entrance system manufacturer.
 - 2. References to BHMA Standards: Provide products complying with standards referenced in this Article and with requirements for description, quality, type, and function listed in the Door Hardware Schedule in Division 8.
- C. Pivot Hinges:
- 1. Standard: BHMA A156.4, Grade 1.
 - 2. Offset-Pivot Hinges: Provide top, bottom, and intermediate offset pivots at each door leaf.
- D. Ball-Bearing Butts:
- 1. Standard: BHMA A156.1, Grade 1, radius corner.
 - 2. Provide nonremovable pins at hinges exposed to outside of door.
 - 3. Provide nonferrous hinges where hinges are exposed to weather.
 - 4. Quantities:
 - a. For doors with heights up to 87 inches (2210 mm), provide 3 hinges per leaf.
 - b. For doors with heights of greater than 87 and up to 120 inches (2210 and up to 3048 mm), provide 4 hinges per leaf.
- E. Continuous-Gear Hinges: Manufacturer's standard with stainless-steel bearings between knuckles; fabricated to full height of door and frame.
- F. Locking Devices, General: Do not require use of key, tool, or special knowledge for operation.
- 1. Opening-Force Requirements:
 - a. Latches and Exit Devices: Not more than 15 lbf (67 N) required to release latch.
- G. Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1.
- H. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- 1. Standard: BHMA A156.3, Grade 1.

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- I. Cylinders: BHMA A156.5, Grade 1.
 - 1. Keying: Master key system. Permanently inscribe each key with a visual key control number and include notation "DO NOT DUPLICATE".
- J. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- K. Electric Strikes:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adams Rite Manufacturing Co. (ARM).
 - b. Folger Adam Security, Inc. (FAS).
 - c. Locknetics Security Engineering,; a Harrow Company (LSE).
 - d. Von Duprin, Inc.; an Ingersoll-Rand Company (VD).
 - 2. Standard: BHMA A156.5, Grade 1
- L. Operating Trim: BHMA A156.6.
- M. Closers: With accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use, and adjustable to meet field conditions and requirements for opening force.
 - 1. Standard: BHMA A156.4, Grade 1.
- N. Concealed Overhead Holders: BHMA A156.8, Grade 1.
- O. Surface-Mounted Holders: BHMA A156.16, Grade 1.
- P. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- Q. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
 - 2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- R. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- S. Thresholds: Raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (13 mm).
 - 1. Standard: BHMA A156.21.

- T. Security Contacts and Card Readers: Doors and Frames shall be pre-drilled and prepared for security contacts and card readers.

2.7 ACCESSORY MATERIALS

- A. Insulating Materials: As specified in Division 7 Section "Building Insulation."
- B. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."
- C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.8 FABRICATION

- A. Form aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from interior.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).
- E. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.
 - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- F. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- 2.9 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. High-Performance Organic Finish: (3-coat fluoropolymer) thermocured system with fluoropolymer coats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2605.
1. Finish Material: Kynar 500 with 20-year warranty.
 - a. Colors: Provide custom colors to match architect's sample.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.

6. Seal joints watertight, unless otherwise indicated.
- B. Metal Protection:
1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, without warp or rack.
- F. Install glazing as specified in Division 8 Section "Glazing."
- G. Entrances: Install to produce smooth operation and tight fit at contact points.
1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
 2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- H. Install insulation materials as specified in Division 7 Section "Building Insulation."
- I. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.
- J. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:
1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).
 3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch (3 mm).

3.3 ADJUSTING

- A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.
 - 1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch measured to the leading door edge.

END OF SECTION 08 41 13

SECTION 08 44 00 - GLAZED ALUMINUM CURTAIN WALLS

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 conventionally glazed aluminum curtain walls installed as stick systems, including "shadow back-box" system and custom fins where indicated on the drawings.
- B. Related Sections include the following:
 - 1. Division 7 Section "Building Insulation" for insulation materials field installed with glazed aluminum curtain-wall systems.
 - 2. Division 7 Section "Fire-Resistive Joint Systems" for perimeter fire-containment systems (safing insulation) field installed with glazed aluminum curtain-wall systems.
 - 3. Division 7 Section "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain-wall systems and for sealants to the extent not specified in this Section.
 - 4. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for entrance systems installed with glazed aluminum curtain-wall systems.
 - 5. Division 8 Section "Aluminum Windows" for windows installed with glazed aluminum curtain-wall systems.
 - 6. Division 8 Section "Glazing" for insulating-glass requirements.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide glazed aluminum curtain-wall systems, including anchorage, capable of withstanding, without failure, the effects of the following:
 - 1. Structural loads.
 - 2. 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.
 - 3. Dimensional tolerances of building frame and other adjacent construction.
 - 4. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferred to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
 - d. Noise or vibration created by wind and thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.

- B. Structural Loads:
1. Basic Wind Speed: As indicated on Structural Drawings in 110 mph. at 33 feet (10 m) above grade. Determine wind loads and resulting design pressures applicable to Project, including Importance Factor, Exposure Category and according to the following, based on mean roof heights above grade as indicated on Drawings:
 - a. ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 6.4.2, "Analytic Procedure."
 2. Seismic Loads: As indicated on Structural Drawings.
- C. Structural-Test Performance: Provide glazed aluminum curtain-wall systems, including anchorage, capable of withstanding test pressure indicated without material and deflection failures and permanent deformation of structural members exceeding 0.2 percent of span when tested according to ASTM E 330.
1. Submit reports of tests performed on manufacturer's standard assemblies.
 2. Test Pressure: 150 percent of positive and negative wind-load design pressures.
 3. Test Duration: As required by design wind velocity but not less than 60 seconds.
- D. Deflection of Framing Members:
1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span or 3/4 inch (19 mm), whichever is smaller.
 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).
 - a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) 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.
- E. Story Drift: Provide glazed aluminum curtain-wall systems that accommodate design displacement of adjacent stories indicated.
1. Design Displacement: As indicated on Drawings.
 2. Test Performance: No glass breakage, anchor failures, or structural damage when tested according to AAMA 501.4.
- F. Thermal Movements: Provide glazed aluminum 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 (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 2. Test Performance: No buckling, stress on glass, glazing-edge seal failure, sealant failure, excess stress on curtain-wall framing, anchors and fasteners, or reduction of performance when tested according to AAMA 501.5.
 - a. Test Ambient Temperature Range: 0 to 180 deg F (minus 18 to plus 100 deg C).
- G. Air Infiltration: Provide glazed aluminum curtain-wall systems with maximum air leakage of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
- H. Water Penetration Under Static Pressure: Provide aluminum 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 10 lbf/sq. ft. (479 Pa).
- I. Water Penetration Under Dynamic Pressure: Provide glazed aluminum curtain-wall systems that do not evidence water leakage when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive design wind load, but not less than 10 lbf/sq. ft. (479 Pa).
1. Maximum Water Leakage: According to AAMA 501.1. Water controlled by flashing and gutters that is drained to exterior and cannot damage adjacent materials or finishes is not considered water leakage.
- J. Condensation Resistance: Provide glazed aluminum curtain-wall systems with condensation-resistance factor (CRF) of not less than 55 for glass and 70 for frame, when tested according to AAMA 1503.
- K. Average Thermal Conductance: Provide glazed aluminum curtain-wall systems with average U-factor of not more than 0.66 Btu/sq. ft. x h x deg F (3.75 W/sq. m x K) 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 glazed aluminum curtain-wall systems.
 1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 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 systems, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:

1. Joinery.
 2. Anchorage.
 3. Expansion provisions.
 4. Glazing.
 5. Flashing and drainage.
- E. Welding certificates.
- F. Qualification Data: For Installer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for glazed aluminum curtain-wall systems.
- H. Field quality-control test reports.
- I. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Capable of assuming engineering responsibility and performing Work of this Section and who is acceptable to manufacturer.
1. Engineering Responsibility: Preparation of data for glazed aluminum 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.
 - b. Shop Drawings, preconstruction-testing program development, and comprehensive engineering analysis by a qualified professional engineer licensed in the state of Connecticut.
- 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 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.
- D. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."

- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to glazed aluminum curtain-wall systems including, but not limited to, the following:
1. Review structural load limitations.
 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review required testing, inspecting, and certifying procedures.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for glazed aluminum 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 glazed aluminum 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 glazed aluminum 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, metal finishes, and other materials beyond normal weathering.
 - d. Water leakage.
 - e. 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: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for glazed aluminum curtain-wall systems is based on Kawneer, Outside Glazed Curtain Wall System, Series 1600 with steel reinforcement as required to meet structural loads indicated. Provide .093 inches thick aluminum continuous brake metal “shadow back-box” and provide custom fins applied to curtain-wall frame where indicated on drawings. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
1. Kawneer.
 2. Wausau Window and Wall Systems.
 3. YKK AP America Inc.
 4. EFCO

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 (ASTM B 209M).
 - 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
 - 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 non-staining, nonferrous shims for aligning system components.

- D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding 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 8 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

2.4 ACCESSORY MATERIALS

- A. Perimeter Fire-Containment Systems (Safing Insulation): Specified in Division 7 Section "Fire-Resistive Joint Systems."
- B. Insulating Materials: Specified in Division 7 Section "Building Insulation."
- C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.5 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. Provisions for reglazing from exterior.
- 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. Factory-Assembled Frame Units:
 - 1. Rigidly secure nonmovement joints.
 - 2. Seal joints watertight, unless otherwise indicated.
 - 3. Pressure equalize system at its interior face.
 - 4. Install glazing to comply with requirements in Division 8 Section "Glazing."
- E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.6 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. High-Performance Organic Finish: (3-coat fluoropolymer) thermocured system with fluoropolymer coats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2605.
 - 1. Finish Material: Kynar 500 with 20-year warranty.
 - a. Colors: Provide custom color to match architect's sample.

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 8 Section "Glazing."
- G. Install sealants as specified in Division 7 Section "Joint Sealants."
- H. Install insulation materials as specified in Division 7 Section "Building Insulation."
- I. Install perimeter fire-containment systems (safing insulation) as specified in Division 7 Section "Fire-Resistive Joint Systems."
- J. Erection Tolerances: Install glazed aluminum curtain-wall systems to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet (3 mm in 3 m); 1/4 inch in 40 feet (6 mm in 12 m).
 - 2. Level: 1/8 inch in 20 feet (3 mm in 6 m); 1/4 inch in 40 feet (6 mm in 12 m).
 - 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (13 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (13 to 25 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
 - c. Where surfaces are separated by reveal or protruding element of 1 inch (25 mm) wide or greater, limit offset from true alignment to 1/4 inch (6 mm).
 - 4. Location: Limit variation from plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/2 inch (12.7 mm) over total length.

3.3 ADJUSTING AND CLEANING

- A. Clean aluminum surfaces promptly after installation, exercising care to avoid damage to protective coating and finishes.
- B. Submit to Architect, with copy to Owner, manufacturer's written recommendations for maintenance and protection of curtain wall system.

END OF SECTION 08 44 00

SECTION 08 51 13 - 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. Type D2 – Project out windows.
- B. Related Sections include the following:
 - 1. Division 8 Section "Aluminum-Framed Entrances and Storefronts."
 - 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. AW: Architectural.
- B. Performance grade number, included as part of the AAMA/NWWDA product designation code, is actual design pressure in 40 psf. 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.2-97.
- B. Structural Performance: Provide aluminum windows capable of withstanding the following, including wind loads based on passing AAMA/NWWDA 101/I.S.2-97, Uniform Load Structural Test, at basic wind speed indicated:

1. Deflection: Based on passing AAMA/NWWDA 101/I.S.2-97, Uniform Load Deflection Test.
 2. Basic Wind Speed: As indicated in 100 mph. at 33 feet (10 m) above grade. Determine wind loads and resulting design pressures applicable to Project according to the following, based on mean roof heights above grade as indicated on Drawings:
 - a. ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 6.4.2, "Analytic Procedure."
- 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: 0.07 cfm/sq. ft. (2 cu. m/h x sq. m) of area at an inward test pressure of 6.24 lbf/sq. ft. (300 Pa).
- 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.2-97, Water Resistance Test.
1. Test Pressure: 20 percent of positive design pressure, but not more than 12 lbf/sq. ft. (580 Pa).
- E. Forced-Entry Resistance: Comply with Performance Level 10 requirements when tested according to ASTM F 588.
- F. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503-98, showing a CRF of 58, where windows are indicated to be "thermally improved."
- G. Thermal Transmittance: The thermal transmittance due to conduction with the "U-value" expressed in Btu/hr-ft²-F shall not exceed .051 Btu/hr-ft²-F.
- H. 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 (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.
- I. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/NWWDA 101/I.S.2-97.
- J. Awning and Casement Windows: Comply with AAMA/NWWDA 101/I.S.2-97 for the following tests:
1. Hardware Load Test.
 2. Sash Torsion Test.

3. Torsion Test.
4. Horizontal Concentrated Load Test on Latch Rail.
5. Vertical Concentrated Load Test on Latch Rail.
6. Torsion Load Test on Intermediate Frame Rails.
7. Vertical Concentrated Load Test on Intermediate Frame Rails.
8. 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.
 8. Window cleaning provisions.
 9. Window System Operators: Show locations, mounting, and details for installing operator components and controls.
 10. 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 and used to determine the following:
 - a. Structural test pressures and design pressures from basic wind speeds indicated.
 - b. Deflection limitations of glass framing systems.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For aluminum window components required, prepared on Samples of size indicated below.
 1. Main Framing Member: 12-inch- (300-mm-) 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- (300-mm-) long sections.
 4. Architect reserves the right to require additional samples that show fabrication techniques, workmanship, and design of hardware and accessories.
- E. Qualification Data: For professional engineer.
- F. 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. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aluminum windows' 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 pre-construction testing, field testing, and in-service performance.
- 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.2-97, "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.
- F. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.
- G. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Build mockup in building envelope wall in location shown on Drawings.
 - 2. Perform tests specified in "Field Quality Control" Article. Modify mockup construction and perform additional tests as required to achieve specified minimum acceptable results.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- H. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to aluminum windows including, but not limited to, the following:
 - 1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review required testing and inspecting procedures.

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. Insulating glass failure.
- B. Warranty Period: Five years from date of Substantial Completion.
- C. Warranty Period for Metal Finishes: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Product: The basis of design for Aluminum Windows is Winco Model # 1450H. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. Projected Windows (Project-out):
 - a. EfcO Corporation.
 - b. Kawneer Company, Inc.
 - c. Wausau Window

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 (150-MPa) ultimate tensile strength, not less than 16,000-psi (110-MPa) minimum yield strength, and not less than .125-inch thickness at any location for the main frame and sash members. All window main frames shall not be less than 4" deep and vents shall not be less than 2" deep.

- B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be non-corrosive 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 (3.2 mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, non-corrosive, 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.2-97.
- F. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
 - 1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semi-rigid, polypropylene sheet or polypropylene-coated material.
- G. Replaceable Weather Seals: Comply with AAMA 701/702.
- H. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, non-shrinking, and non-migrating 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.
- B. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

2.4 **HARDWARE**

- A. General: Provide manufacturer's standard hardware fabricated from white bronze material complying with AAMA 907, 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.
- B. Four- bar Friction Hinges: Comply with AAMA 904.
 - 1. Provide stainless steel four-bar friction hinges on the awning vents.
 - 2. Friction Shoes: Provide friction shoes of nylon or other nonabrasive, non-staining, non-corrosive, durable material.
- C. Locking Mechanisms: Provide the following operating hardware:
 - 1. Projected Windows:
 - a. Provide one white bronze cam lock handle per sash. For sashes larger than 42" in width, provide a second standard white bronze cam lock.
 - b. Provide one white bronze single action casement lock on each jamb for sashes larger than 42" in height.

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. Fabricate insect screens to fully integrate with window frame. 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," Architectural C-24 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 or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
 - 1. Extruded-Aluminum or Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.050-inch wall thickness.
 - 2. Finish: Match aluminum window members.
- C. Wickets: Provide hinged wickets, framed and trimmed for a tight fit and for durability during handling.

2.6 FABRICATION

- A. General: Fabricate aluminum windows, in sizes indicated, that comply with AAMA/NWWDA 101/I.S.2-97 for performance class and performance grade indicated. Include a complete system for assembling components and anchoring windows.
- B. General: Fabricate aluminum windows, in sizes indicated, that comply with requirements and that meet or exceed AAMA/NWWDA 101/I.S.2-97 performance requirements for the following window type and performance class. Include a complete system for assembling components and anchoring windows.
 - 1. Projected Windows: AP-AW80.
 - 2. Fixed Windows: F-AW80.
- C. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.
- D. 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 thermal barriers tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505.
 - 3. Provide hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.
- E. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.
- F. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- 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 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/NWDA 101/I.S.2-97.
- 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. High-Performance Organic Finish: (3-coat fluoropolymer) thermocured system with fluoropolymer coats containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with physical properties and coating performance requirements of AAMA 2605.
 - 1. Finish Material: Kynar 500 with 20-year warranty.
 - a. Colors: Provide custom color to match architect's sample.

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.2-97.

3.3 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.

3.4 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 08 51 13

SECTION 08 51 19 – STEEL WINDOWS

PART 1 GENERAL

1.1 SUMMARY

1.1.1 This section includes the following:

- A. Fire rated steel windows.

1.2 PERFORMANCE

Steel windows shall be designed to meet the following performance requirements, and shall be of the type and size indicated. Fire-rated windows shall bear the Underwriters Laboratories, Inc. label including the manufacturer's file number for the indicated rating.

1.2.1 Fire Resistance

Fire resistance shall meet requirements established by ASTM E 163 and as tested and classified by Underwriters Laboratories Inc, in accordance with UL-9. Products shall meet the requirements of Underwriters Laboratories Inc. The Listing Mark of UL on the product will be accepted as evidence of compliance.

- A. Rated protected openings specified as 1-hour shall be glazed with clear insulated glass (non-wire) with a minimum 1-hour rating as specified under Division 8-Glazing.

1.2.2 Life Safety Criteria

Windows shall conform to NFPA 101 Life Safety Code when rescue and/or second means of escape are indicated.

1.3 SUBMITTALS

- A. Manufacturer's descriptive data and catalog cut sheets.
- B. Drawings indicating elevations of windows, rough-opening dimensions for each type and size of windows, full-size sections, thickness of metal, fastenings, methods of installation and anchorage, connections with other work, type of wall construction, size and spacing of anchors, method of glazing, types and locations of operating hardware, mullion details and window schedules showing locations of each window type and indicating compliance with fire safety code, where required.
- C. Manufacturer's preprinted installation instructions and cleaning instructions.

D. Certificates stating that the steel windows conform to requirements of this section.

E. Manufacturer's standard color samples of painted finishes.

1.4 QUALIFICATION

Window manufacturer shall specialize in designing and manufacturing the type of steel windows specified, and shall have a minimum of 5 years of documented successful experience. Manufacturer shall have the facilities capable of meeting contract requirements, single-source responsibility and warranty.

1.5 DELIVERY AND STORAGE

Steel windows shall be delivered to project site and stored in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.1 GENERAL

2.1.1 Manufacturer: Subject to compliance with Contract Documents and specifications, provide the following:

A: Basis of Design: Series 950 Fixed Lite Window as manufactured by D.V. Fyre-Tec.

B: Adams Steelguard – Equivalent product to basis of design.

C. Optimum Window Manufacturing Corp. – Equivalent product to basis of design.

2.2 MATERIALS

2.2.1 Steel Frames

Steel frames shall be fabricated from roll-formed galvanized lock-forming quality steel per ASTM A 527. Frame corners shall mitered and welded. Integral muntin shall be galvanized roll-formed material fitted and welded.

2.2.2 Formed Component Parts

Formed component parts shall be hot-rolled sheet steel conforming to ASTM A 569, commercial quality with a minimum of 0.15 percent carbon. Sheet steel shall be zinc coated (galvanized) by the hot-dip process in accordance with ASTM A 653 or ASTM A 924.

2.2.3 Screws and Bolts

Screws and bolts shall conform to ASTM B 766, ASME B18.6.3 and ASME B18.6.4.

2.3 STEEL WINDOW TYPES

Steel windows shall be designed for inside field glazing, and for glass types scheduled on drawings or otherwise specified. Units shall be complete with glass and glazing provisions to meet performance requirements specified. Glazing material shall be compatible with steel, and shall not require painting.

2.3.1 Fire-Rated Windows

Fire-rated windows shall conform to UL-9 and shall be labeled with a 3/4 or 1 hour fire-test rating as indicated on drawings. Units shall be designed and fabricated to meet glass sizes, window sizes, and opening dimensions established by NFPA 80. Hardware shall conform to NFPA 80 requirements.

2.4 ACCESSORIES

2.4.1 Fasteners

Fastening devices shall be window manufacturer's design made from non-magnetic stainless steel, cadmium-plated steel, zinc-plated steel, nickel/chrome-plated steel or magnetic stainless steel

2.4.2 Window Anchors

Anchors for installing windows shall be stainless steel or hot-dip zinc coated steel conforming to ASTM A 123.

2.5 FINISHES

2.5.1 Prime Coat

Steel windows, fins, mullions, cover plates and associated parts shall be cleaned, pre-treated with iron phosphate and factory painted manufacturer's standard primer coat in a dry film thickness of not less than 0.025 mm (1.0 mil).

PART 3 EXECUTION

3.1 INSTALLATION

Steel windows shall be installed in accordance with approved shop drawings and manufacturer's approved recommendations. Fire-rated windows shall be installed in compliance with NFPA 80 and NFPA 101. Steel surfaces in close proximity with masonry, concrete, wood, and dissimilar metals other than stainless steel, zinc, cadmium, or small areas of white bronze shall be protected from direct contact. The completed window installation shall be watertight. Fire-rated windows shall be glazed in accordance with NFPA 80.

3.2 CLEANING

3.2.2 Cleaning

Steel window finish and glass shall be cleaned on interior and exterior sides in accordance with window manufacturer's recommendation. Alkaline or abrasive agents shall not be used.

END OF SECTION 08 51 19

SECTION 08 56 73 – SOUND RETARDANT WINDOWS

Part I - General

1.1 Description

- A. Work Included: Provide Sound Retardant Metal Fixed Window Systems where shown on drawings and specified herein.
- B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
- C. Except for the items specifically listed in this Section, finish paint, glass and glazing are furnished and installed under other sections of these Specifications.

1.2 Quality Assurance

- A. Experience: Provide work of this Section designed and furnished by one manufacturer. Use a manufacturer who is ISO9001:2000 certified and has been engaged in the manufacture of Sound Retardant Metal Fixed Window systems for at least five (5) years immediately prior to the start of this work, and who has a history of successful production acceptable to the Architect.

1.3 Related Sections

- A. Division 8 – Glazing
- B. Division 9 – Painting

1.4 References

- A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss in Building Partitions.
- B. ASTM E336 – Standard Test Method for Measurement of Airborne Sound Insulation in Buildings.
- C. ASTM E413 – Classification for Determination of Sound Transmission Class
- D. UL9 – Fire Tests of Window Assemblies.

1.5 Submittals

- A. Shop Drawings: Submit a schedule of items to be provided under this Section along with shop drawings in sufficient detail to show fabrication, installation, anchorage and interface of the work of this section with the work of adjacent trades.
- B. Certification: Provide certification that the fixed window construction utilized has been tested at an independent laboratory in accordance with ASTM E90, and that the STC rating determined in accordance with ASTM E413, is not less than that specified in Part 2 of this Section. The laboratory referenced in the certification must be qualified under the National Voluntary Accreditation Program (NVLAP) of the U.S. Bureau of Standards.

Certification must reference laboratory name, test report number, and date of test; substitution of test data not in accordance with ASTM E90 and E413 will not be acceptable.

- C. Installation Instructions: Provide recommended installation procedures which, upon approval by the architect, will become the basis for acceptance or rejection of the actual procedures used for installation.
- D. Warranty: Upon completion of the work of this Section, provide the Architect with two (2) copies of the manufacturer's standard written two (2) year warranty.

Part 2 - Products

2.1 Design

- A. Design Basis and Type: Sound Retardant Metal Fixed Window System designs are based on those manufactured by Overly Door Company, Greensburg, PA 15601. Tel 800-979-7300, Fax 724-830-2871.
 - 1. Provide the basis of design product or a comparable product by one of the following:
 - a. Krieger Steel Products
 - b. Acoustical Surfaces, Inc.
- B. Performance: Sound Retardant Metal Fixed Window System to be Overly Model No. 549226 or equal with a minimum STC rating of 54 when tested as a system in accordance with ASTM E90 and ASTM E413.
- C. Components: Assemblies to be complete with metal frame, glass, and glazing. Glass, and glazing shipped loose to be field installed.

2.2 Fabrication

- A. Materials: Sound Retardant Metal Fixed Window Frames to be constructed from formed sheet steel or structural shapes and bars. Sheet steel shall be commercial quality, level, cold rolled steel conforming to ASTM A366 or hot rolled, pickled and oiled steel conforming to ASTM A1011. Steel shapes shall comply with ASTM A36 and steel bars with ASTM A108, Grade 1018. Exterior units shall be fabricated from Galvannealed material conforming to ASTM A653 (A60) with a coating weight of not less than 0.60 ounces per square foot.
- B. Frame Design: Sound Retardant Metal Fixed Window Frames shall be 14 gauge minimum welded units with integral trim and shipped with temporary spreader. Knock-down frames are not acceptable, unless sizes of frames exceed shipping limitations. After installation, field splices required because of shipping limitations must be field welded by certified welders per manufacturer's instructions and in accordance with AWS D1.1/D1.3.
- C. Anchors: Provide suitable anchors to properly install frames in partition types shown on Architects drawings.
- D. Painting and Cleaning: After fabrication of frames, all tool marks and surface imperfections shall be removed and exposed faces of all welded joints dressed smooth. Chemically treat all surfaces to insure maximum paint adhesion and coat with a water-based rust-inhibitive primer.

Part 3 - Execution

3.1 Site Storage and Protection of Materials

- A. Receipt: Upon receipt of product, all materials shall be thoroughly inspected and all discrepancies, deficiencies and/or damages shall be immediately reported to the supplier in writing.
- B. Storage: Store all materials on planks or dunnage in a dry location in a vertical position, spaced by blocking to permit air circulation between units. Cover all material or store in a controlled area to protect from damage.

3.2 Installation

- A. Prior to installation, secure the services of a qualified representative of the manufacturer to visit the job site and instruct the contractor's personnel in proper installation and adjustment of the assemblies or secure services of manufacturer's factory trained and authorized installer to perform installation of assemblies.
- B. Install work of this Section in strict accordance with approved shop drawings and manufacturer's recommended installation instructions. Where installations require field welding, all work must be performed by certified welders in accordance with AWS D1.1/D1.3.
- C. Upon installation, secure the services of a qualified representative of the manufacturer to visit the jobsite and inspect the complete installation of the fixed window assemblies, and direct installer in correcting any non-conforming items found.

3.3 Field Testing

- A. Secure the services of a qualified Independent Testing agency to test window and frame installations selected by Owner/Architect in accordance with ASTM E336. Installed product shall perform no less than five (5) FSTC rating points below the specified STC rating. Any installations which fail to meet this criteria shall be examined, re-worked and re-tested until compliance is obtained.

END OF SECTION 08 56 73

SECTION 08 62 00 - UNIT SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes factory-assembled unit skylights for installation in flat roof areas.
 - 1. Type: Self flashing with integral curb
 - 2. Glazing: Tempered glass

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Loads:
 - 1. Snow Load: 30lbs PSF
 - 2. Live Load: 25lbs PSF

1.3 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Include details of installation.
- C. Samples: For each exposed finish.

1.4 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. Warranty Period: Five years from Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 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. Kalwall Corporation;

2. Wasco Products, Inc.;
3. Solar Industries, Inc.

2.2 UNIT SKYLIGHTS

- A. General: Factory-assembled units that include glazing, extruded-aluminum glazing retainers, gaskets, and inner frames and that are capable of withstanding design loads indicated.
- B. Integral Curb: Self-flashing type.
 1. Height: 8 inches
 2. Insulation: Manufacturer's standard rigid type
- C. Unit Shape and Size: As indicated
- D. Insulating Glass: Clear, sealed units that comply with Division 8 Section "Glazing," in manufacturer's standard overall thickness.
 1. Exterior Lite: 1/4-inch (6-mm) clear (tinted) heat-strengthened glass.
 2. Interior Lite: Laminated glass; 2 plies of 1/8-inch (3-mm) clear heat-strengthened glass with 0.030-inch (0.762-mm) clear polyvinyl butyral interlayer.
 3. Interspace Content: Argon.
 4. Low-Emissivity Coating: Manufacturer's standard.
- E. Glazing Gaskets: Manufacturer's standard.
- F. Aluminum Components:
 1. Sheets: ASTM B 209 (ASTM B 209M), 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 (ASTM B 221M), alloy and temper to suit structural and finish requirements but with not less than the strength and durability of alloy 6063-T52.
- G. 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.
 1. Where removal of exterior exposed fasteners might allow access to building, provide nonremovable fastener heads.
- H. Condensation Control: Fabricate unit skylights with integral internal gutters and nonclogging weeps to collect and drain condensation to the exterior.
- I. Thermal Break: Fabricate unit skylights with thermal barrier separating interior metal framing from materials exposed to outside temperature.
- J. Protective Screens: Manufacturer's standard to protect personnel from falls complying with OSHA 1910.23.

2.3 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 (0.4-mm) dry film thickness per coating.
- B. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- C. Elastomeric Sealant: ASTM C 920; Type S; Grade NS; Class 25; and Uses NT, G, A, and (as applicable to joint substrates indicated) O; recommended by unit skylight manufacturer and compatible with joint surfaces.
- D. Roofing Cement: ASTM D 4586, asbestos free, designed for trowel application or other adhesive compatible with roofing system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate unit skylight installation with installation of substrates, vapor retarders, roof insulation, roofing, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.
 - 1. Unless otherwise indicated, install unit skylights according to construction details of NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Where metal surfaces of units will contact incompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation recommended in writing by unit skylight manufacturer.

END OF SECTION 08 62 00

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. Division 6 – Exterior Finish Carpentry
2. Division 8 – Steel Doors and Frames
3. Division 8 – Flush Wood Doors
4. Division 8 – Aluminum-Framed Entrances and Storefronts
5. Division 16 – Access Control

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 Building Code 2005
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 least 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 eighteen (18) months 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. Mortise locksets: Five (5) years
 2. Cylindrical locksets – Heavy Duty: Five (5) years
 3. Exit Devices: Five (5) years
 4. Door closers: Ten (10) years

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. CONTINUOUS STAINLESS STEEL HINGES

- a. All hinges to be non-handed and of slim barrel design. Hinges to be made of type 304 stainless steel and shall have a concealed teflon-coated stainless steel pin with twin self-lubricated nylon bearings at each knuckle. Hinges shall be UL list up to and including 3 hours and shall be available with power transfer cutouts when necessary.

- 1) Specified Manufacturers: Markar
- 2) Approved Manufacturers: MCKinney

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 biting number.

- 1) Specified Manufacturer: Sargent Signature
- 2) Approved Substitutes: Corbin Russwin Pyramid PS, Schlage Everest Primus, Yale 5000

2. KEYING

- a. All locks and cylinders shall be removable core type and be furnished with brass construction cores for use during the construction phase. All permanent cores shall be master-keyed or grandmaster-keyed as directed by the owner. The factory shall key all locks and cylinders. 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) Fifteen (15) construction master 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: Sargent Key Wizard
 - 2) Approved Manufacturers: Corbin Russwin, Schlage

E. LOCKING DEVICES

1. LEVER 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. Provide tactile warning on levers at all hazardous areas.

- 1) Specified Manufacturer: Sargent 8200 Series
- 2) Approved Substitutes: Corbin Russwin ML2000 Series, Schlage L9000 Series, Yale 8800 Series

2. LEVER 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. Provide tactile warning on levers at all hazardous areas.

- 1) Specified Manufacturer: Sargent 10 Series
- 2) Approved Substitutes: Corbin Russwin CL3300 Series, Schlage ND Series, Yale 5400LN 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: Sargent
- 2) Approved Manufacturers: Best, Corbin Russwin, Schlage, Yale

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. ELECTRIC STRIKES

1. STANDARD STRIKES

- a. All standard electric strikes shall meet BHMA standard 501, grade 1 and be UL Listed for Burglary Resistance, category 1034. Strikes shall be all stainless steel construction for corrosion resistance, strength and durability. Strikes shall have been tested to withstand a forcing strength of a minimum 2400 lbs. before releasing and perform with a minimum of

one million cycles of operation. Strikes shall be 24VDC fail-secure unless otherwise specified.

- 1) Specified Manufacturers: HES 1006 Series
- 2) Approved Substitutes: Folger Adams 742-75 Series

2. SURFACE MOUNTED STRIKES

- a. All surface mounted electric strikes shall meet BHMA standard 501, grade 1 and be UL Listed for Burglary Resistance, category 1034. Strikes shall have two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Optional latchbolt and latchbolt strike monitoring that indicates position of the latchbolt and locked condition of the strike shall be available. Strikes shall have been tested for a minimum of 500,000 operating cycles.
 - 1) Specified Manufacturers: HES 9500/9600 Genesis
 - 2) Approved Substitutes: Folger Adam or Von Duprin

G. 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. Provide tactile warning on trim at all hazardous locations.
 - 1) Specified Manufacturer: Sargent 80 Series
 - 2) Approved Substitutes: Corbin Russwin ED5000 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: Sargent
 - 2) Approved Manufacturers: Corbin Russwin, Von Duprin, Yale

H. 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: Sargent 351 Series
 - 2) Approved Substitutes: Norton 7500 Series, LCN 4041 Series

2. HOLD OPEN CLOSERS

- a. SINGLE-POINT HOLD OPEN
 - 1) Closers to have adjustable hold-open range of 85 to 110 degrees. Mountings for regular and double egress arm applications to be supplied where necessary. When a detector is required, use integral photo-electric type with LED indicator. Voltage to be 24VDC unless otherwise specified.
 - a) Specified Manufacturers: Sargent EHT
 - b) Approved Manufacturers: Norton Powertrack

3. AUTOMATIC DOOR OPERATORS – HEAVY DUTY

- a. All door closers shall be ANSI 156.19, Grade 1 Certified. Units shall have adjustments for door closing force and backcheck, motor assist from 0 to 30 seconds, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay up to 30 seconds. Operator units shall provide conventional door closer opening and closing forces unless the power operator motor is activated by an initiating device with door closer assembly having adjustable spring size, backcheck valve, sweep valve, latch valve, speed control valve, and pressure adjustment valve to control door closing. Operators shall have push and go function to activate power operator or power assist functions. Units shall have a presence detector input to prevent a closed door from opening or a door that is fully opened from closing and shall have a holdopen toggle input to allow remote activation for indefinite hold open; door shall close the second time the input is activated.

Operators shall have a SPDT relay for interfacing with latching or locking devices. All controlling operator switches shall be of radio-frequency design and not hard-wired.

- 1) Specified Manufacturer: Sargent MP4000 Series
- 2) Approved Substitutes: Norton 6900 Series

I. 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

J. 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: Sargent
 - 2) Approved Substitutes: Rixson, 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

K. 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

L. SILENCERS

1. Furnish rubber door silencers all hollow metal frames; two (2) per pair and three (3) per single door frame.

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 hardware supplier shall allow 8 hours of time to instruct owner's personnel on the basic operating procedures of all hardware at the owners site.

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.

3.07 MANUFACTURER'S ABBREVIATIONS

- A. HS HES
- B. MA MARKAR
- C. MC MCKINNEY
- D. PE PEMKO
- E. RX RIXSON
- F. SA SARGENT

Hardware Sets

SET #1

2	Continuous Hinge	FM-300 CE-4D	US32D	MA
1	Removable Mullion	64 L980	PC	SA
1	Exit Device	16 43 56 64 8810 FLW-DT CPC	US32D	SA
1	Exit Device	16 43 56 64 8804 FSW CPC	US32D	SA
5	Cylinder Core	10 6300	US15	SA
2	Door Closer	351 P10	EN	SA
2	Overhead Stop	690S	US26D	SA
1	Threshold	2005 AV		PE
1	Power Supply	3540		SA
1	Weatherseal/Astragal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
1	Card Reader	FURNISHED BY SECURITY CONTRACTOR		
2	Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #2

1	Continuous Hinge	FM-300	US32D	MA
1	Continuous Hinge	FM-300 CE-4D	US32D	MA
1	Removable Mullion	64 L980	PC	SA
1	Exit Device	16 43 64 8810 FLW-DT CPC	US32D	SA
1	Exit Device	16 43 56 64 8804 FSW CPC	US32D	SA
4	Cylinder Core	10 6300	US15	SA
2	Door Closer	351 P10	EN	SA
2	Overhead Stop	690S	US26D	SA
1	Threshold	2005 AV		PE

1 Power Supply	3540		SA
1 Weatherseal/Astragal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
1 Card Reader	FURNISHED BY SECURITY CONTRACTOR		
2 Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #3

1 Continuous Hinge	FM-300 CE-4D	US32D	MA
1 Exit Device	16 43 56 64 8804 FSW CPC	US32D	SA
2 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 P10	EN	SA
1 Overhead Stop	690S	US26D	SA
1 Threshold	2005 AV		PE
1 Power Supply	3540		SA
1 Card Reader	FURNISHED BY SECURITY CONTRACTOR		
1 Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #4

2 Continuous Hinge	FM-300	US32D	MA
1 Removable Mullion	64 L980	PC	SA
1 Exit Device	16 43 64 8810 FLW-DT CPC	US32D	SA
1 Exit Device	16 43 64 8804 FSW CPC	US32D	SA
4 Cylinder Core	10 6300	US15	SA
2 Door Closer	351 P10	EN	SA
2 Overhead Stop	690S	US26D	SA
1 Threshold	2005 AV		PE
1 Weatherseal/Astragal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
2 Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #5

1 Continuous Hinge	FM-300	US32D	MA
1 Exit Device	16 43 64 8804 FSW CPC	US32D	SA
2 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 P10	EN	SA
1 Overhead Stop	690S	US26D	SA
1 Threshold	2005 AV		PE
1 Weatherseal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
1 Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #6

2 Continuous Hinge	FM-300	US32D	MA
1 Removable Mullion	64 L980	PC	SA
2 Exit Device	16 43 64 8804 ETL CPC	US32D	SA
5 Cylinder Core	10 6300	US15	SA
2 Door Closer	351 O	EN	SA
2 Overhead Stop	690S	US26D	SA
1 Threshold	171A		PE

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- 1 Weatherseal/Astragal/Sweeps FURNISHED BY ALUMINUM DOOR SUPPLIER
- 2 Concealed Monitor Switch FURNISHED BY SECURITY CONTRACTOR

SET #7

- 1 Continuous Hinge FM-300 US32D MA
- 1 Exit Device 16 43 64 8804 ETL CPC US32D SA
- 2 Cylinder Core 10 6300 US15 SA
- 1 Door Closer 351 O EN SA
- 1 Overhead Stop 690S US26D SA
- 1 Threshold 171A PE
- 1 Weatherseal/Sweep FURNISHED BY ALUMINUM DOOR SUPPLIER
- 1 Concealed Monitor Switch FURNISHED BY SECURITY CONTRACTOR

SET #8

- 2 Continuous Hinge FM-300 US32D MA
- 2 Push Bar 8893 US32D SA
- 2 Pull Plate FLW-DT US32D SA
- 2 Door Closer 351 P10 EN SA
- 2 Overhead Stop 690S US26D SA

SET #9

- 1 Continuous Hinge FM-300 US32D MA
- 1 Push Bar 8893 US32D SA
- 1 Pull Plate FLW-DT US32D SA
- 1 Door Closer 351 P10 EN SA
- 1 Overhead Stop 690S US26D SA

SET #10

- 1 Continuous Hinge FM-300 US32D MA
- 1 Continuous Hinge FM-300 CE-4D US32D MA
- 1 Removable Mullion 64 L980 PC SA
- 1 Exit Device 16 43 64 8810 FLW-DT CPC US32D SA
- 1 Exit Device 16 43 56 64 8804 FSW CPC US32D SA
- 4 Cylinder Core 10 6300 US15 SA
- 2 Door Closer 351 CPS EN SA
- 1 Threshold 2005 AV PE
- 1 Power Supply 3540 SA
- 1 Weatherseal FURNISHED BY ALUMINUM DOOR SUPPLIER
- 1 Astragal FURNISHED BY FRP DOOR SUPPLIER
- 1 Card Reader FURNISHED BY SECURITY CONTRACTOR
- 2 Concealed Monitor Switch FURNISHED BY SECURITY CONTRACTOR

SET #11

- 1 Continuous Hinge FM-300 CE-4D US32D MA
- 1 Exit Device 16 43 56 64 8804 FSW CPC US32D SA

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2 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 CPS	EN	SA
1 Threshold	2005 AV		PE
1 Power Supply	3540		SA
1 Weatherseal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
1 Card Reader	FURNISHED BY SECURITY CONTRACTOR		
1 Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #12

2 Continuous Hinge	FM-300	US32D	MA
1 Removable Mullion	64 L980	PC	SA
1 Exit Device	16 43 64 8810 FLW-DT CPC	US32D	SA
1 Exit Device	16 43 64 8804 FSW CPC	US32D	SA
4 Cylinder Core	10 6300	US15	SA
2 Door Closer	351 CPS	EN	SA
1 Threshold	2005 AV		PE
1 Astragal	FURNISHED BY FRP DOOR SUPPLIER		
1 Weatherseal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
2 Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #13

1 Continuous Hinge	FM-300	US32D	MA
1 Exit Device	16 43 64 8804 FSW CPC	US32D	SA
2 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 CPS	EN	SA
1 Threshold	2005 AV		PE
1 Weatherseal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
1 Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #14

1 Continuous Hinge	FM-300	US32D	MA
1 Exit Device	16 43 64 8810 FLW-DT CPC	US32D	SA
1 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 CPS	EN	SA
1 Threshold	2005 AV		PE
1 Weatherseal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
1 Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #15

1 Continuous Hinge	FM-300	US32D	MA
1 Lockset	64 8204 LNL	US32D	SA
1 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 CPSH	EN	SA
1 Threshold	2005 AV		PE
1 Weatherseal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
1 Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #16

2	Continuous Hinge	FM-300	US32D	MA
2	Flush Bolt	FB01M	US26D	MC
1	Lockset	64 8204 LNL	US32D	SA
1	Cylinder Core	10 6300	US15	SA
2	Door Closer	351 CPSH	EN	SA
1	Dust Proof Strike	DPS2	US32D	MC
1	Threshold	2005 AV		PE
1	Weatherseal	FURNISHED BY ALUMINUM DOOR SUPPLIER		
1	Astragal	FURNISHED BY FRP DOOR SUPPLIER		
2	Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #17

1	Cylinder Core	10 6300	US15	SA
1	Rim/Mortise Cylinder	64-34/64-41 AS REQUIRED	US26D	SA
1	Balance of Hardware	FURNISHED BY DOOR SUPPLIER		

SET #18

1	Continuous Hinge	FM-300	US32D	MA
1	Lockset	64 8204 LNL	US32D	SA
1	Cylinder Core	10 6300	US15	SA
1	Door Closer	351 CPS	EN	SA
1	Threshold	2005 AV		PE
1	Weatherseal	S88 C		PE
1	Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #19

1	Continuous Hinge	FM-300	US32D	MA
1	Exit Device	16 43 64 8804 FSW CPC	US32D	SA
2	Cylinder Core	10 6300	US15	SA
1	Door Closer	351 CPS	EN	SA
1	Threshold	2005 AV		PE
1	Weatherseal	S88 C		PE
1	Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #20

1	Continuous Hinge	FM-300	US32D	MA
1	Exit Device	12 43 64 8804 FSW CPC	US32D	SA
1	Cylinder Core	10 6300	US15	SA
1	Door Closer	351 CPS	EN	SA
1	Threshold	2005 AV		PE
1	Weatherseal	S88 C		PE
1	Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #21

2 Continuous Hinge	FM-300	US32D	MA
2 Flush Bolt	FB01M	US26D	MC
1 Lockset	64 8204 LNL 7/8" CTE	US26D	SA
1 Cylinder Core	10 6300	US15	SA
2 Door Closer	351 CPSH	EN	SA
2 Armor Plate	KP50 34" X 1" LDW	US32D	MC
1 Dust Proof Strike	DPS2	US32D	MC
1 Weatherseal	S88 C		PE
1 Threshold	2005 AV		PE
1 Astragal	FURNISHED WITH HOLLOW METAL DOORS		

SET #22

3 Hinges	T4A3786 4 1/2 X 4 1/2	US26D	MC
1 Exit Device	16 43 8804 ETL	US32D	SA
2 Cylinder Core	10 6300	US15	SA
1 Electric Strike	9600 12/24VDC 2004	US32D	HS
1 Door Closer	351 P10	EN	SA
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC
1 Card Reader	FURNISHED BY SECURITY CONTRACTOR		

SET #23

3 Hinges	T4A3786 4 1/2 X 4 1/2	US26D	MC
1 Exit Device	12 43 64 8816 ETL	US32D	SA
2 Cylinder Core	10 6300	US15	SA
1 Electric Strike	9600 12/24VDC 2004	US32D	HS
1 Door Closer	351 P10	EN	SA
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC
1 Card Reader	FURNISHED BY SECURITY CONTRACTOR		
1 Magnetic Holder	FURNISHED BY ELECTRICAL CONTRACTOR		

SET #24

2 Continuous Hinge	FM-300	US32D	MA
2 Exit Device	12 43 NB 8715 ETL	US32D	SA
2 Electromechanical Closer	351 EHT	EN	SA
2 Kickplate	KP50 8" X 1" LDW	US32D	MC
2 Wall Stop	WS01	US32D	MC
2 Door Silencers	S1M		MC

SET #25

2 Continuous Hinge	FM-300	US32D	MA
2 Exit Device	12 43 NB 8715 ETL	US32D	SA
2 Door Closer	351 P10	EN	SA

2 Kickplate	KP50 8" X 1" LDW	US32D	MC
2 Wall Stop	WS01	US32D	MC
2 Door Silencers	S1M		MC
2 Magnetic Holder	FURNISHED BY ELECTRICAL CONTRACTOR		

SET #26

2 Continuous Hinge	FM-300	US32D	MA
2 Exit Device	12 43 NB 8710	US32D	SA
2 Electromechanical Closer	351 DEHT	EN	SA
2 Kickplate	KP50 8" X 1" LDW	US32D	MC
2 Wall Stop	WS01	US32D	MC
2 Door Silencers	S1M		MC

SET #27

2 Continuous Hinge	FM-300	US32D	MA
2 Exit Device	12 43 NB 8710	US32D	SA
2 Door Closer	351 P10	EN	SA
2 Kickplate	KP50 8" X 1" LDW	US32D	MC
2 Wall Stop	WS01	US32D	MC
2 Door Silencers	S1M		MC
2 Magnetic Holder	FURNISHED BY ELECTRICAL CONTRACTOR		

SET #28

1 Continuous Hinge	FM-300	US32D	MA
1 Exit Device	12 43 8815 ETL	US32D	SA
1 Door Closer	351 P10	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC
1 Magnetic Holder	FURNISHED BY ELECTRICAL CONTRACTOR		

SET #29

2 Continuous Hinge	FM-300	US32D	MA
1 Removable Mullion	64 L980	PC	SA
2 Exit Device	12 43 64 8816 ETL	US32D	SA
4 Cylinder Core	10 6300	US15	SA
2 Door Closer	351 P10	EN	SA
2 Kickplate	KP50 8" X 2" LDW	US32D	MC
2 Wall Stop	WS01	US32D	MC
2 Door Silencers	S1M		MC
2 Magnetic Holder	FURNISHED BY ELECTRICAL CONTRACTOR		

SET #30

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1 Continuous Hinge	FM-300	US32D	MA
1 Exit Device	12 43 64 8816 ETL	US32D	SA
2 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 P10	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC
1 Magnetic Holder	FURNISHED BY ELECTRICAL CONTRACTOR		

SET #31

6 Hinges	T4A3786 4 1/2 X 4 1/2	US26D	MC
1 Removable Mullion	64 L980	PC	SA
2 Exit Device	12 43 64 8816 ETL	US32D	SA
5 Cylinder Core	10 6300	US15	SA
2 Electromechanical Closer	351 EHT	EN	SA
2 Kickplate	KP50 8" X 2" LDW	US32D	MC
2 Door Silencers	S1M		MC

SET #32

3 Hinges	T4A3786 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 8238 LNL	US26D	SA
2 Cylinder Core	10 6300	US15	SA
1 Electromechanical Closer	351 EHT	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #33

3 Hinges	T4A3786 4 1/2 X 4 1/2	US26D	MC
1 Exit Device	12 43 64 8816 ETL	US32D	SA
2 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 P10	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #34

3 Hinges	T4A3786 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 8238 LNL	US26D	SA
2 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 O	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #35

3 Hinges	T4A3786 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 8238 LNL	US26D	SA
2 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 P10	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #36

3 Hinges	TA2714 4 1/2 X 4 1/2	US26D	MC
1 Lockset	8250 LNL	US26D	SA
1 Door Closer	351 O	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #37

3 Hinges	TA2714 4 1/2 X 4 1/2	US26D	MC
1 Privacy Set	8265 LNL	US26D	SA
1 Door Closer	351 O	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #38

3 Hinges	TA2714 4 1/2 X 4 1/2	US26D	MC
1 Privacy Set	8265 LNL	US26D	SA
1 Door Closer	351 P10	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #39

3 Hinges	T4A3786 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 7837 PT	US32D	SA
1 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 O	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #40

3 Hinges	T4A3786 4 1/2 X 4 1/2	US26D	MC
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1 Push Plate	P053	US32D	MC
1 Door Closer	351 CPSH	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #41

3 Hinges	TA2714 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 8204 LNL	US32D	SA
1 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 O	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #42

3 Hinges	TA2714 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 8204 LNL	US32D	SA
1 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 P10	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #43

3 Hinges	TA2714 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 8237 LNL	US26D	SA
1 Cylinder Core	10 6300	US15	SA
1 Overhead Stop	1540S	US26D	SA
3 Door Silencers	S1M		MC

SET #44

3 Hinges	TA2714 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 8237 LNL	US26D	SA
1 Cylinder Core	10 6300	US15	SA
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #45

3 Hinges	T4A3786 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 8237 LNL	US26D	SA
1 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 PH10	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC

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3 Door Silencers	S1M		MC
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SET #46

3 Hinges	T4A3786 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 8237 LNL	US26D	SA
1 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 H	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #47

3 Hinges	TA2714 4 1/2 X 4 1/2	US26D	MC
1 Passage Set	8215 LNL	US26D	SA
1 Door Closer	351 O	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
1 Weatherstrip	29310 CS		PE
1 Auto Door Bottom	434 ARL		PE

SET #48

3 Hinges	T4A3786 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 8238 LNL	US26D	SA
2 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 CPSH	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
3 Door Silencers	S1M		MC

SET #49

3 Hinges	TA2714 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 8237 LNL	US26D	SA
1 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 O	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #50

2 Continuous Hinge	FM-300	US32D	MA
1 Removable Mullion	64 L980	PC	SA
2 Exit Device	12 43 64 8816 ETL	US32D	SA
5 Cylinder Core	10 6300	US15	SA
2 Door Closer	351 P10	EN	SA
2 Kickplate	KP50 8" X 2" LDW	US32D	MC
2 Wall Stop	WS01	US32D	MC

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2 Door Silencers	S1M			MC
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SET #51

3 Hinges	TA2714 4 1/2 X 4 1/2			MC
1 Passage Set	8215 LNL			SA
1 Wall Stop	WS01			MC
3 Door Silencers	S1M			MC

SET #52

3 Hinges	TA2714 4 1/2 X 4 1/2			MC
1 Lockset	64 8237 LNL			SA
1 Cylinder Core	10 6300			SA
1 Door Closer	351 H			SA
1 Kickplate	KP50 8" X 2" LDW			MC
1 Wall Stop	WS01			MC
1 Sound/Light Seal	29310 CS			PE
1 Auto Door Bottom	434 ARL			PE

SET #53

3 Hinges	TA2714 4 1/2 X 4 1/2			MC
1 Lockset	64 8259 LNL			SA
2 Cylinder Core	10 6300			SA
1 Door Closer	351 H			SA
1 Kickplate	KP50 8" X 2" LDW			MC
1 Wall Stop	WS01			MC
3 Door Silencers	S1M			MC

SET #54

6 Hinges	TA2714 4 1/2 X 4 1/2			MC
2 Flush Bolt	FB01M			MC
1 Lockset	64 8204 LNL			SA
1 Cylinder Core	10 6300			SA
1 Overhead Stop	1540S			SA
1 Wall Stop	WS01			MC
1 Dust Proof Strike	DPS1			MC
2 Door Silencers	S1M			MC

SET #55

3 Hinges	T4A3786 4 1/2 X 4 1/2			MC
1 Lockset	64 8239 LNL			SA
2 Cylinder Core	10 6300			SA
1 Electric Strike	1006 2004			HS
1 Door Operator	4051			SA
2 Wall Switch	4296HP			SA
1 Kickplate	KP50 8" X 2" LDW			MC

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1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #56

1 Continuous Hinge	FM-300	US32D	MA
1 Lockset	8217 LNL	US26D	SA
2 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 CPS	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Weatherseal	S88 C		PE
1 Threshold	2005 AV		PE
1 Concealed Monitor Switch	FURNISHED BY SECURITY CONTRACTOR		

SET #57

1 Lockset	28 64 10G37 LL	US26D	SA
1 Cylinder Core	10 6300	US15	SA
1 Balance of Hardware	REUSE EXISTING		

SET #58

1 Lockset	28 10G50 LL	US26D	SA
1 Balance of Hardware	REUSE EXISTING		

SET #59

3 Hinges	TA2714 4 1/2 X 4 1/2	US26D	MC
1 Lockset	64 8237 LNL	US26D	SA
1 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 P10	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #60

6 Hinges	TA2714 4 1/2 X 4 1/2	US26D	MC
2 Flush Bolt	FB01M	US26D	MC
1 Lockset	64 8204 LNL	US32D	SA
1 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 O	EN	SA
1 Overhead Stop	1540S	US26D	SA
2 Kickplate	KP50 8" X 1" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
2 Door Silencers	S1M		MC
1 Astragal	FURNISHED WITH HOLLOW METAL DOORS		

SET #61

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1 Lockset	28 64 10G04 LL	US26D	SA
1 Cylinder Core	10 6300	US15	SA
1 Balance of Hardware	REUSE EXISTING		

SET #62

1 Continuous Hinge	FM-300	US32D	MA
1 Exit Device	12 43 64 8816 ETL	US32D	SA
2 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 P10	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

SET #63

2 Continuous Hinge	FM-300	US32D	MA
1 Coordinator	CSM500	BLACK	MC
1 Cons. Latching Flush Bolt Set	FB11W	US26D	MC
1 Lockset	64 8237 LNL	US26D	SA
1 Cylinder Core	10 6300	US15	SA
2 Door Closer	351 O	EN	SA
2 Wall Stop	WS01	US32D	MC
2 Armor Plate	KP50 34" X 1" LDW	US32D	MC
1 Dust Proof Strike	DPS1	US32D	MC
2 Door Silencers	S1M		MC

SET #64

6 Hinges	TA2714 4 1/2 X 4 1/2	US26D	MC
1 Coordinator	CSM500	BLACK	MC
1 Cons. Latching Flush Bolt Set	FB11W	US26D	MC
1 Lockset	64 8237 LNL	US26D	SA
1 Cylinder Core	10 6300	US15	SA
2 Door Closer	351 O	EN	SA
2 Armor Plate	KP50 34" X 1" LDW	US32D	MC
2 Wall Stop	WS01	US32D	MC
1 Dust Proof Strike	DPS1	US32D	MC
2 Door Silencers	S1M		MC

SET #65

2 Continuous Hinge	FM-300	US32D	MA
1 Coordinator	CSM500	BLACK	MC
1 Cons. Latching Flush Bolt Set	FB11W	US26D	MC
1 Lockset	64 8237 LNL	US26D	SA
1 Cylinder Core	10 6300	US15	SA
2 Door Closer	351 O	EN	SA
2 Armor Plate	KP50 34" X 1" LDW	US32D	MC

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2 Wall Stop	WS01	US32D	MC
1 Dust Proof Strike	DPS1	US32D	MC
2 Door Silencers	S1M		MC

SET #66

2 Continuous Hinge	FM-300	US32D	MA
2 Push Plate	P053	US32D	MC
2 Pull Plate	DP803	US32D	MC
2 Door Operator	4051	EN	SA
2 Wall Switch	4296HP		SA
2 Armor Plate	KP50 34" X 1" LDW	US32D	MC
2 Wall Stop	WS01	US32D	MC
2 Door Silencers	S1M		MC

SET #67

1 Concealed Closer	MW806 90H	626	RX
1 Push Plate	P053	US32D	MC
1 Armor Plate	KP50 34" X 1" LDW	US32D	MC
1 Floor Stop	FS01	US26D	MC

SET #68

2 Continuous Hinge	FM-300	US32D	MA
1 Removable Mullion	64 L980	PC	SA
2 Exit Device	16 43 8810 CPC	US32D	SA
3 Cylinder Core	10 6300	US15	SA
2 Door Closer	351 CPS	EN	SA
2 Kickplate	KP50 8" X 2" LDW	US32D	MC
2 Weatherseal	S88 C		PE
1 Threshold	2005 AV		PE

SET #69

1 Lockset	28 64 10G37 LL	US26D	SA
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SET #70

3 Hinges	T4A3786 4 ½ X 4 ½	US26D	MC
1 Alarmed Exit Device	12 43 64 AL 8804 ETL	US32D	SA
2 Cylinder Core	10 6300	US15	SA
1 Door Closer	351 P10	EN	SA
1 Kickplate	KP50 8" X 2" LDW	US32D	MC
1 Wall Stop	WS01	US32D	MC
3 Door Silencers	S1M		MC

END OF SECTION 08 71 00

SECTION 08 71 12 - ACOUSTICALLY GASKETED DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Acoustically gasketed metal door seals shall be the product of one manufacturer. Doors, frames, and other door hardware shall be as specified elsewhere.

1.2 SUBMITTALS

- A. Before delivery of the door seals, contractor shall submit for approval of the Architect and Acoustical Consultant, the following documents:
 - 1. Shop drawings of the door, frame, hardware and seals showing major operating dimensions and cross-sections of doors and seals.
 - 2. Product data including construction details, material descriptions, core descriptions, label compliance, fire-resistance and temperature rise ratings, and finishes for each type of acoustical seal.

1.3 APPROVED MANUFACTURERS

- A. The following firms are approved manufacturers, subject to the above:
 - 1. Zero International, Inc., Bronx, NY, 800-635-5335
 - 2. Reese Enterprises Inc., Rosemount, MN, 800-328-0953
 - 3. National Guard Products, Memphis, TN 800-647-7874

PART 2 - PRODUCTS

2.1 Door Construction

- A. Doors scheduled to receive acoustical seals shall be solid core steel or solid core wood door, 1-3/4" thick flush construction with minimum face density of 5 lb/ft². Steel door constructed from welded 18 ga cold rolled steel seamless sheets with a solid core of fiber board or other material providing the 5 lb/ft² minimum density. Wood door to be solid core wood throughout. Door to be provided with an Underwriters' Laboratory rating as specified in the door schedule. Door to be mounted in frames that are packed with glass or mineral fiber.
- B. Sound seals, specified below, to be fitted to the hinge, lock, head of the door frame and a door bottom to be installed at the sill of the door leaf. All seals should be continuous with no interference from door hardware such as closures, exit devices, panic bars, etc.

2.2 Perimeter Treatment

- A. Acoustically Gasketed Doors Type G1:
 - 1. Head and jamb seal shall consist of an extruded solid neoprene seal. Seal shall be either a self adhesive seal or a kerf frame door seal.
 - 2. The following are acceptable:

- #8004, #188, or #824N from Zero International, Inc.
 - Products manufactured by Reese Enterprises or National Guard Products which meet the above requirements will be acceptable.
3. Door bottom seal shall consist of a polypropylene brush and polypropylene fin in the center. The polypropylene brush fibers are to be held by a carrier of the same material, welded into a homogeneous bond which means the fibers are fixed effectively in place. Aluminum housing should not exceed 1.0" wide and should be designed to locate the polypropylene brush and fin seal under the door leaf.
 4. The following are acceptable:
 - #98 from Zero International, Inc.
 - Products manufactured by Reese Enterprises or National Guard Products which meet the above requirements will be acceptable.
 5. Meeting stile for double doors shall consist of a polypropylene brush and polypropylene fin in the center. The polypropylene brush fibers are to be held by a carrier of the same material, welded into a homogeneous bond which means the fibers are fixed effectively in place. Aluminum housing should not exceed 1.0" wide.
 6. The following are acceptable:
 - #98 (Pair) from Zero International, Inc.
 - Products manufactured by Reese Enterprises or National Guard Products which meet the above requirements will be acceptable.
- B. Acoustically Gasketed Doors Type G2:
1. Head and jamb seal shall consist of an adjustable door stop constructed of extruded aluminum housing of thickness 0.093 inches. Adjusting screws shall be provided 12 inch O.C. giving a 0.310 adjusting range. The housing dimensions not to exceed 1-1/2" depth or 15/16" width. The seals are effected by the use of tubular, solid neoprene. Install with neoprene touching door and compressed 1/32". Solid neoprene to be used inside the housing to prevent sound from "flanking" through the mechanism. Because the gasket dimension adds to the stop dimension, a lever handle or door knobs with a 3-1/4" backset should be used.
 2. The following are acceptable:
 - #770 (applied to stop) or #770FS (applied to frame) from Zero International, Inc.
 - #499 from Reese Enterprises Inc.
 - #1038N from National Guard Products
 3. Door bottom seal shall consist of an automatic door bottom, surface-mounted, semi-mortised or mortised as called out on the drawings and schedules. Seal is actuated by an adjustable operating rod that seals automatically with delayed action when the door contacts the jamb. When the door is opened, a spring mechanism returns the seal to the housing. Gasket material to be closed cell, ribbed sponge neoprene. Neoprene or pile seal to be used inside the mechanism to prevent sound from "flanking" through the mechanism. Housing constructed of extruded aluminum.
 4. The following are acceptable:
 - #365 (surface mounted) or #364 (semi-mortised) or #364FS (mortised) from Zero International, Inc.
 - #521 (surface mounted) or #371 (mortised) from Reese Enterprises Inc.
 - #220N (surface mounted) or 225N (mortised) from National Guard Products
 5. Meeting stile for double doors are an adjustable surface applied type with a neoprene or polypropylene brush seal at the door intersection. The seals should be continuous with no

interference from door hardware such as closures, panic bars, etc. Install seals so they are compressed against each other by 1/16".

6. The following are acceptable:
 - #555FS/#55FS from Zero International, Inc.
 - #93CP/#93 (both doors active & fire rated) from Reese Enterprises Inc.
 - #140P from National Guard Products
- C. Acoustically Gasketed Doors Type G3:
 1. Head, jamb, and door bottom seal shall consist of a solid neoprene bulb seal on an extruded aluminum housing. The seal shall be stop applied and the aluminum housing dimensions should not exceed 0.561" deep or 0.351" wide.
 2. The following are acceptable:
 - #485 from Zero International
 - Products manufactured by Reese Enterprises or National Guard Products which meet the above requirements will be acceptable.
 3. Meeting stile for double doors shall consist of a closed cell neoprene sponge seal on an extruded aluminum housing. The closed cell sponge neoprene seal shall be 0.375" by 0.750" and the aluminum housing shall be not exceed 1.625" wide. The seal shall be surface mounted to one of the door leaves.
 4. The following are acceptable:
 - #140 or #322 from Zero International
 - Products manufactured by Reese Enterprises or National Guard Products which meet the above requirements will be acceptable.

PART 3 - EXECUTION

3.1 Installation

- A. Door shall be installed as specified elsewhere. Acoustical seals shall be installed in accordance to the manufacturer recommendations

END OF SECTION 08 71 12

SECTION 08 80 00 - GLAZING

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 glazing and fire rated insulated glass units 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 8 Section "Steel Doors and Frames" for metal doors and hollow metal frames to receive glazing.
- 2. Division 8 Section "Flush Wood Doors" for wood doors to receive glazing.
- 3. Division 8 Section "Aluminum-Framed Entrances and Storefronts."
- 4. Division 8 Section "Aluminum Windows" for factory-glazed window units.
- 5. Division 8 Section "Glazed Aluminum Curtain Walls."
- 6. Division 8 Section "Steel Windows."

1.3 DEFINITIONS

- A. **Manufacturer:** A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.
- B. **Interspace:** Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- C. **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.
- D. **Deterioration of Laminated 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 laminated glass contrary to manufacturer's written instructions. Defects include

edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

- E. Deterioration of Insulating Glass: Failure of the 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 thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, 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: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings.
 - 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 four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), 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 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 (67 deg C), ambient; 180 deg F (100 deg C), 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 mm thick.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units with lites 6 mm thick and a nominal 1/2-inch- (13-mm-) wide interspace.
 4. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 4.1 computer program, expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
 5. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 4.1 computer program.
 6. Solar Optical Properties: NFRC 300.

1.5 FIRE RATED GLAZING PERFORMANCE REQUIREMENTS

- A. General: Provide insulated glazing system that is produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading without failure, including loss or glass breakage attributable to the following:
1. Defective manufacture, fabrication, and installation.
 2. Failure of sealants or gaskets to remain watertight and airtight.
 3. Deterioration of glazing materials.
 4. Other defects in construction.
- B. Glass Design: Provide insulated glass lites for the various size openings in thicknesses and strengths to meet or exceed the following criteria:
1. Minimum glass thickness of lites in exterior walls: Nominal [3/16 inch][5.0 mm].
 2. Tinted and heat-absorbing glass thickness for each tint: Same throughout Project.
 3. Size glass to withstand positive and negative loads acting on glazing systems, with edge clearances and tolerances complying with recommendations of glass manufacturer.
- C. Thermal Movement: Design temperature change (range) or 120 degrees F [67 degrees C ambient, and 180 degrees F [100 degrees C] material surface.

1.6 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass and of 12-inch- (300-mm-) 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- (300-mm-) square Samples for glass.
 - 1. Each color of tinted float glass.
 - 2. Ceramic-coated spandrel glass.
 - 3. Wired glass.
 - 4. Laminated glass.
 - 5. Insulating glass for each designation indicated.
 - 6. For each color (except black) of exposed glazing sealant 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.
- F. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- G. 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.
- H. Product Test Reports: From a qualified testing agency indicating the following products comply with requirements, based on comprehensive testing of current products:
 - 1. Tinted float glass.
 - 2. Coated float glass.
 - 3. Insulating glass.
 - 4. Glazing sealants.
 - 5. Glazing gaskets.
- I. SWRI Validation Certificate: For each elastomeric glazing sealant specified to be validated by SWRI's Sealant Validation Program.
- J. Warranties: Special warranties specified in this Section.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Clear Glass: Obtain clear float glass from one primary-glass manufacturer.
- C. Source Limitations for Tinted Glass: Obtain tinted, heat-absorbing, and light-reducing float glass from one primary-glass manufacturer for each tint color indicated.

- D. Source Limitations for Coated Glass: Obtain coated glass from one manufacturer for each type of coating and each type and class of float glass indicated.
- E. Source Limitations for Insulating Glass: Obtain insulating-glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.
- F. Source Limitations for Laminated Glass: Obtain laminated-glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.
- G. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.
- H. 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.
- I. 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.
- J. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glass type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants.
 - 1. Use manufacturer's standard test methods to determine whether priming and other specific preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - a. Perform tests under normal environmental conditions replicating those that will exist during installation.
 - 2. Submit not fewer than nine pieces of each type and finish of glass-framing members and each type, class, kind, condition, and form of glass (monolithic, laminated, and insulating units) as well as one sample of each glazing accessory (gaskets, tape sealants, setting blocks, and spacers).
 - 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.

- K. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- L. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.
 - 1. Subject to compliance with requirements, permanently mark safety glass with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- M. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA'S "Glazing Manual" and "Laminated Glass Design Guide."
 - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
 - 3. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines," and SIGMA TB-3001, "Sloped Glazing Guidelines."
- N. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of any one of the following inspecting and testing agencies:
 - 1. Insulating Glass Certification Council.
 - 2. Associated Laboratories, Inc.
 - 3. National Accreditation and Management Institute.
- O. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.8 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.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.9 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 (4.4 deg C).

1.10 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty on Coated-Glass Products: Written warranty, made out to Owner and signed by coated-glass manufacturer agreeing to furnish replacements for those 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.
- C. Manufacturer's Special Warranty on Laminated Glass: Written warranty, made out to Owner and signed by laminated-glass manufacturer agreeing to furnish replacements for laminated-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: Five years from date of Substantial Completion.
- D. Manufacturer's Special Warranty on Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for 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 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 indicated in schedules at the end of Part 3.

2.2 PRIMARY FLOAT GLASS

- A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

2.3 HEAT-TREATED GLASS

- A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

- B. Fabrication Process: By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturer's option, except provide horizontal process where indicated as tongless or free of tong marks.
- C. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); class, kind, and condition as indicated in schedules at the end of Part 3.
- D. Heat-Treated Laminated Glass: ASTM C 1172; Kind LHS; Plastic interlayer thickness: .060 inch.

2.4 WIRED GLASS

- A. Wired Glass: ASTM C 1036, Type II (patterned and wired glass, flat), Class 1 (clear), Quality q8 (glazing); 6.4 mm thick; of form and mesh pattern indicated below:
 - 1. Polished Wired Glass: Form 1 (wired, polished both sides), and as follows:
 - a. Mesh m2 (square).
- B. 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. Polished Wired Glass:
 - a. Ashai Glass Co./Ama Glass Corp.
 - b. Central Glass Co., Ltd.
 - c. Nippon Sheet Glass Co., Ltd.
 - d. Pilkington Glass Ltd.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Preassembled 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 the Insulating-Glass Schedule at the end of Part 3.
 - 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 "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.
 - 2. Basis of design product: VIRACON, INC. – Type: VRE 1-46
- B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
- C. Sealing System: Dual seal, with primary and secondary sealants as follows:

1. Manufacturer's standard sealants.
- D. Spacer Specifications: Manufacturer's standard spacer material and construction.
- E. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
1. Aluminum with mill or clear-anodized finish.
 2. Desiccant: Molecular sieve or silica gel, or blend of both.
 3. Corner Construction: Manufacturer's standard corner construction.

2.6 FIRE RATED INSULATING GLASS UNITS

Basis of Design: FireLite IGU as supplied by Technical Glass Products, Kirkland, Washington.

- A. Sealed Insulating Glass Units: ASTM E 774, Class A.
1. Nominal Thickness: 1 inch
 2. Glass - Vision Units: Two lites, one fire-rated and one tempered safety or annealed glass, as scheduled:
 - a. Exterior Lite: Clear float.
 - b. Interior Lite: Clear FireLite
 - c. Performance: 43 percent visible light transmittance and 34 percent visible light reflectance; winter nighttime U-value of 0.30; and solar heat gain coefficient of 0.28.
 3. Air Space Width: Nominal 1/2 inch measured perpendicularly from surfaces of glass lites at unit's edge.
 4. Sealing System: Dual seal, polyisobutylene primary seal, polysulfide secondary seal, 10 year limited warranty.
 5. Spacer Specifications: Manufacturer's standard stainless steel.
 - a. Desiccant: Manufacturer's standard desiccant.
 - b. Corner Construction: Manufacturer's standard corner construction.
- B. Labeling: Permanently label each piece of fire rated insulating glass units with manufacturer's logo, UL logo and fire rating in sizes up to 3,325 sq. in., and with the manufacture's label only for sizes that exceed the listing as approved by the local authority having jurisdiction.
- C. Fire Rating: Fire rating listed and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with ASTM E2074-00, ASTM E2010-01 , NPFA 252 and NFPA 257.

2.7 ELASTOMERIC 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: Match Architect's samples.
 4. Colors of Exposed Glazing Sealants: As indicated by manufacturer's designations.
 5. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range for this characteristic.
- B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.
1. Additional Movement Capability: Where additional movement capability is specified in the Glazing Sealant Schedule, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements in ASTM C 920 for uses indicated.
- C. Glazing Sealant for Fire-Resistive Glazing Products: Identical to product used in test assembly to obtain fire-protection rating.

2.8 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: 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 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- D. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; 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.

2.9 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. Thermoplastic polyolefin rubber, ASTM C 1115.
 - 3. 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. Neoprene.
 - 2. EPDM.
 - 3. Silicone.
 - 4. Thermoplastic polyolefin rubber.
 - 5. Any material indicated above.

2.10 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 A durometer hardness of 85, plus or minus 5.

- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore 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 O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

- G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.11 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

- C. Grind smooth and polish exposed glass edges.

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 the length plus width is larger than 50 inches (1270 mm) 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 (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. 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. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- 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 stretch allowance during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 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 PROTECTION AND CLEANING

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.8 MONOLITHIC FLOAT-GLASS SCHEDULE

- A. Uncoated Clear Float Glass: Where glass as designated below is indicated, provide Type I (transparent glass, flat), Class 1 (clear) glass lites complying with the following:
 - 1. Uncoated Clear Annealed Float Glass: For interior borrow lites and transom lites, and where indicated..
 - 2. Uncoated Clear Heat-Strengthened Float Glass: Kind HS (heat strengthened): Where indicated
 - 3. Uncoated Clear Fully Tempered Float Glass: Kind FT (fully tempered): In interior and exterior aluminum entrance doors, glass doors and shelves for display cases, and where indicated and where required by codes having jurisdiction.

3.9 INSULATING-GLASS SCHEDULE

- A. Low-E Insulating Glass: In aluminum windows, non-spandrel portions of glazed aluminum curtain wall, exterior storefront (entrance) sidelights and transom lites, and where glass of this designation is indicated, provide low-emissivity insulating-glass units complying with the following:

1. Overall Unit Thickness and Thickness of Each Lite: 1 inch and .25 inch.
 2. Interspace Content: Air.
 3. Indoor Lite: Type I (transparent glass, flat), Class 1 (clear) float glass.
 - a. Annealed, except Kind FT (fully tempered), Condition A (uncoated surfaces) where safety glazing is required at stair landings.
 4. Outdoor Lite: Type I (transparent glass, flat) float glass.
 - a. Class 1 (clear).
 - b. Kind HS (heat strengthened), Condition A (uncoated surfaces), except Kind FT (fully tempered), Condition A (uncoated surfaces) where inside lite is Kind FT.
 5. Low-Emissivity Coating: Vacuum Deposition – Sputtered on second surface
 6. Visible Light Transmittance: 43 percent min
 7. Winter Nighttime U-Value: 0.30 max
 8. Solar Heat Gain Coefficient: 0.28 max
 9. Shading Coefficient: 0.33 max
 10. Outdoor Visible Reflectance: 34 percent
- B. Heat Strengthened Spandrel Insulating Glass: Where glass is located within Shadow Boxes shown on drawings, provide insulating-glass units complying with the following (Note: This is a true Shadow Box with a painted back pan. Provide vision glass specified above with both lites HS) :
1. Construction: Provide units that comply with requirements specified for insulating-glass.
 2. Spandrel / Shadow Box glass
 - a. Kind HS (Heat Strengthened) (VRE 1-46 #2)
 - b. Color for painted back pan: As selected by Architect from manufacturer's full range.
- C. Heat Strengthened Laminated Insulating Glass: Where indicated on drawings, provide laminated insulating glass units complying with the following:
1. Construction: Provide units that comply with the requirements specified for insulating glass and the following.
 2. Overall Unit Thickness and Thickness of Each Lite: 1.25 inch and .25 inch.
 3. Interspace Content: Air.
 4. Indoor Lite: (2) .25 inch layers clear laminated glass w/ .060 inch thick plastic interlayer
 5. Outdoor Lite: Type I (transparent glass, flat) float glass.
 - a. Class 1 (clear).

- b. Kind HS (heat strengthened), Condition A (uncoated surfaces), except Kind FT (fully tempered), Condition A (uncoated surfaces) where inside lite is Kind FT.

D. Fire Rated Insulating Glass Units: Refer to part 2.6 for requirements.

3.10 GLAZING SEALANT SCHEDULE

A. Low-Modulus Nonacid-Curing Silicone Glazing Sealant: For use in factory-glazed aluminum window units, and where glazing sealants of this designation are indicated, provide products complying with the following:

1. Products: Available products include the following:

- a. 790; Dow Corning.
- b. Silpruf; GE Silicones.
- c. UltraPruf SCS2300; GE Silicones.
- d. 864; Pecora Corporation.
- e. Omniseal; Sonneborn, Div of ChemRex, Inc.
- f. Spectrem 1; Tremco.

2. Type and Grade: S (single component) and NS (nonsag).

3. Class: 25.

4. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.

5. Use Related to Exposure: NT (nontraffic).

6. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

- a. Use O Glazing Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and wood.

B. Medium-Modulus Neutral-Curing Silicone Glazing Sealant: For use in glazed aluminum curtain wall system and where glazing sealants of this designation are indicated, provide products complying with the following:

1. Products: Available products include the following:

- a. 756 H.P.; Dow Corning.
- b. Silglaze II; GE Silicones.
- c. 895; Pecora Corporation.

2. Type and Grade: S (single component) and NS (nonsag).

3. Class: 25.

4. Additional Movement Capability: 50 percent movement in extension and 50 percent movement in compression for a total of 100 percent movement.

5. Use Related to Exposure: NT (nontraffic)

6. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

- a. Use O Glazing Substrates: Coated glass, color anodic aluminum, aluminum coated with a high-performance coating, galvanized steel, and wood.

END OF SECTION 08 80 00

SECTION 08 90 00 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fixed, extruded-aluminum louvers.
 - 2. Wall vents (brick vents).
- B. Related Sections include the following:
 - 1. Division 7 Section "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.

1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act on vertical projection of louvers.
- B. Seismic Performance: Provide louvers capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- C. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Air-Performance, Water-Penetration, Air-Leakage, and Wind-Driven Rain Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.5 SUBMITTALS

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

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.

1. For installed louvers and vents indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of metal finish required.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code--Aluminum."
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.

D. UL and NEMA Compliance: Provide motors and related components for motor-operated adjustable louvers that are listed and labeled by UL and comply with applicable NEMA standards.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating louvers without

field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Louvers:
 - a. Construction Specialties, Inc.
 - b. Greenheck.
 - c. Industrial Louvers, Inc.
 - d. Ruskin Company; Tomkins PLC.

2. Wall Vents (Brick Vents):
 - a. Airolite Company (The).
 - b. Construction Specialties, Inc.
 - c. Greenheck.
 - d. Hohmann & Barnard, Inc.
 - e. Ruskin Company; Tomkins PLC.

B. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Basis-of-Design Product: The design for each louver is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T5 or T-52.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Aluminum Castings: ASTM B 26/B 26M, alloy 319.

- D. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.
 - 1. Use types and sizes to suit unit installation conditions.
 - 2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.
- E. 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.

2.3 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. 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: Channel, unless otherwise indicated.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.
 - 1. 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.
 - 2. Exterior Corners: Prefabricated corner units with mitered blades with concealed close-fitting splices and with fully-recessed mullions at corners.
- F. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

- 1. Louver Depth: 4 inches (100 mm)

2. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.060 inch (1.5 mm) for blades and 0.080 inch (2.0 mm) for frames.
3. Performance Requirements:
 - a. Free Area: Not less than 50%.
 - b. Air Performance: Not more than 0.10-inch wg (25-Pa) static pressure drop at 600-fpm (3.0-m/s) free-area velocity.
 - c. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 3 inches (75 mm) per hour and a wind speed of 29 mph (13 m/s) at a core area intake velocity of 300 fpm (1.5 m/s).
4. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.5 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
 1. Screen Location for Fixed Louvers: Interior face.
 2. Screening Type: Insect screening.
- B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
 1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
 2. Finish: Same finish as louver frames to which louver screens are attached.
 3. Type: Rewirable frames with a driven spline or insert for securing screen mesh.

2.6 WALL VENTS (BRICK VENTS)

- A. Extruded-Aluminum Wall Vents: Extruded-aluminum louvers and frames, not less than 0.125-inch (3.2-mm) nominal thickness, assembled by welding; with 18-by-14- (1.4-by-1.8-mm-) mesh, aluminum insect screening on inside face; incorporating weep holes, continuous drip at sill, and integral waterstop on inside edge of sill; of load-bearing design and construction.
 1. Dampers: Aluminum blades and frames mounted on inside of wall vents; operated from exterior with Allen wrench in socket-head cap screw. Fabricate operating mechanism from Type 304 stainless-steel components.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Finish louvers after assembly.

2.8 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
- B. 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 (0.04 mm), medium gloss.
 - 2. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers 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 galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.
- B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 90 00

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

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. Interior gypsum wallboard.
 - 2. Exterior gypsum board panels for ceilings and soffits.
 - 3. Non-load-bearing steel framing.
- B. Related Sections include the following:
 - 1. Division 7 Section "Building Insulation" for insulation and vapor retarders installed in gypsum board assemblies.
 - 2. Division 9 Section "Gypsum Board Shaft-Wall Assemblies" for framing, gypsum panels, and other components of shaft wall assemblies.
 - 3. Division 9 Section "Ceramic Tile" for cementitious backer board units for ceramic tile applications.

1.3 DEFINITIONS

- A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.
- C. Samples: For the following products:
 - 1. Trim Accessories: Full-size sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to

ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: Indicated by design designations from FM's "Approval Guide, Building Products;" UL's "Fire Resistance Directory;" GA-600, "Fire Resistance Design Manual;" or ITS's "Directory of Listed Products."

B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or 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. Stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

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. Steel Framing and Furring:

- a. Clark Steel Framing Systems.
- b. Consolidated Systems, Inc.
- c. Dale Industries, Inc. - Dale/Incor.
- d. Dietrich Industries, Inc.
- e. MarinoWare; Division of Ware Ind.
- f. National Gypsum Company.
- g. Scafco Corporation.
- h. Unimast, Inc.
- i. Western Metal Lath & Steel Framing Systems.

2. Gypsum Board and Related Products:

- a. American Gypsum Co.
- b. G-P Gypsum Corp.
- c. National Gypsum Company.
- d. United States Gypsum Co.

2.2 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Components, General: Comply with ASTM C 754 for conditions indicated.
- B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
- C. Hanger Attachments to Concrete: As follows:
 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by a qualified independent testing agency.
 - a. Type: Cast-in-place anchor, designed for attachment to concrete forms, or postinstalled, expansion anchor.
 2. 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 a qualified independent testing agency.
- D. Hangers: As follows:
 1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.
 2. Rod Hangers: ASTM A 510 (ASTM A 510M), mild carbon steel.
 - a. Diameter: 1/4-inch (6.34-mm).
 - b. Protective Coating: ASTM A 153/A 153M, hot-dip galvanized.
 3. Flat Hangers: Commercial-steel sheet, ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized.
 - a. Size: 1 by 3/16 inch (25.4 by 4.76 mm) by length indicated.
 4. Angle Hangers: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized commercial-steel sheet.
 - a. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).
 - b. Size: 7/8 by 1-3/8 inches (22.2 by 34.9 mm).

- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch (1.37 mm), a minimum 1/2-inch- (12.7-mm-) wide flange, with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.
1. Depth: 2-1/2 inches (63.5 mm).
- F. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.
1. Cold Rolled Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange, 3/4 inch (19.1 mm) deep.
 2. Steel Studs: ASTM C 645.
 - a. Minimum Base Metal Thickness: As indicated.
 - b. Depth: As indicated.
 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.
 - a. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
 4. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical, with face attached to single flange by a slotted leg (web).
- G. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
 - b. Chicago Metallic Corporation; Drywall Furring 640 System.
 - c. USG Interiors, Inc.; Drywall Suspension System.

2.3 STEEL PARTITION AND SOFFIT FRAMING

- A. Components, General: As follows:
1. Comply with ASTM C 754 for conditions indicated.
 2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.
- B. Steel Studs and Runners: ASTM C 645.
1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
 2. Depth: As indicated.

- C. Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges.
- D. Proprietary Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - 1. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Product: Subject to compliance with requirements, provide one of the following:
 - a. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
 - b. Metal-Lite, Inc.; The System.
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base Metal Thickness: 0.027 inch (0.7 mm).
- F. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange.
 - 1. Depth: 1-1/2 inches (38.1 mm).
 - 2. Clip Angle: 1-1/2 by 1-1/2 inch (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.
- G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).
 - 2. Depth: 7/8 inch (22.2 mm).
- H. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.
 - 1. Configuration: Asymmetrical, with face attached to single flange by a slotted leg (web).
- I. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange.
 - 1. Depth: 3/4 inch (19.1 mm).
 - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch (0.79 mm).
 - 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
- J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare metal thickness of 0.0395 inch (0.45 mm), and depth required to fit insulation thickness indicated.

- K. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.4 INTERIOR GYPSUM WALLBOARD

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

- B. Gypsum Wallboard: ASTM C 36.

- 1. Type X:

- a. Thickness: 5/8 inch (15.9 mm).
- b. Long Edges: Tapered.
- c. Location: As indicated.

- C. Abuse-Resistant Gypsum Wallboard: ASTM C 36, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels.

- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. National Gypsum Company; Gold Bond Hi-Abuse Wallboard.
 - b. United States Gypsum Co.; SHEETROCK Brand Abuse-Resistant Gypsum Panels.
- 3. Core: 5/8 inch (15.9 mm), Type X.
- 4. Long Edges: Tapered.
- 5. Location: Vertical surfaces, unless otherwise indicated.

2.5 EXTERIOR GYPSUM PANELS FOR CEILINGS, SOFFITS AND SHEATHING

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

- B. Exterior Gypsum Soffit Board: ASTM C 931/C 931M, with manufacturer's standard edges.

- 1. Core: 5/8 inch (15.9 mm), Type X.

- C. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M.

1. Available Product: Subject to compliance with requirements, a product that may be incorporated into the Work includes, but is not limited to, "Dens-Glass Gold" by G-P Gypsum Corp.
2. Product: Subject to compliance with requirements, provide "Dens-Glass Gold" by G-P Gypsum Corp.
3. Core: As indicated.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
 - a. Cornerbead: Use at outside corners.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
 - c. Expansion (Control) Joint: Use where indicated.
 - d. 2" Reveal Moldings: Extruded aluminum with tape and spackle flange.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized steel sheet or rolled zinc.
2. Shapes:
 - a. Cornerbead: Use at outside corners.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening. Use where indicated.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

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 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.
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 Exterior Applications:
 - 1. Exterior Gypsum Soffit Board: Use setting-type taping and setting-type, sandable topping compounds.
 - 2. Glass-Mat Gypsum Sheathing Board: As recommended by manufacturer.

2.8 ACOUSTICAL SEALANT

- 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. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
- C. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.9 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. 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 (0.84 to 2.84 mm) thick.
- C. Isolation Strip at Exterior Walls:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.
- D. 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.
- E. Thermal Insulation: As specified in Division 7 Section "Building Insulation."

- F. Polyethylene Vapor Retarder: As specified in Division 7 Section "Building Insulation."

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.
1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."
- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
 2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.
- D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.4 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Suspend ceiling 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 ceiling suspension system. 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 the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
 4. Secure hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 6. Do not attach hangers to steel deck tabs.
 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member and transversely between parallel members.
- C. Sway-brace suspended steel framing with hangers used for support.
- D. For exterior soffits, install cross bracing and framing to resist wind uplift.
- E. Wire-tie furring channels to supports, as required to comply with requirements for assemblies indicated.
- F. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.
1. Hangers: 48 inches (1219 mm) o.c.
 2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
 3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.
- G. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

- A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.
1. Where studs are installed directly against exterior walls, install asphalt-felt or foam-gasket isolation strip between studs and wall.

- B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.
 - C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief.
 - 2. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.
 - a. Terminate partition framing at suspended ceilings where indicated.
 - D. Install steel studs and furring at the following spacings:
 - 1. Single-Layer Construction: 16 inches (406 mm) o.c., unless otherwise indicated.
 - 2. Multilayer Construction: 16 inches (406 mm) o.c., unless otherwise indicated.
 - E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.
 - F. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. 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.
 - 1. Install two studs at each jamb, unless otherwise indicated.
 - 2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint.
 - 3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
 - G. 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.
 - H. Polyethylene Vapor Retarder: Install to comply with requirements specified in Division 7 Section "Building Insulation."
- 3.6 APPLYING AND FINISHING PANELS, GENERAL
- A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
 - B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- E. 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.
- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members using resilient channels, or provide control joints to counteract wood shrinkage.
- I. Form control and expansion joints with space between edges of adjoining gypsum panels.
- J. Cover both faces of steel stud partition 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. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- K. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- L. Floating Construction: Where feasible, including where recommended in writing by manufacturer, install gypsum panels over wood framing, with floating internal corner construction.
- M. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion 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 manufacturer's written recommendations for locating edge trim and closing

off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

- N. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
 - 1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.
- O. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

3.7 PANEL APPLICATION METHODS

A. Single-Layer Application:

- 1. On ceilings, apply gypsum panels before wall/partition board application to the 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 board.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Exterior Soffits and Ceilings: Apply exterior gypsum soffit board panels perpendicular to supports, with end joints staggered and located over supports.

- 1. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or structural penetrations.
- 2. Fasten with corrosion-resistant screws.

3.8 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

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 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, according to ASTM C 840, for locations indicated:
 - 1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 - 2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated.
 - 3. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges where indicated.
 - 4. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Isolate finish gypsum board surfaces in accordance with recommendations of gypsum board manufacturer using control or other approved means. Exact locations and types of isolation joints: As approved. Locate joints generally where:
 - 1. Partitions or furring abut dissimilar walls, dissimilar ceilings, or structural elements other than floors.
 - 2. Ceilings abut a structural element, dissimilar wall or partitions or other vertical penetration.
 - 3. Construction changes within the plane of the partition or ceiling.
 - 4. Partition or furring run exceeds 30'.
 - 5. Expansion or control joints occur in the substrate wall.

3.10 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
 - 1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.

END OF SECTION 09 21 16

SECTION 09 21 23 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Shaft enclosures.
 - 2. Chase enclosures.
 - 3. Horizontal enclosures.
- B. Related Sections include the following:
 - 1. Division 9 " Gypsum Board Assemblies" for applying and finishing panels in gypsum board shaft-wall assemblies.

1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board construction not defined in this Section or in other referenced standards.

1.4 SUBMITTALS

- A. Product Data: For each gypsum board shaft-wall assembly indicated.
- B. Fire-Test-Response Reports: From a qualified independent testing and inspecting agency substantiating each gypsum board shaft-wall assembly's required fire-resistance rating.
 - 1. Include data substantiating that elevator entrances and other items that penetrate each gypsum board shaft-wall assembly do not negate fire-resistance rating.
- C. Research/Evaluation Reports: Evidence of compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction that substantiate required fire-resistance rating for each gypsum board shaft-wall assembly.
- D. Acoustical-Test-Response Reports: From a qualified independent testing agency substantiating required STC rating for each gypsum board shaft-wall assembly.

1.5 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: Indicated by design designations from FM's "Approval Guide, Building Products;" UL's "Fire Resistance Directory;" GA-600, "Fire Resistance Design Manual;" or ITS's "Directory of Listed Products."
- B. STC-Rated Assemblies: For gypsum board shaft-wall assemblies indicated to have STC ratings, provide assembly materials and construction complying with requirements of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Management and Coordination." Review methods and procedures for installing work related to gypsum board shaft-wall assemblies including, but not limited to, the following:
 1. Fasteners proposed for anchoring steel framing to building structure.
 2. Sprayed fire-resistive materials applied to structural framing.
 3. Elevator equipment, including hoistway doors, elevator call buttons, and elevator floor indicators.
 4. Wiring devices in shaft-wall assemblies.
 5. Doors and other items penetrating shaft-wall assemblies.
 6. Items supported by shaft-wall-assembly framing.
 7. Mechanical work enclosed within shaft-wall assemblies.

1.6 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. Stack gypsum panels flat on leveled supports off the ground to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Comply with requirements for environmental conditions, room temperatures, and ventilation specified in Division 9 Section " Gypsum Board Assemblies."

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 Co.
 2. G-P Gypsum Corp.
 3. National Gypsum Company.
 4. United States Gypsum Co.

2.2 ASSEMBLY MATERIALS

- A. General: 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.
- B. Steel Framing: ASTM C 645.
 - 1. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized coating.
- C. Gypsum Liner Panels: Manufacturer's proprietary liner panels in 1-inch (25.4-mm) thickness and with moisture-resistant paper faces.
- D. Gypsum Wallboard: ASTM C 36, core type as required by fire-resistance-rated assembly indicated.
 - 1. Edges: Tapered.
- E. Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 9 Section "Gypsum Board Assemblies" that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.
- F. Gypsum Wallboard Joint-Treatment Materials: ASTM C 475 and as specified in Division 9 Section "Gypsum Board Assemblies."
- G. 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 (0.84 to 2.84 mm) thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- H. Track (Runner) 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. Powder-Actuated Fasteners: Provide powder-actuated fasteners with capability to sustain, without failure, a load equal to 10 times that imposed by shaft-wall assemblies, as determined by testing conducted by a qualified independent testing agency according to ASTM E 1190.
 - 2. Postinstalled Expansion Anchors: Where indicated, provide expansion anchors with capability to sustain, without failure, a load equal to 5 times that imposed by shaft-wall assemblies, as determined by testing conducted by a qualified independent testing agency according to ASTM E 488.

- I. Acoustical Sealant: As specified in Division 9 Section "Gypsum Board Assemblies."
- J. Sound Attenuation Blankets: ASTM C 665 for Type I, unfaced mineral-fiber-blanket insulation produced by combining thermosetting resins with mineral fibers manufactured from slag or rock wool.

2.3 GYPSUM BOARD SHAFT WALL

- A. Basis-of-Design Product: As indicated on Drawings by design designation of a qualified testing and inspecting agency.
- B. Deflection Limit: L/240.
- C. Studs: Manufacturer's standard profile for repetitive members and corner and end members and for fire-resistance-rated assembly indicated.
 - 1. Depth: As indicated.
 - 2. Minimum Base Metal Thickness: Manufacturer's standard thicknesses that comply with structural performance requirements for stud depth indicated.
- D. Track (Runner): Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, but at least 2 inches (51 mm), in depth matching studs.
 - 1. Minimum Base Metal Thickness: Manufacturer's standard thicknesses that comply with structural performance requirements for stud depth indicated.
- E. Jamb Struts: Manufacturer's standard J-profile strut with long-leg length of 3 inches (76.2 mm), in depth matching studs, and not less than 0.0341 inch (0.87 mm) thick.
- F. Room-Side Finish: As indicated.
- G. Shaft-Side Finish: As indicated by fire-resistance-rated assembly design designation.
- H. STC Rating: As indicated.
- I. Cavity 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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Sprayed Fire-Resistive Materials: Coordinate with gypsum shaft-wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft-wall assemblies to comply with requirements specified in Division 7 Section "Sprayed Fire-Resistive Materials."
1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (600 mm) o.c.
 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 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.
 2. Division 9 Section "Gypsum Board Assemblies" for applying and finishing panels.
- B. Do not bridge building expansion joints with shaft-wall assemblies; frame both sides of 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.
1. At elevator hoistway door frames, provide jamb struts on each side of door frame.
 2. Where handrails directly attach to gypsum board shaft-wall assemblies, provide galvanized steel reinforcing strip with 0.0312-inch (0.79-mm) minimum thickness of base (uncoated) metal, accurately positioned and secured behind at least 1 face-layer panel.
- 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, elevator call buttons, elevator floor indicators, and similar items.
- E. Isolate gypsum finish panels from building structure to prevent cracking of finish panels while maintaining continuity of fire-rated construction.
- F. Install control joints to maintain fire-resistance rating of 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 manufacturer's written instructions or ASTM C 919, whichever is more stringent.

- H. In elevator shafts where gypsum board shaft-wall assemblies cannot be positioned within 2 inches (51 mm) of the shaft face of structural beams, floor edges, and similar projections into shaft, install 1/2- or 5/8-inch- (12.7- or 15.9-mm-) thick, gypsum board cants covering tops of projections.
1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches (610 mm) o.c. with screws fastened to shaft-wall framing.
 2. Where steel framing is required to support gypsum board cants, install framing at 24 inches (610 mm) o.c. and extend studs from the projection to the shaft-wall framing.

END OF SECTION 09 21 23

SECTION 09 24 00 - PORTLAND CEMENT PLASTER

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. Interior portland cement plasterwork on solid plaster bases.
- B. Related Sections include the following:
 - 1. Division 7 Section "Joint Sealants" for acoustical sealants.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.
- C. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.
- D. Samples for Verification: For each type of finish coat indicated; 12 by 12 inches (305 by 305 mm), and prepared on rigid backing.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For portland cement plaster assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Mockups: Before plastering, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for each type of finish indicated.
 - 2. For interior plasterwork, simulate finished lighting conditions for review of mockups.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. 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.

1.6 PROJECT CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Interior Plasterwork: Maintain room temperatures at greater than 40 deg F (4.4 deg C) for at least 48 hours before plaster application, and continuously during and after application.
 1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
 2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 ACCESSORIES

- A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Zinc and Zinc-Coated (Galvanized) Accessories:
 1. Available Manufacturers:
 - a. Dietrich Industries, Inc.
 - b. Phillips Manufacturing Co.
 - c. Unimast, Inc.

2. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
3. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
4. Cornerbeads: Fabricated from zinc.
 - a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
 - b. Small nose cornerbead with perforated flanges; use on curved corners.
 - c. Small nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing masonry corners.
 - d. Bull nose cornerbead, radius 3/4 inch (19.1 mm) minimum, with expanded flanges; use at locations indicated on Drawings.
5. Casing Beads: Fabricated from zinc; square-edged style; with expanded flanges.
6. Control Joints: Fabricated from zinc; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
7. Expansion Joints: Fabricated from zinc; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

2.3 MISCELLANEOUS MATERIALS

- A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in portland cement plaster.
- C. Bonding Compound: ASTM C 932.

2.4 PLASTER MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
 1. Color for Finish Coats: White
- B. Colorants for Job-Mixed Finish-Coats: Colorfast mineral pigments that produce finish plaster color to match Architect's sample.
- C. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
- D. Sand Aggregate: ASTM C 897.
 1. Color for Job-Mixed Finish Coats: In color matching Architect's sample.

- E. Ready-Mixed Finish-Coat Plaster: Mill-mixed portland cement, aggregates, coloring agents, and proprietary ingredients.
 - 1. Available Products:
 - a. ChemRex; Thoro Stucco.
 - b. Highland Stucco & Lime Products, Inc.;
 - c. United States Gypsum Co.; Oriental Exterior Finish Stucco.
 - 2. Color: As selected by Architect from manufacturer's full range.

2.5 PLASTER MIXES

- A. General: Comply with ASTM C 926 for applications indicated.
 - 1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.
- B. Base-Coat Mixes: Single base coats for two-coat plasterwork as follows:
 - 1. Portland Cement Mix: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
- C. Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat plasters, comply with manufacturer's written instructions.

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. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

- B. Prepare solid-plaster bases that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.
- C. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of plaster assemblies and without reducing the fire-resistive material thickness to less than that required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.
- B. Acoustical Sealant: Where required, seal joints between edges of plasterwork and abutting construction with acoustical sealant.

3.4 INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings.
- B. Reinforcement for External Corners:
 - 1. Install lath-type external-corner reinforcement at exterior locations.
 - 2. Install cornerbead at interior locations.
- C. Control Joints: Install control joints in specific locations approved by Architect for visual effect and as follows:
 - 1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
 - a. Vertical Surfaces: 144 sq. ft. (13.4 sq. m).
 - b. Horizontal and other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).
 - 2. At distances between control joints of not greater than 18 feet (5.5 m) o.c.
 - 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
 - 4. Where control joints occur in surface of construction directly behind plaster.
 - 5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.5 PLASTER APPLICATION

- A. General: Comply with ASTM C 926.
 - 1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6.4 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.
 - 2. Grout hollow-metal frames, bases, and similar work occurring in plastered areas, with base-coat plaster material, before lathing where necessary. Except where full grouting is indicated or required for fire-resistance rating, grout at least 6 inches (152 mm) at each jamb anchor.
 - 3. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
 - 4. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Bonding Compound: Apply on plaster bases.
- C. Plaster Finish Coats: Apply to provide float finish to match Architect's sample.
- D. Concealed Interior Plasterwork:
 - 1. Where plaster application will be concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
 - 2. Where plaster application will be concealed above suspended ceilings and in similar locations, finish coat may be omitted.
 - 3. Where plaster application will be used as a base for adhesive application of tile and similar finishes, finish coat may be omitted.

3.6 CUTTING AND PATCHING

- A. Cut, patch, replace, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.7 CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of other work. Promptly remove plaster from doorframes, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION 09 24 00

SECTION 09 30 13 - CERAMIC TILE

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. Ceramic mosaic tile.
- 2. Quarry tile.
- 3. Glazed wall tile.
- 4. Stone thresholds installed as part of tile installations.
- 5. Waterproof membrane for thin-set tile installations.
- 6. Cementitious backer units installed as part of tile installations.
- 7. Metal edge strips installed as part of tile installations.

- B. Related Sections include the following:

- 1. Division 3 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
- 2. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

- A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

1.4 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum 0.6.
 - 2. Step Treads: Minimum 0.6.
 - 3. Ramp Surfaces: Minimum 0.8.

1.5 SUBMITTALS

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

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- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
 - C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
 - D. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required.
 - 2. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches (300 mm) square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
 - 3. Full-size units of each type of trim and accessory for each color and finish required.
 - 4. Stone thresholds in 6-inch (150-mm) lengths.
 - E. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
 - F. Product Certificates: For each type of product, signed by product manufacturer.
 - G. Qualification Data: For Installer.
 - H. Material Test Reports: For each tile-setting and -grouting product.
- 1.6 QUALITY ASSURANCE
- A. Source Limitations for Tile: Obtain all tile of same type 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. Joint sealants.
 - 4. Cementitious backer units.
 - 5. Metal edge strips.
 - D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 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 and emulsion adhesives in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 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.

1.9 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. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Ceramic Tile: Manufactured by American Olean, Daltile, U.S. Ceramic Tile Co., or Summitville Tile.
- B. For purposes of establishing standards of quality and design; specifications reference products of Daltile.
- C. All tile: Quality certified by the Tile Council of America, Inc. To equal to exceed Standard Grade requirements of ANSI A137.1. The certification mark of the Tile Council of America shall appear on each label or carton of tile. Furnish master grade certificates bearing the certification mark of the Tile Council of America, signed by manufacturer and tile subcontractor, stating the type and quantity of the material to cover all tile specified in this section.

- D. Unglazed Quarry Tile CT: Square-edged flat tile as follows:
 - 1. Wearing Surface: Nonabrasive, smooth.
 - 2. Facial Dimensions: 6 by 6 inches (152 by 152mm).
 - 3. Thickness: 3/8 inch (9.5 mm).
 - 4. Face: Plain.
 - 5. Basis-of-Design Product: Metropolitan Ceramics by Ironrock Capital.

- E. Floor tile: 2" x 2" Daltile unglazed porcelain ceramic mosaic tile, complying with ANSI 137.1. Colors: Keystones by Architect from manufacturer's full range.
 - 1. CFT-1: Group 2
 - 2. CFT-2: Group 3
 - 3. CFT-3: Premium

- F. Wall and base tile: 4 1/4" x 4 1/4" x 1/4" thick except as noted, Daltile Semi-gloss glazed tile, standard grade complying with ANSI 137.1. Colors: as selected by Architect from manufacturer's full range.
 - 1. CWT-1: Group 2

- G. Wall accent tile: 4 1/4" X 4 1/4" X 1/4" thick, Daltile.
 - 1. CWT-2: Group 3

- H. Base cove tile: 4 1/4" high x 4 1/4" long trim. Color: As selected by Architect from manufacturers full range.

- I. Base cove tile where wall tile is not required: 4" high x 4" long trim, thin set cap. Color: as selected by Architect from manufacturer's full range.

- J. Provide all miscellaneous ceramic mosaic trim required to complete the work in acceptable manner. Butt internal angles and nose external angles. At hollow metal frames frames, butt or return base to trim.

- K. Marble for saddles: Group A, color as selected, conforming to ANSI A94.1. Saddles: 1 piece with beveled edges, notched to profile of jambs, set in mortar of type specified for adjacent floor tile. Saddles: thickness, width and profile indicated.

- L. Tile edge trim: Stainless steel L shaped protective edge trim.

- M. Portland cement: ASTM C-150, Type 1.

- N. Lime: ASTM C206, Type S.

- O. Sand: ASTM C144.

- P. Water: potable

- Q. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.
- R. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:
 - 1. Prepackaged dry mortar mix combined with acrylic resin 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 ASNI A118.4.
- S. Epoxy Tile Grout for Floor applications: Latapoxy SP-100, as manufactured by Laticrete Corporation, in colors to be selected by architect from manufacturers full range of standard colors.
- T. Polymer-Modified Tile Grout for wall applications: laticrete Tri-Poly fortified unsanded grout, 1600 Series, as manufactured by laticrete Corporation, in colors to be selected by Architect from manufacturer's full range of standard colors.

2.2 CEMENTITIOUS BACKER UNITS

- A. Provide cementitious backer units complying with ANSI A118.9 in maximum lengths available to minimize end-to-end butt joints.
 - 1. Thickness: 1.2 inch (12.7 mm).
 - 2. Width: 48 inches (1219 mm).
- B. Available Products:
 - 1. C-Cure; C-Cure Board 990.
 - 2. Custom Building Products; Wonderboard.
 - 3. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
 - 4. USG Corporation; DUROCK Cement Board.

2.3 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. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications, white zinc alloy.

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.
- D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to 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.
- E. Lay out tile wainscots to next full tile beyond dimensions indicated.
- F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- G. Grout tile to comply with requirements of the following tile installation standards:
 - 1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

3.4 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.
 - 1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
 - a. Tile floors in wet areas.
 - b. Tile floors composed of rib-backed tiles.
- B. Joint Widths: Install tile on floors with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).

- C. 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.
- D. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

3.5 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.
- B. Install metal lath and scratch coat for walls to comply with ANSI A108.1A, Section 4.1.
- C. Joint Widths: Install tile on walls with the following joint widths:
 - 1. Glazed Wall Tile: 1/16 inch (1.6 mm).

3.6 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 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.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- 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.

END OF SECTION 09 30 13

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 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 9 Section "Gypsum Board Assemblies".
- C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at 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. Coordinate Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
 - 1. Ceiling suspension members.
 - 2. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).
- C. Samples for Initial Selection: For components with factory-applied color finishes.

- D. 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 full-size Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- (300-mm-) long Samples of each type, finish, and color.
- E. Qualification Data: For testing agency.
- F. Field quality-control test reports.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
- H. Research/Evaluation Reports: For each acoustical panel ceiling and components.
- I. 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, as documented according to ASTM E 548. 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:
 - 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.
- C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.

- D. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 - 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
- E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

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. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

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 2.0 percent of quantity installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2.0 percent of amount installed.

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. Basis-of-Design Product: The design for each tile type 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 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 (400 mm) away from test surface per ASTM E 795.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.3 WATER-FELTED, MINERAL-BASE ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING - Type 'A'

- A. Basis-of-Design Product:
 - 1. Manufacturer: Armstrong World Industries
 - 2. Product: Optima, No. 3252 (Impact Resistant)
- B. Alternate Manufacturers: Provide the specified basis-of-design product or, subject to compliance with requirements, an equivalent product by one of the following manufacturers:
 - 1. Capaul Corporation
 - 2. Celotex Corporation
 - 3. USG Interiors, Inc
- C. Classification: Provide panels complying with ASTM E 1264 for Type III, mineral base with painted finish; Form 2, water felted; and pattern as follows:
 - 1. Pattern: C (perforated, small holes) E (lightly textured).
- D. Color: White.
- E. LR: Not less than 0.90.
- F. NRC: Not less than 0.95.
- G. Edge Detail: Tegular.

- H. Thickness: 1 inch .
- I. Size: 24 by 48 inches .

2.4 WATER-FELTED, MINERAL-BASE ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING - Type 'A-1'

- A. Basis-of-Design Product:
 - 1. Manufacturer: Armstrong World Industries
 - 2. Product: Optima, No. 3252 (Impact Resistant) w/ TechZone Ceiling System
 - B. Alternate Manufacturers: Provide the specified basis-of-design product or, subject to compliance with requirements, an equivalent product by one of the following manufacturers:
 - 1. Capaul Corporation
 - 2. Celotex Corporation
 - 3. USG Interiors, Inc
 - C. Classification: Provide panels complying with ASTM E 1264 for Type III, mineral base with painted finish; Form 2, water felted; and pattern as follows:
 - 1. Pattern: C (perforated, small holes) E (lightly textured).
 - D. Color: White.
 - E. LR: Not less than 0.90.
 - F. NRC: Not less than 0.95.
 - G. Edge Detail: Tegular.
 - H. Thickness: 1 inch .
- Size: 24 by 48 inches .

2.5 WATER-FELTED, MINERAL-BASE ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING - Type 'B'

- A. Basis-of-Design Product:
 - 1. Manufacturer: Armstrong World Industries
 - 2. Product: Optima, No. 3250 (Impact Resistant)
- B. Alternate Manufacturers: Provide the specified basis-of-design product or, subject to compliance with requirements, an equivalent product by one of the following manufacturers:
 - 1. Capaul Corporation
 - 2. Celotex Corporation

- 3. USG Interiors, Inc
 - C. Classification: Provide panels complying with ASTM E 1264 for Type III, mineral base with painted finish; Form 2, water felted; and pattern as follows:
 - 1. Pattern: C (perforated, small holes) E (lightly textured).
 - D. Color: White.
 - E. LR: Not less than 0.90.
 - F. NRC: Not less than 0.95.
 - G. Edge Detail: Tegular.
 - H. Thickness: 1 inch .
 - I. Size: 24 by 24 inches .
- 2.6 WATER-FELTED, MINERAL-BASE ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING - Type 'B-1'
 - A. Basis-of-Design Product:
 - 1. Manufacturer: Armstrong World Industries
 - 2. Product: Optima, No. 3250 (Impact Resistant) w/ impact retention clips
 - B. Alternate Manufacturers: Provide the specified basis-of-design product or, subject to compliance with requirements, an equivalent product by one of the following manufacturers:
 - 1. Capaul Corporation
 - 2. Celotex Corporation
 - 3. USG Interiors, Inc
 - C. Classification: Provide panels complying with ASTM E 1264 for Type III, mineral base with painted finish; Form 2, water felted; and pattern as follows:
 - 1. Pattern: C (perforated, small holes) E (lightly textured).
 - D. Color: White.
 - E. LR: Not less than 0.90.
 - F. NRC: Not less than 0.95.
 - G. Edge Detail: Tegular.
 - H. Thickness: 1 inch .
 - I. Size: 24 by 24 inches.

2.7 WATER-FELTED, MINERAL-BASE ACOUSTICAL PANELS WITH MEMBRANE-FACED OVERLAY FOR ACOUSTICAL PANEL CEILING -Type 'C':

- A. Products:
 - 1. Manufacturer: Armstrong World Industries
 - 2. Product: "Clean Room VL" - Unperforated
 - B. Alternate Manufacturers: Provide the specified basis-of-design product or, subject to compliance with requirements, an equivalent product by one of the following manufacturers:
 - 1. Capaul Corporation
 - 2. Celotex Corporation, Architectural Ceilings Marketing Dept.
 - 3. USG Interiors, Inc.
 - C. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for Type IV, mineral base with membrane-faced overlay; Form 2, water felted.
 - 1. Overlay: Vinyl overlay on face.
 - 2. Pattern: E (Lightly Textured).
 - D. Color: White.
 - E. LR: Not less than 0.80.
 - F. NRC: Not less than 0.55.
 - G. CAC: Not less than 35.
 - H. Edge Detail: Square.
 - I. Thickness: 1/2 inch .
- Size: 24 by 48 inches.

2.8 METAL PANEL CEILING - Type 'I'

- A. Basis-of-Design Product:
 - 1. Manufacturer: USG Interiors, Inc.
 - 2. Product: Panz – Aluminum Perforated Panel Ceiling w/ fiberglass backing
 - 3. Size: 24 by 24 inches
 - 4. Pattern: No. H250, round ¼" perforations
- B. Alternate Manufacturers: Provide the specified basis-of-design product or, subject to compliance with requirements, an equivalent product by one of the following manufacturers:
 - 1. Capaul Corporation
 - 2. Celotex Corporation

3. Armstrong World Industries

2.9 WATER-FELTED, MINERAL-BASE ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING - Type 'J'

A. Basis-of-Design Product:

1. Manufacturer: Armstrong World Industries
2. Product: Cirrus Second Look, No. 514

B. Alternate Manufacturers: Provide the specified basis-of-design product or, subject to compliance with requirements, an equivalent product by one of the following manufacturers:

1. Capaul Corporation
2. Celotex Corporation
3. USG Interiors, Inc

C. Classification: Provide panels complying with ASTM E 1264 for Type III, mineral base with painted finish; Form 2, water felted; and pattern as follows:

1. Pattern: C (perforated, small holes) E (lightly textured).

D. Color: White.

E. LR: Not less than 0.85.

F. NRC: Not less than 0.65.

G. Edge Detail: Beveled Tegular.

H. Thickness: 3/4 inch .

Size: 24 by 48 inches .

2.10 WATER-FELTED, MINERAL-BASE ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING - Type 'K'

A. Basis-of-Design Product:

1. Manufacturer: Armstrong World Industries
2. Product: Optima, No. 3255 (Impact Resistant) w/ TechZone Ceiling System

- B. Alternate Manufacturers: Provide the specified basis-of-design product or, subject to compliance with requirements, an equivalent product by one of the following manufacturers:
 - 1. Capaul Corporation
 - 2. Celotex Corporation
 - 3. USG Interiors, Inc
 - C. Classification: Provide panels complying with ASTM E 1264 for Type III, mineral base with painted finish; Form 2, water felted; and pattern as follows:
 - 1. Pattern: C (perforated, small holes) E (lightly textured).
 - D. Color: White.
 - E. LR: Not less than 0.90.
 - F. NRC: Not less than 0.95.
 - G. Edge Detail: Tegular.
 - H. Thickness: 1 inch .
- Size: 48 by 48 inches .

2.11 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. Basis-of-Design Product: The design for each suspension system type is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers:
 - 1. Celotex Corporation, Architectural Ceilings Marketing Dept.
 - 2. Chicago Metallic Corporation.
 - 3. MM Systems, Inc.
 - 4. USG Interiors, Inc.
- C. 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.
 - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" for ceiling type 'C' and where high-humidity finishes are indicated.

- D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Cast-in-place anchors.
 - b. Type: Postinstalled expansion anchors.
 - c. Type: Postinstalled adhesive anchors.
 - d. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 - e. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 - f. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 alloy 304 or 316 for bolts; alloy 304 or 316 for anchor.
 - g. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.
 2. 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.
- E. 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.
Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
 - 2.
 3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- (3.5-mm-) diameter wire.
- F. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- G. Delete hanger types in paragraph above and first paragraph below if not required. Insert sizes here or show on Drawings.
- H. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.
- I. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- J. Retain paragraph above and below if required. Coordinate with manufacturer's requirements and authorities having jurisdiction.

- K. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.
 - L. Hold-Down Clips: Where indicated below, provide manufacturer's standard hold-down clips spaced 24 inches (610 mm) o.c. on all cross tees:
 - 1. Enclosed Storage Rooms
 - 2. Single-use Toilet Rooms
 - 3. Enclosed Corridors and Passageways (short runs) with doors on either ends.
 - 4. Multipurpose Room
 - M. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- 2.12 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILINGS – For all ceiling types unless noted otherwise.
- A. Basis-of-Design Product:
 - 1. Manufacturer: Armstrong World Industries
 - 2. Product: Prelude ML 15/16-inch exposed tee grid system, No. 7301
 - B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. End Condition of Cross Runners: Butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Steel or aluminum cold-rolled sheet.
 - 5. Coordinate finish with metal type selected.
 - 6. Cap Finish: Painted to match color of acoustical unit.
- 2.13 ACOUSTICAL SEALANT
- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

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.
- B. 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, GENERAL

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic 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. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 4. 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. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 5. 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.
 - 6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 - 7. 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.
 - 8. Do not attach hangers to steel deck tabs.
 - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.

10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.66 m). Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. 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. Arrange directionally patterned acoustical panels as follows:
 - a. Install panels with pattern running in one direction, as indicated on reflected ceiling plans or, if not indicated, as directed by the Architect.
 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
 6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly. Delete first subparagraph below if all edges are concealed by suspension system 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 09 51 13

SECTION 09 54 26 – SUSPENDED WOOD CEILING SYSTEMS

PART 1 - GENERAL

- A. The General Conditions and the requirements of Division 1 of the specifications shall apply to all work hereunder.
- B. All work shall be performed in accordance with the manufacturer's instructions, and in a manner satisfactory to the owner's representative.

1.01 SUMMARY

Panel Grilles and suspension clips necessary to complete installation, in accordance with plans and specifications.

1.02 RELATED WORK NOT INCLUDED UNDER THIS SECTION

Suspension systems and components for ceilings, other than manufacturer's Panel Grille Suspended Wood Ceiling System, are not included.

1.03 QUALITY ASSURANCE

- A. **Installer Qualifications:** The installer must be a firm with a minimum of two (2) years of successful experience in installation of suspended wood ceilings of similar requirements to this project. The installer must be acceptable to the architect, manufacturer, and owner's representative.
- B. **Fire Performance Characteristics:** When specified as "Fire Resistant", Panel Grille wood strips shall conform to Class A flame spread rating, when tested according to ASTM E-84.
- C. **Environmental Standards:** When required the wood ceiling shall originate from well managed forests as certified by accredited and recognized industry certifying organizations.

1.04 PROJECT CONDITIONS

Installation shall be done only when the temperature and humidity closely approximate the interior conditions that will exist when the building is occupied. The heating and cooling systems shall be operating before, during, and after installation, with the humidity of the interior spaces maintained between 25% and 55%.

Plenums have proper ventilation, especially in high moisture areas. There shall be no excessive build up of heat in the ceiling areas.

Prior to the start of installation, all exterior windows and doors are to be in place, glazed, and weather-stripped. The roof is to be watertight, and all wet trades' work is to be completed, and thoroughly dry.

Mechanical, electrical, and other utility service installations above the ceiling plane shall have been completed. No materials should rest against, or wrap around, the ceiling suspension components or connecting hangers.

1.05 COORDINATION OF WORK

The layout and installation of Panel Grilles and ceiling suspension system shall be coordinated with other work penetrating the ceiling. This includes light fixtures, HVAC equipment, and fire suppression system components.

1.06 SUBMITTALS

- A. Product Data: Provide product specifications and installation instructions for all supplied ceiling materials.
- B. Shop Drawings: Supply shop drawings showing Panel Grille lengths, and placement of hangers, T-rail carriers, and other details deemed pertinent to proper installation.
- C. Samples: A 12"x12" inch wood ceiling sample, in the specified Panel Grille style, with finish applied, shall be submitted for approval.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Panel Grilles and components shall be delivered to the project site in original, unopened packages.
- B. The Panel Grilles shall be stored flat and level in a fully enclosed space. For a minimum of seventy-two (72) hours immediately prior to ceiling installation, the Panel Grilles shall be stored in the room in which they will be installed. The temperature and humidity of the room shall closely approximate those conditions that will exist when the building is occupied. The Panel Grilles must be stored off the floor.
- C. Care in handling must be exercised to avoid damage.

1.08 WARRANTIES

- A. Manufacturer: All materials supplied by the ceiling manufacturer shall be guaranteed against manufacturing defects for eighteen (18) months. Because of differing site conditions, wood stains and colorings can vary with age, and are excluded from this warranty.
- B. Contractor: All work shall be guaranteed for eighteen (18) months from final acceptance of completed work.

PART 2 - PRODUCT

2.01 PANEL GRILLES

The basis of design for the wood strips shall be as manufactured by Rulon Company, St. Augustine, Florida, PH-1-800-227-8566. The wood strips shall be made from prime grade, all-natural maple with a clear finish. The Panel Grille shall be pattern number PG-4-21-37D having wood strips 1 5/16 inches wide x 2 5/16 inches deep with 1 11/16 inches spacing between strips.

Other acceptable manufacturers: Armstrong, Hunter Douglas, Parador.

Standard Panel Grilles shall be assembled 1' wide - in nominal lengths of 2' to 10' in 1' increments. Wood strips shall be manufactured without finger-joints, and fastened together with black dowels. The dowels shall be positioned 5-1/2" from the ends and 12" on center, with interconnecting male-to-female dowel attachment for support of the system.

Panels shall be Fire Resistant with a Class A flame spread rating, per ASTM E-84.

Wood is a natural product that will undergo changes with variations in the environment. Therefore, all dimension tolerances are $\pm 1/8"$.

2.02 SUSPENSION SYSTEMS

Panel Grilles shall be suspended from standard heavy-duty 15/16" T-rail carriers using clips for connection when removability of panel grilles is necessary for access above the ceiling. #12 gauge wire hangers shall suspend T-rail carriers.

2.03 EDGES, BORDERS, AND PERIMETER TRIMS

Edges, borders, and perimeter trims, shall be designated by specifier in accordance with standard design details available. All wood ceiling products specified shall be supplied by the ceiling manufacturer.

2.04 FINISHES AND COLORS

All Panel Grilles shall be factory-finished with clear sealers, wood stains, or semi-transparent color treatments as selected. All finishes shall be as selected by the architect.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Ceiling Layout: The contractor shall measure ceiling areas, and establish layout of Panel Grilles and T-rails, in accordance with installation instructions.

- B. Coordination: The contractor shall furnish the layout for supports that shall be installed for suspension of ceilings. He shall furnish concrete inserts, steel deck hanger clips, or similar devices for installation, in time to coordinate the work. The contractor shall coordinate with other trades the location of devices which will penetrate the Ceiling Panels or interfere with the installation. Recessed or surface devices located within the ceiling panels are to be located and cut in the field.

3.02 INSTALLATION

- A. General: The contractor shall install materials in accordance with manufactures printed instructions. The installation shall comply with applicable regulations and industry standards.
- B. Perimeters: Using a leveling device, the contractor shall lay out and install the perimeter trim as specified.
- C. Suspension: The T-rail carriers shall be suspended and leveled in a direction perpendicular to the wooden strip direction. #12 gauge wire hangers shall be used to support T-rail carriers. Hangers shall be placed at 4' intervals along the carrier.
- D. Wood Suspension: Panel Grilles shall be suspended from the T-rail carrier system by clips.

3.03 ADJUSTMENT, CLEANING, AND REPAIR

- A. The contractor shall make final adjustments to level or contours.
- B. Upon completion of ceiling installation, all Panel Grilles and borders shall be cleaned free of dirt, dust, grease, oils, and fingerprints.
- C. All work which cannot be successfully cleaned or repaired, shall be removed and replaced.

3.04 INSPECTION

Upon completion of ceiling installation, the owner's representative shall inspect all finished surfaces to ensure that work has been performed in a manner satisfactory to the owner. Any deficiencies in the installed ceiling shall be corrected by the contractor at no additional cost to the owner, or to the ceiling manufacturer.

END OF SECTION 09 54 26

SECTION 09 64 00 - WOOD FLOORING

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. Solid-wood strip or plank Maple flooring.
- 2. Solid-wood strip or plank Bamboo flooring.
- 3. Refinishing of existing wood flooring.

- B. Related Sections include the following:

- 1. Division 6 Section "Miscellaneous Carpentry" for wood substrates, including sleepers and subflooring.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details including location and layout of each type of wood flooring and accessory.
- C. Samples for Verification: For each type of wood flooring and accessory, with stain color and finish required, approximately 12 inches (300 mm) long and of same thickness and material indicated for the Work. Include sample sets showing the full range of normal color and texture variations expected.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed wood flooring similar in material, design, and extent to that indicated for this Project and whose work has resulted in wood flooring installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of material and product from one source with resources to provide materials and products of consistent quality in appearance and physical properties.
- C. Hardwood Flooring: Comply with NOFMA grading rules for species, grade, and cut.
 - 1. Certification: Provide flooring that carries NOFMA grade stamp on each bundle or piece.

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, well-ventilated, weathertight location.
- D. Move wood flooring into spaces where it will be installed, at least seven days before installation.

1.6 PROJECT CONDITIONS

- A. Conditioning: Maintain relative humidity planned for building occupants and an ambient temperature between 65 and 75 deg F (18 and 24 deg C) in spaces to receive wood flooring for at least seven days before installation, during installation, and for at least seven days after installation. After post-installation period, maintain relative humidity and ambient temperature planned for building occupants.
 - 1. For unfinished products, open sealed packages to allow wood flooring to acclimatize.
 - 2. Do not install flooring until it adjusts to the relative humidity of and is at the same temperature as the space where it is to be installed.
 - 3. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by flooring and finish manufacturers.
- B. Install factory-finished wood flooring after other finishing operations, including painting, have been completed.

1.7 WARRANTY

- A. Special Warranty for Flooring: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace flooring that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for flooring: Ten years from date of Substantial Completion.
- B. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

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. Wood Flooring: Equal to 1 percent of amount installed for each type and finish indicated.

PART 2 - PRODUCTS

2.1 SOLID-WOOD STRIP AND PLANK MAPLE FLOORING

- A. Strip and Plank Flooring: Provide kiln-dried wood flooring as follows:

1. Species: Hard maple.
2. Grade: First Grade.
3. Cut: Plain sawn.
4. Thickness: 3/4 inch.
5. Face Width: 2-1/4 inches.
6. Matching: Tongue and groove, and end matched.
7. Backs: Channeled (kerfed) for stress relief.
8. Random Lengths: Provide standard random-length strips complying with applicable grading rules.
9. Finish: Un-finished.

2.2 FINISHING MATERIALS

- A. Urethane Finish System: Complete system of compatible components that is recommended by finish manufacturer for application indicated.

1. Type: Water based.
2. Floor Sealer: Pliable, penetrating type.
3. Finish Coats: Formulated for multicoat application on wood flooring.
4. 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. Basic Coatings.
 - b. BonaKemi USA, Inc.
 - c. Dura Seal Division; Minwax Co., Inc.
 - d. Hillyard Floor Treatments.
 - e. Huntington Laboratories, Inc.
 - f. National Coatings Co.

- B. Wood Filler: Formulated to fill and repair seams, defects, and open-grain hardwood floors; compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved samples, provide pigmented filler.

2.3 SOLID-WOOD STRIP AND PLANK BAMBOO FLOORING

- A. Strip and Plank Flooring: Provide kiln-dried wood flooring as follows:

1. Species: Mao Species Bamboo.
2. Grade: First Grade.

3. Cut: Plain sawn.
4. Thickness: 5/8 inch.
5. Face Width: 3-3/4 inches.
6. Matching: Tongue and groove, and end matched.
7. Backs: Channeled (kerfed) for stress relief.
8. Random Lengths: Provide standard random-length strips complying with applicable grading rules.
9. Finish: Pre-finished.

2.4 ACCESSORY MATERIALS

- A. Felt Underlayment: ASTM D 226, Type I, No. 15, asphalt-saturated felt.
- B. Fasteners: As recommended by manufacturer, but not less than that recommended in NOFMA's "Installing Hardwood Flooring."
- C. Wall Base at Shops: 2 1/2" x 2" x 3/16" Steel angle iron.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of wood flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with flooring manufacturer's written instructions, but not less than recommendations in NOFMA's "Installing Hardwood Flooring," as applicable to flooring type.
- B. Pattern: Lay wood flooring in pattern indicated on Drawings or, if not indicated, as directed by Architect.
- C. Expansion Space: Provide expansion space at walls and other obstructions and terminations of flooring of not less than 3/4 inch (19 mm), unless otherwise indicated on Drawings.
 1. Unless fully concealed by trim, fill expansion space with flush cork expansion strip.
- D. Felt Underlayment: Where strip or plank flooring is nailed to solid-wood subfloor, install flooring over a layer of asphalt-saturated felt.
- E. Solid-Wood Strip and Plank Flooring: Blind nail or staple flooring to substrate according to NOFMA's written recommendations.

-
- F. Subfloor Construction: All voids below finished floor to be fireblocked to limit voids to 100 square feet maximum or all voids shall be filled solid with mineral wool as required to comply local building codes.

3.3 SANDING AND FINISHING

- 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.
- B. Machine-sand existing flooring to remove existing finish, offsets, ridges, cups, and sanding-machine marks that would be noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish.
- C. Apply filler according to manufacturer's written instructions.
 - 1. Fill and repair seams and defects.
- D. Apply floor sealer according to finish manufacturer's written instructions.
- E. Apply game lines in gymnasium to match existing layout.
- F. Apply floor finish according to finish manufacturer's written instructions. Apply in number of coats recommended by finish manufacturer for application indicated, but not less than three.
- G. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.
- H. Install steel angle iron with expansion fasteners. Miter and weld inside corners and miter, weld and round outside corners.
- I. Install vent cover base with base cement or screws. Use premolded outside corners and mitered inside corners.

3.4 PROTECTION

- A. Cover installed wood flooring to protect it from damage or deterioration, before and after finishing, during remainder of construction period. Use heavy kraft-paper or other suitable covering. Do not use plastic sheet or film that could cause condensation.
 - 1. Do not cover site-finished floors with kraft paper, or any other material, until finish reaches full cure, but not less than seven days after applying last coat.

END OF SECTION 09 64 00

SECTION 09 65 00 - RESILIENT FLOOR TILE

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. Vinyl composition tile (VCT).
 - 2. Resilient wall base and accessories.
 - 3. Rubber flooring

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: Full-size units of each color and pattern of resilient floor tile required.
 - 1. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long, of each resilient product color and pattern required.
- D. Maintenance Data: For resilient products to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 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 (10 deg C) or more than 90 deg F (32 deg C). Store tiles on flat surfaces.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), 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. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

1.7 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. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
 2. Resilient Wall Base and Accessories: Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following: For purposes of establishing standards of quality and design; specifications reference products of Armstrong World Industries, Inc.:
1. Manufacturers of Vinyl Composition Tile for all VCT types:
 - a. Armstrong World Industries, Inc. – Standard Excelon
 - b. Mannington Commercial – Designer Essential
 - c. AZROCK – comparable product
 2. Manufacturers of Rubber Wall Base and Stair Treads:
 - a. Nora Flooring Division, Freudenberg Building Systems, Inc.
 - b. Johnsonite.
 - c. R.C. Musson Rubber Co., Inc.
 - d. Roppe Rubber Corp.

2.2 TILE FLOORING

- A. Vinyl composition tile FS SS-T-312B(1), Type IV, 12" x 12" unless otherwise indicated and as follows:
 - 1. Composition 1 - Asbestos free.
 - 2. Gauge: 1/8"
 - 3. Color and Pattern detail shall be dispersed uniformly throughout thickness of material. Color and pigments to be insoluble in water and resistant to cleaning agents and light.

2.3 RUBBER FLOORING, BASE, STAIR NOSING/TREAD/RISER

- A. Manufacturer: Nora Rubber Flooring of the Freudenberg Building's System, Inc.
- B. Rubber Flooring: Norament 825C hammered profile.

Tile Size: 19.68" x 19.68"
Tile Thickness: .120"
Height of Stud: .02"
- C. Rubber stair nosing/tread/riser: Norament 925B one piece nosing, tread and riser hammered profile minimum thickness #20 overall.

Profile height: .02"
Width: Full width of stairs
- D. Color of rubber flooring, rubber base, rubber stair nosing/tread/riser: As selected by architect from manufacturer's standard colors.

2.4 ACCESSORIES

- A. Rubber Wall Base: Provide rubber base complying with FS SS-W-40-A INT AMD 1, Type 1, with matching end stops and performed or molded corner units, and as follows:
 - 1. Height: 4" as indicated.
 - 2. Thickness: 1/8" gauge.
 - 3. Style for Carpet Floor: Standard top-set, straight base.
 - 4. Style for other than Carpet Floor: Standard top-set, cove base.
 - 5. Finish: Matte.
- B. Resilient Edge Strips: 1/8" thick, homogeneous vinyl or rubber composition, tapered or bullnose edge, color to match flooring, or as selected by Architect from full range of colors available; not less than 1" wide.
- C. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.
- D. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- E. Leveling and Patching Compounds: Latex type as recommended by flooring 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 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. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - a. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. 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.
- D. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- E. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- F. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 - 1. Do not install resilient products until they are same temperature as space where they are to be installed.
- G. Sweep and vacuum clean substrates to be covered by resilient products 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 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 in pattern indicated or square with room axis if no pattern is indicated on Drawings.
- B. Match 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 all in same direction. "Checkerboarding" is not allowed.
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- E. 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.
- F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere 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 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Premolded Corners: Install premolded corners before installing straight pieces.
- G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.5 RESILIENT ACCESSORY INSTALLATION

A. 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.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

A. 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.

a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products 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. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
 - a. Use commercially available product acceptable to manufacturer.
 - b. Coordinate selection of floor polish with Owner's maintenance service.
2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09 65 00

SECTION 09 65 66 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Adhered rubber sheet flooring.
- B. Related Sections include the following:
 - 1. Division 9 Section "Resilient Floor Tile" for wall base and accessories installed with athletic flooring.
 - 2. Division 9 Section "Resilient Floor Tile" for resilient flooring installed in areas other than athletic-activity spaces.

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 patterns available for flooring.
- C. Samples for Verification: For each type, color, and pattern of flooring indicated, 6-inch- (150-mm-) square samples of same thickness and material indicated for the Work.
- D. Maintenance Data: For each type of flooring indicated to include in maintenance manuals specified in Division 1.

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 rolls upright.
- C. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer. Do not install products until they are at the same temperature as the space where they are to be installed.

1.5 PROJECT CONDITIONS

- A. Install products after other finishing operations, including painting, are completed.
- B. Adhesively Applied Products: As follows:
 - 1. Maintain a temperature of not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in installation spaces for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After postinstallation period, maintain a temperature of not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
 - 2. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by manufacturer.
 - 3. Do not install products over concrete slabs until slabs have cured and are dry enough to bond with adhesive, as determined by flooring manufacturer's recommended bond and moisture test.

PART 2 - PRODUCTS

2.1 RUBBER SHEET ATHLETIC FLOORING

- A. Products: Subject to compliance with requirements, provide the following (or equal):
 - 1. ECOsurfaces; ECOshock.
- B. Materials and Construction: Embossed, homogeneous product of vulcanized natural and synthetic rubbers with mineral aggregates, stabilizing agents, and pigmentation.
 - 1. Thickness: 3/8 inch
 - 2. Roll Width: 48 inches
- C. Underlayment: None.
- D. Color and Pattern: As selected by Architect from manufacturer's full range.

2.2 ACCESSORIES

- A. Border Tiles: Interlocking, beveled tiles that transition from the face of flooring surface to the surface below it with a straight outside edge and for use where flooring corners and edges do not abut vertical surfaces.
- B. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by flooring manufacturer.
- C. Adhesives: Water-resistant type recommended by manufacturer for substrate and conditions indicated.

- D. Heat-Welding Bead: Solid-strand product of flooring manufacturer matching field color of floor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where installation of products will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for flooring installation and comply with requirements.
- B. Concrete Substrates: 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, moisture, and pH tests recommended in writing by flooring manufacturer.
 - 2. Substrate finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving resilient flooring.
 - 3. Substrates 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. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- B. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- C. Broom and 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 FLOORING INSTALLATION, GENERAL

- A. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
- B. Extend floor coverings into toe spaces, door reveals, closets, and similar openings, unless otherwise indicated.
- C. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on finish flooring. Use nonpermanent, nonstaining marking device.

- D. Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring 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 SHEET FLOORING INSTALLATION

- A. Lay out sheet flooring to comply with the following requirements:
 - 1. Maintain uniformity of flooring direction.
 - 2. Arrange for a minimum number of seams and place them in inconspicuous and low-traffic areas, and not less than 6 inches (150 mm) from parallel joints in flooring substrates.
 - 3. Match edges of sheet flooring for color shading and pattern at seams.
 - 4. Avoid cross and butt seams.
- B. Heat-Welded Seams: Rout joints and heat weld with welding bead, permanently fusing sections into a monolithic floor finish. Prepare, weld, and finish seams according to manufacturer's written instructions and ASTM F 1516 to produce surfaces flush with adjoining floor covering surfaces.

3.5 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing flooring products:
 - 1. Remove adhesive and other surface blemishes using cleaner recommended in writing by flooring manufacturer.
 - 2. Sweep and vacuum floor thoroughly.
 - 3. Do not wash floor until after waiting period recommended in writing by flooring manufacturer.
 - 4. Damp mop floor to remove marks and soil using method and cleaner recommended in writing by flooring manufacturer.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.
 - 1. Do not move heavy or sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09 65 66

PART 1 – TERRAZZO TILE

1.01 DESCRIPTION OF WORK

- A. Provide all materials, labor, tools, equipment and services required to install Portland cement, terrazzo tile and accessories.

1.02 RELATED SECTIONS

- A. Cast-in-Place Concrete Division 3
- B. Resilient Flooring..... Division 9

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM), latest editions.
 - 1. ASTM C - 150 5. ASTM C - 1028 9. ASTM D - 2103
 - 2. ASTM C - 33 6. ASTM C - 131 10. ASTM D - 56
 - 3. ASTM C - 140 7. ASTM C - 627
 - 4. ASTM C - 293 8. ASTM D - 226
- B. American National Standards Institute (ANSI).
 - 1. ANSI A108.5 4. ANSI A118.4
 - 2. ANSI A108.1 5. ANSI A118.6
 - 3. ANSI A108.10
- 2. National Terrazzo and Mosaic Association, Inc. (NTMA).
- 3. Tile Council of America (TCA).

1.04 SUBMITTALS

- 1. Product Data: Submit manufacturer's specifications and technical data for precast terrazzo tile and accessories; including manufacturer's printed installation instructions.
- B. Samples:
 - 1. Initial Selection: Submit manufacturers samples in the form of actual sections of tile and accessories to the Architect. Samples are to include manufacturers full range of color and patterns available.
 - 2. Verification Prior to Installation: Submit Full Size samples of all types, colors and patterns selected, indicating full range of pattern and color variations.
 - 3. Material Certificates: Submit certificates from the manufacturers of the specified materials stating compliance with the applicable requirements set forth for all materials specified in this Section.

- D. Maintenance Instructions: Submit copies of manufacturer's recommended maintenance instructions for precast terrazzo tile and accessories.

1.05 TEST REPORTS

- A. The precast terrazzo tie units shall conform to test criteria as outlined by the approved manufacturer and the National Terrazzo and Mosaic Association, Inc. (NTMA).

1.06 QUALITY ASSURANCE

- 1. Qualifications: Installer is to be a firm who has at least three years of experience with the installation of precast terrazzo tile and has successfully completed installations of a similar size and scope as specified in this Section.
- B. Regulatory Requirements: Building Code: Work of this Section shall conform to all requirements of the Connecticut State Building Code and all applicable regulations of other governmental authorities.
- 3. Setting and Grouting Materials: Provide materials obtained from one source for each type and color of grout and setting materials.
- 4. NTMA Standards: Comply with specified provisions and recommendations of National terrazzo & Mosaic Association, Inc.
- 5. TCA Standards: Comply with specifications under the current Handbook for Tile Installation.
- 6. Manufacturer to supply a written Quality Assurance Program and Procedure Manual.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original, unopened packages, containers or bundles bearing brand name and identification of manufacturer.
- B. Store all materials inside, under cover in a manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.

1.08 PROJECT CONDITIONS

- A. Maintain minimum temperature of 50°F in spaces to receive precast terrazzo tile, for at least 48 hours after installation. Store materials in space where they will be installed for at least 48 hours before starting installation.
- B. Install terrazzo tile and accessories after other finishing operations, including painting, have been completed.

- C. Do not install tile on concrete slabs until they have been cured and are sufficiently dry to achieve bond with adhesive, as determined by the tile manufacturer's recommended bond and moisture test.

1.09 MAINTENANCE

1. Extra Materials: After completion of the Work, deliver extra terrazzo tile as maintenance materials to the Owner's Representative (to be transferred to the custodian). Furnish maintenance materials from same manufactured lot as materials installed, and enclosed in protective packaging with appropriate identifying labels. Furnish not less than one box of tile for each fifty boxes or fraction thereof, for each type, color, pattern and size of tile installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

1. Acceptable product manufacturers.
1. Wausau Tile, Inc. - Wausau, WI - 1-800-388-8728.
 2. Romoco Precast Terrazzo Products
 3. Precast Terrazzo Enterprises, INC.
2. Clarification Note: Drawings and installation specifications are based on manufacturer's proprietary literature. Other manufacturer's shall comply with the minimum levels of material specifications and detailing indicated on the drawings or specified herein.

2.02 MATERIALS

1. Portland Cement: ASTM C - 150 specifications for Portland Cement.
2. Aggregates: All aggregates to meet ASTM C - 33. ASTM C - 131 specs.
3. Coloring: Pigments used shall be inorganic, resistant to alkalinity and used per manufacturer's recommendations.
4. Color Blending: Precast terrazzo has a color range in the aggregate. This can cause variances in overall color. Tile is to be blended at the job site from multiple pallets in numerical sequence.
5. Setting Materials:
 1. Latex-Portland Cement Mortar ANSI A118.4 - No fast setting latex Portland cement mortar to be allowed.

6. Grouting Materials:

1. Latex-Portland Cement Grout: Comply with ANSI A118.6 and the following:

1. Water emulsion latex additive: Add at project site to pre-packaged dry grout mix, with type of latex and dry grout mix specified or recommended by latex manufacturer.

- 1) Latex additive: Concentrated Acrylic Latex Additive.
- 2) Grout type: Blended, marble fines-Portland Cement as supplied by Tile Manufacturer or Sand-Portland Cement.

2. Grout Colors: To be determined by Architect, selected from manufacturer's standard range or a custom color.

7. Crack Isolation Membrane

8. Self Leveling Underlayment

9. Expansion Joint Materials:

1. 1/4" x 13/16" Neoprene backed by 13/16" x 3/4" x 16 gauge zinc angles, as supplied by Tile Manufacturer
2. Color - Black.

10. Edge Protection:

1. Provide aluminum edge protection between terrazzo tile and other floor finishes.
2. Edge protection shall be Schluter – Jolly type, or approved equal.

11. Polishing & Cleaning Materials:

1. Water Emulsion Seal/Finish or
2. Stone Maintenance System or
3. Polysiloxane seal/vitrification

2.03 MANUFACTURED UNITS

A. Precast terrazzo

1. Size. 11-15/16" x 11-15/16" x 3/4", 9.5 lbs. (Actual).
2. Chamfered face edges.
3. Surface to be ground & polished, free of holes or rough areas.
4. Surfaces to be uniform in appearance.
5. Finish/Color:

1. Selected from Tile Manufacturer complete color palette
6. Precast terrazzo flooring is not factory sealed

2.04 MIXES

1. Aggregate: Natural, sound, crushed marble chips complying with NTMA requirements.
2. Matrix Pigments: Pure mineral or synthetic pigments, resistant to alkalis and non- fading.
3. Face Layer: Minimum depth of 3/8" (nominal) and shall include 70% coverage of the precast terrazzo face with marble aggregate.

2.05 FABRICATION

1. Mechanically vibrated in the molds.
2. Hydraulically pressed by a 600 ton/2100 psi press.
3. Steam cured with 100% humidity for 11 hour cycle.
4. Factory finish: In-line grinding
5. Tolerances:
 1. Dimensional tolerances: Fact: toe - .26%; thickness .26%
 2. Warpage: Along with any edge + or - 1.5%
On either diagonal + or - 1.5%
 3. Wedging: Not to exceed 1.0%

2.06 SOURCE QUALITY CONTROL

A Tests: Manufacturer to supply independent laboratory for test results on:

1. Flexural Strength ASTM C-293
 2. Water Absorption ASTM C-140
 3. Compressive Strength ASTM C-140
2. Inspections:
1. Documented inspection of precast terrazzo quality control tests.

2.07 ACCESSORIES

1. Divider Strips: Zinc - 1-1/4 inches deep by 1/4" thickness or as otherwise indicated on drawings and/or as required.

PART 3 - EXECUTION

3.01 PREPARATION GUIDELINES

1. The following work should be completed and approved before installation of precast terrazzo is begun:
 1. Surfaces to receive precast terrazzo shall be plumb, level and true with square corner, maximum variation from required plane shall be 18" in 10'. Concrete surface to be troweled with a broom finish with no curing compounds.
 2. Apply Self Leveling Underlayment to concrete floors where determined by Architect in conjunction with the terrazzo tile contractor.
 3. Before setting, ensure surfaces are free from coatings, curing compounds, oil, grease, wax or dust.
 4. All anchors, outlets and other inserts must be in place.
 5. Report all unacceptable surfaces to Architect and do not set until surface areas are corrected.
 6. Crack Isolation Membrane to be used on non-directional cracks, shrinkage cracks and all areas where crack transfer is suspected.
 7. Locate and determine expansion joints based on building control joints, cold joints, sawed joints and recommend expansion joints based on TCA specifications EJ 171 or current issue.

3.02 INSTALLATION GUIDELINES

1. All work to be performed by trade contractor, tile and marble setters and finisher's who are thoroughly competent to execute the work with a minimum of 5 years of successful experience on projects of similar magnitude and complexity to that indicated for this project.
 1. F111 - Cement Mortar, Cleavage Membrane
 1. Follow current issue, TCA specifications and Tile Manufacturer installation procedures for desired installation guidelines.
 2. Underbed comply with ANSI A108-1A and the following:
 1. Screed underbed to elevation of 7/8" below finished floor elevation to receive 3/4" terrazzo tile to be set by the Thinset Method.
 2. F112 - Cement Mortar, Bonded
 1. Follow current issue, TCA specifications and Tile Manufacturer installation procedures for desired installation guidelines.
 2. Underbed comply with ANSI A108.1 and the following:

1. Screed underbed to elevation of 7/8" below finished floor elevation to receive 3/4" terrazzo tile to be set by the Thinset Method.
3. F113 - Dry Set Mortar or Latex-Portland Cement Mortar Bonded Over (Cement Mortar, Cleavage Membrane) - (Cement Mortar Bonded) - (Structural Concrete)
 1. Precast terrazzo installation
 1. Thinset application follow current issue, TCA and ANSI A108.5

3.03 PRECAST TERRAZZO FINISHING GUIDELINES

1. Grouting: Comply with ANSI A108.10 and the Tile Manufacturer installation guidelines.
2. Finishing
 1. Water emulsion floor finish sealer
1. Products
 1. Provide a single source for sealer, stripper, cleaner with neutral pH as manufactured for use on cementitious terrazzo following Tile Manufacturer installation guidelines.
 2. Manufacturer of the seal, stripper, cleaner shall provide detailed maintenance manuals for care of terrazzo tile using water emulsion floor sealer/finish.
 3. High polish stone system
1. Products
 1. Provide a single source for impregnator, cleaner, soap, polishing compound following Tile Manufacturer installation guidelines.
 2. Manufacturer of the impregnator, cleaner, soap, polishing compound shall provide detailed maintenance manuals for care of terrazzo tile using high polish stone system.
 3. Polysiloxane seal/vitrification
- B. Products
 1. Provide a compatible source for polysiloxane penetrating sealer, polishing compound and vitrifier following Tile Manufacturer installation guidelines.
 2. Manufacturers polysiloxane penetrating sealer, polishing compound and vitrifier to provide detailed maintenance manuals for care for terrazzo tile using polysiloxane seal, vitrification.

3.04 CLEANING AND PROTECTION

- A. Upon completion of installation and curing of adhesive, clean floors in accordance with manufacturers instructions.
- B. Remove all excess adhesive, dirt, stain and all other foreign material. Apply 2 coats of protective sealer to flooring surface as recommended by tile manufacturer.
- C. Protect flooring from damage prior to final inspections, using manufacturer's directions.

END OF SECTION 09 66 16

SECTION 09 67 00 – FLUID-APPLIED FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION OF THE WORK

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.
- B. Work of this Section includes all labor, materials, equipment and services necessary to complete the epoxy resin composition flooring and integral base as scheduled on the drawings and/or specified herein.

1.2 RELATED WORK

- A. Concrete – Division 3.
- B. Floor drains - Division 15.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Section 1.
- B. Product Data: Submit manufacturer's technical data, application instructions and general recommendations for the epoxy resin composition flooring specified herein.
- C. Samples for initial selection purposes in form of manufacturer's color charts showing full range of colors and finishes available. Submit 2-1/2" x 4" samples of color chips from color chart selection designated by the Architect. Furnish samples of full range of non-slip surface.
- D. Material certificates signed by manufacturer certifying that the epoxy resin composition flooring complies with requirements specified herein.
- E. Maintenance Instructions: Submit manufacturer's written instructions for recommended maintenance practices.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer or applicator who has specialized in installing resinous flooring types similar to that required for this Project and who is acceptable to manufacturer of primary materials.
- B. Single-Source Responsibility: Obtain epoxy resin composition flooring materials, including primers, resins, hardening agents, and finish or sealing coats, from a single manufacturer.
- C. Qualified Materials: Request for material approvals for any products other than the specified products must be submitted to the architect two weeks prior to the bid, including complete

application specification, physical characteristics, and chemical resistance data. Any request after this date will not be accepted. Failure of performance requires immediate removal and replacement of unapproved substituted material with those originally specified at no cost to the owner, architect, construction manager, or general contractor.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name and directions for storage and mixing with other components.
- B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Comply with epoxy resin composition flooring manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect Work.
- B. Lighting: Permanent lighting will be in place and working before installing resinous flooring.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Troweled epoxy resin composition flooring shall be Dex-O-Tex Cheminert CFS flooring with Positred CR clear topcoat finish as manufactured by Crossfield Products Corp.; Roselle Park, New Jersey.
Alternate Manufacturers: Delta Polymers, Inc.; Duraflex Inc.

2.2 PROPERTIES

- A. Colors: As selected by Architect from manufacturer's standard colors.
- B. Physical Properties:
Provide flooring system that meet or exceed the listed minimum physical property requirements when tested according to the referenced standard test method in parentheses.

Compressive Strength (ASTM C 579):	11,000 psi.
Tensile Strength (ASTM C 307):	1643 psi.
Flexural Modulus of Elasticity (ASTM C 580):	4,300 psi.
Water Absorption (MIL D-3134):	0.3 percent max.

Surface Hardness (ASTM D-2240):	85.5 Durometer "D"
Abrasion Resistance (ASTM D-1044):	0.0 gr.
Impact Resistance (MIL-D-3134, Para 4.7.3):	0.024" max. No chipping, cracking loss of adhesion
Impact Resistance (Gardner Impact Tester):	No chipping, cracking, or delamination and not more than 0.014" indentation
Adhesion (A.C.I. Comm. No. 503.1):	400 psi (100% failure in concrete)
Electrical Conductivity (NFPA 56A):	Di-electric
Flammability-Critical Radiant Flux (ASTM E-648):	Greater than 1.07 watts/cm ²
Co-efficient of Friction (MIL-D-3134 procedure - rubber shoe surface)	

	Static Friction		Sliding Friction	
	Saltwater Solution On Surface	Oil on Surface	Saltwater Solution On Surface	Oil on Surface
Fine Profile	.95	.75	.89	.44
Medium Profile	1.03	.75	.95	.45
Coarse Profile	1.09	.85	1.00	.56
Very Coarse Profile	1.24	.78	1.04	.59

2.03 SUPPLEMENTAL MATERIALS

- A. Textured Top Coat: Type recommended or produced by manufacturer of epoxy resin matrix flooring system for type and profile of desired final finish.

PART 3.0 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where the epoxy resin composition flooring is to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the Contractor in a manner acceptable to the Architect.

3.02 PREPARATION

- A. Substrate: Perform preparation and cleaning procedures according to flooring manufacturer's instructions for particular substrate conditions involved, and as specified. Provide clean, dry, and neutral substrate for flooring application.
- B. Concrete Surfaces: Shot-blast, acid etch or power scarify as required to obtain optimum bond of flooring to concrete. Remove sufficient material to provide a sound surface free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents. Remove grease, oil, and other penetrating contaminates. Repair damaged and deteriorated concrete to acceptable condition. Leave surface free of dust, dirt, laitance, and efflorescence.
- C. Materials: Mix resin hardener and aggregate when required, and prepare materials according to flooring system manufacturer's instructions.

3.03 APPLICATION

- A. General: Apply each component of epoxy resin composition flooring system according to manufacturer's directions to produce a uniform monolithic flooring surface of thickness indicated.
- B. Bond Coat: Apply bond coat over prepared substrate at manufacturer's recommended spreading rate.
- C. Body Coat: Over primer, trowel apply epoxy mortar mix at nominal 1/4-inch thickness; hand or power trowel. When cured, sand or grind if necessary to remove trowel marks and roughness.
- D. Finish or Sealing Coats: After body coat has cured sufficiently, apply grout and finish coats of type recommended by flooring manufacturer to produce finish matching approved sample and in number of coats and spreading rates recommended by manufacturer.
 - 1. Final finish coat shall be in color and skid retardant profile as approved by the Architect.
 - 2. Finished floor shall be 1/4" thick, uniform in color and free of trowel marks.
- E. Cove Base: Apply cove base mix to wall surfaces at locations shown to form cove base height of 4 inches unless otherwise indicated. Follow manufacturer's printed instructions and details including taping, mixing, priming, troweling, sanding, and top-coating of cove base.

3.04 CURING, PROTECTION AND CLEANING

- A. Cure epoxy resin composition flooring materials according to manufacturer's directions, taking care to prevent contamination during application stages and before completing curing process. Close application area for a minimum of 24 hours.

END OF SECTION 09 67 00

SECTION 09 68 00 - CARPET

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. Tufted carpet.

- B. Related Sections include the following:

- 1. Division 3 Section "Cast-in-Place Concrete" for concrete slab substrates
- 2. Division 9 Section "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.

- 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. Existing flooring materials to be removed.
- 3. Existing flooring materials to remain.
- 4. Carpet type, color, and dye lot.
- 5. Locations where dye lot changes occur.
- 6. Seam locations, types, and methods.
- 7. Type of subfloor.
- 8. Type of installation.
- 9. Pattern type, repeat size, location, direction, and starting point.
- 10. Pile direction.
- 11. Type, color, and location of insets and borders.
- 12. Type, color, and location of edge, transition, and other accessory strips.
- 13. Transition details to other flooring materials.
- 14. Type of cushion.

- 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- (300-mm-) square Sample.
 - 2. Exposed Edge Stripping and Accessory: 12-inch- (300-mm-) long Samples.
 - 3. Carpet Seam: 6-inch (150-mm) Sample.
 - 4. Mitered Carpet Border Seam: 12-inch- (300-mm-) square Sample. Show carpet pattern alignment.
- D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.
- E. Maintenance Data: For carpet to include in maintenance manuals specified in Division 1. 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.

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.
- C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered. Refer to Division 1 Section "Substitutions."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

- A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."
- 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 and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
 - 1. Warranty Period: Lifetime limited

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. (8.3 sq. m).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of design product: The design of the Carpet is based on products manufactured by Shaw Contract Group. Subject to compliance with the requirements, provide the named product or a comparable product by one of the following:
 - 1. Interface
 - 2. Collins & Aikman

2.2 CARPET CPT-A.

- A. Basis-of-Design Product: The design is based on the product named.
 - 1. Manufacturer: Shaw Contract Group
 - 2. Product: Style – 60597
- B. Construction: multi-level pattern Loop.
- C. Fiber product: 100% Eco Solution premium branded nylon

- D. Gauge: 1/12
- E. Primary backing: Synthetic
- F. Secondary backing: Ultraloc pattern
- G. Size : broadloom 12 foot
- H. Electrostatic propensity: Less than 3.5 KV - permanent conductive filament
- I. Flammability: ASTM E-648 flooring radiant panel Class 1
 ASTM E-662 NBS smoke chamber less than 450
- J. Stitches per inch: 9.50
- K. Face weight: 34 oz/sq. yd.
- L. Finished pile thickness: 0.169 inches
- M. Average density: 7,243 oz/cubic yd.
- N. Protective treatments: ssp shaw soil protection
- O. Dye methods: solution dyed
- P. Warranty: Lifetime limited

2.3 CARPET CPT-B.

- A. Basis-of-Design Product: The design is based on the product named.
 - 1. Manufacturer: Shaw Contract Group
 - 2. Product: Style – 60596
- B. Construction: multi-level pattern Loop.
- C. Fiber product: 100% Eco Solution premium branded nylon
- D. Gauge: 1/12
- E. Primary backing: Synthetic
- F. Secondary backing: Ultraloc pattern
- G. Size : broadloom 12 foot
- H. Electrostatic propensity: Less than 3.5 KV - permanent conductive filament
- I. Flammability: ASTM E-648 flooring radiant panel Class 1
 ASTM E-662 NBS smoke chamber less than 450

- J. Stitches per inch: 9.00
- K. Face weight: 34 oz/sq. yd.
- L. Finished pile thickness: 0.177 inches
- M. Average density: 6,915 oz/cubic yd.
- N. Protective treatments: ssp shaw soil protection
- O. Dye methods: solution dyed

2.4 CARPET CPT-C.

- A. Basis-of-Design Product: The design is based on the product named.
 - 1. Manufacturer: Shaw Contract Group
 - 2. Product: Style – 60598
- B. Construction: multi level pattern Loop.
- C. Fiber product: 100% Eco Solution premium branded nylon
- D. Gauge: 1/10
- E. Primary backing: Synthetic
- F. Secondary backing: Ultraloc pattern
- G. Size : broadloom 12 foot
- H. Electrostatic propensity: Less than 3.5 KV - permanent conductive filament
- I. Flammability: ASTM E-648 flooring radiant panel Class 1
 ASTM E-662 NBS smoke chamber less than 450
- J. Stitches per inch: 11.66
- K. Face weight: 30 oz/sq. yd.
- L. Finished pile thickness: 0.164 inches
- M. Average density: 6,585 oz/cubic yd.
- N. Protective treatments: ssp shaw soil protection
- O. Dye methods: solution dyed

2.5 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the following:
 - 1. Carpet manufacturer.
 - 2. Carpet cushion 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 that is recommended by the following:
 - 1. Carpet manufacturer.
- C. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.
- 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 the following:
 - a. Carpet manufacturer.
 - 2. Subfloor finishes comply with requirements specified in Division 3 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 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- 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 the following:
 - 1. Carpet manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet. 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. Direct-Glue-Down Installation: Comply with CRI 104, Section 8, "Direct Glue-Down Installation."
- B. Comply with carpet manufacturer's written recommendations 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.
 - 1. Level adjoining border edges.
- C. Do not bridge building expansion joints with carpet.
- D. 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.
- E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. 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.
- G. Install pattern quarter-turn, unless otherwise indicated.

3.4 CLEANING AND PROTECTION

- 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 15, "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.

END OF SECTION 09 68 00

SECTION 09 84 13 – ACOUSTICAL PANELS

Part 1 General

1.1 Section Includes

- A. Back mounted acoustical ceiling panels.
- B. Back mounted acoustical wall panels.

1.2 Related Sections

- Division 3 – Cast-in-place Concrete: Surface attachment to concrete walls or deck.
- Division 4 – Unit Masonry Assemblies: Surface attachment to masonry wall.
- Division 5 – Steel Deck: Surface attachment to underside of metal deck.
- Division 9 – Gypsum Board Assemblies: Surface attachment to gypsum board.

1.3 References

- A. ASTM C423 – Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. ASTM C165 – Test for Measuring Compressive Properties of Thermal Insulations.
- C. ASTM E84 – Surface Burning Characteristics of Building Materials.
- D. ASTM C553, Type I – Specification for Mineral Fiber Board Thermal Insulation for Commercial and Industrial Applications.
- E. ASTM C1104 – Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.
- F. ASTM C1338 – Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
- G. ASTM C665 – Standard Specification for Mineral-Fiber Board Thermal Insulation for Light Frame Construction and Manufactured Housing.

1.4 Performance Requirements

- A. Product shall be a standard thickness of 2” and have a Standard density of 3.0 PCF for ceiling panels and 5 to 7 PCF for wall panels.
- B. Product shall be dimensionally stable with no capability for shrinking or warping.
- C. Product shall have a resilient composition with good resistance to damage from job-site impact.
- D. Product shall be composed of inorganic glass fibers.
- E. Product’s mat face shall be able to be cleaned by vacuuming.
- F. Product shall not be susceptible to rot or mildew contamination.
- G. Product shall not cause corrosion greater than caused by sterile cotton to steel and aluminum, when tested in accordance with ASTM C665.
- H. Acoustical Performance (Tested to ASTM C423, Type A mounting)

<u>Density</u> Pcf (kg/m ³)	<u>Thickness</u> In (mm)	<u>Octave Band Center Frequencies, Hz</u>						
		125	250	500	1000	2000	4000	NRC
3.0	2.0	.18	.71	1.12	1.12	1.03	1.02	1.00

<u>Density</u> Pcf (kg/m ³)	<u>Thickness</u> In (mm)	<u>Octave Band Center Frequencies, Hz</u>						
		125	250	500	1000	2000	4000	NRC
5 to 7	2.0	0.29	0.82	1.10	1.04	1.01	1.02	1.00

I. Surface Burning of Core Material (tested to UL 723, or CAN/ULC-S102-M):

1. Flame spread 25, smoke developed 50.

J. Water vapor sorption – by weight (Tested to ASTM C1104):

1. <3% at 120°F (49°C) at 95% relative humidity.

K. Minimum Compressive Strength (Tested to ASTM C165):

- | | |
|-----------------------|---------------------------------|
| | <u>3 lb. Density</u> |
| 1. At 10% deformation | 25 lb/ft ² (1197 Pa) |
| 2. At 25% deformation | 90 lb/ft ² (4309 Pa) |

L. Fungi resistance

1. Meets all requirements of ASTM C1338

1.6 Submittals

A. Product Data: Manufacturer’s descriptive literature for Acoustic Panel, including component item data, physical sizes, material densities, fastening and attachment methods.

B. Samples:

1. Submit two samples, (6” x 10”), of each specified type of acoustical panel.

C. Manufacturer’s Certificate: Provide certificate that products meet or exceed specified requirements.

1. Certify system acoustical and fire resistance performance.
2. Certify that installers have been trained and are qualified to install the system.

1.7 Quality Assurance

A. Installer: Experienced in the installation of building insulation and acoustical materials.

B. Test Reports: Submit tests reports from a NVLAP accredited testing laboratory indicating that the system has passed all noted fire resistance requirements and acoustical requirements.

- 1.8 Regulatory Requirements
 - A. Conform to applicable code for fire rated panel construction and combustibility requirements for materials.

- 1.9 Delivery, Storage And Handling
 - A. Inspect material upon arrival to the site. Immediately log damaged materials with the shipping company and report to the manufacturer. Report flaws or defects in the material to the manufacturer within 24 hours of delivery.
 - B. Store material in a secure, dry clean, and dust free environment away from high traffic areas
Store material in such a manner to prevent damage to insulation core or mat faced finish. (Do not pile material on top of other components.)
 - C. Keep material in its original packaging until installation.

Part 2 Products

- 2.1 Ceiling Panels – Manufacturer:
Basis of Design: SelectSound Acoustic Board, by Owens Corning.
 - A. Alternate Manufacturers:
 - 1. Decoustics Limited – Equivalent product to basis of design.
 - 2. USG Corporation – Equivalent product to basis of design.

- 2.2 Wall Panels – Manufacturer:
Basis of Design: Fabric Molded Fiberglass Wall Panels by Kinetics Noise Control.
 - A. Alternate Manufacturers:
 - 1. Decoustics Limited – Equivalent product to basis of design.
 - 2. USG Corporation – Equivalent product to basis of design.

Part 3 Execution

- 3.1 Examination
 - A. Verify that adjacent materials and surfaces are dry, in a dust free environment, free of obstructions, and ready to receive Acoustical panel installation.
 - B. Verify painting, finish woodwork, wiring runs, and flooring is complete prior to Acoustic panel installation.
 - C. Verify that special standouts and furring for wall trim details or additional wall support items are installed.
 - D. Verify wall penetrations have been sealed, where applicable.

- 3.1 Preparation
 - A. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory or unsafe conditions have been corrected.

- B. Confirm to the manufacturer that the site has been properly prepared prior to installation.

3.2 Installation

- A. Install Acoustic panels to drywall, concrete block, precast concrete or other manufacturer-approved surfaces using impaling pins or construction adhesives.
- B. When installing with adhesive, follow adhesive manufacturer's recommendations for surface preparation and pattern prior to installation.
- C. When installing with impaling pins, follow pin manufacturer's recommendations for surface preparation, location and spacing of pins. Pin length shall be selected to ensure tight fit. Where subject to contact, protect pin tips.

3.3 Cleaning

- A. Clean finish surfaces of panels. Remove foreign objects from material.

END OF SECTION 09 84 13

SECTION 09 91 00 - 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 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. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- C. 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. Acoustical wall panels.
 - c. Metal toilet enclosures.
 - d. Metal lockers.
 - e. Unit kitchens.
 - f. Elevator entrance doors and frames.
 - g. Elevator equipment.
 - h. Finished mechanical and electrical equipment.
 - i. Light fixtures.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.

- g. Elevator shafts.
- 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
- 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
- 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:

- 1. Division 2 Section "Hot-Mix Asphalt Paving" for traffic-marking paint.
- 2. Division 2 Section "Cement Concrete Pavement" for traffic-marking paint.
- 3. Division 5 Section "Structural Steel" for shop priming structural steel.
- 4. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
- 5. Division 6 Section "Interior Architectural Woodwork" for shop priming interior architectural woodwork.
- 6. Division 6 Section "Exterior Finish Carpentry".
- 7. Division 8 Section "Steel Doors and Frames" for factory priming steel doors and frames.
- 8. Division 9 Section "Gypsum Board Assemblies" for surface preparation of gypsum board.
- 9. Division 9 Section "Wood Flooring" for finishing wood flooring.
- 10. Division 9 Section "Wood Athletic Flooring Assemblies" for finishing wood gymnasium flooring.

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

SECTION 09 91 00
PAINTING (PROFESSIONAL LINE PRODUCTS)
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- 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 three (3) Samples on the following substrates for Architect's review of color and texture only:
 - a. Concrete Unit Masonry: 6-by-10-inch (150-by-250-mm) Samples of masonry, with mortar joint in the center, for each finish and color.
 - b. Painted Wood: 12-inch- (300-mm-) square Samples for each color and material on hardboard.
 - c. Stained or Natural Wood: 6-by-10-inch (150-by-250-mm) Samples of natural- or stained-wood finish on representative surfaces.
 - d. Ferrous Metal: 8-inch- (100-mm-) square Samples of flat metal and 8-inch- (200-mm-) long Samples of solid metal for each color and finish.
- D. Qualification Data: For Applicator.

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 and primers 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. (9 sq. m).

- 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 (7 deg C). 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 (10 and 32 deg C).
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).
- 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 (3 deg C) 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

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- 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 an additional 5 percent, but not less than 1 gal. (3.8 L) or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design based on the products named in other Part 2 articles and in the schedule at the end of Part 3. Subject to compliance with requirements, provide either the named product or a comparable product by one of the following manufacturers:
 - 1. Benjamin Moore & Co. (Benjamin Moore).
 - 2. PPG Industries, Inc. (Pittsburgh Paints).
 - 3. Pratt & Lambert, Inc. (Pratt & Lambert)
 - 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: As selected by Architect from manufacturer's full range.

2.3 CONCRETE UNIT MASONRY BLOCK FILLERS

- A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.
 - 1. Benjamin Moore; Moorcraft Super Craft Latex Block Filler No. 285: Applied at a dry film thickness of not less than 8.1 mils (0.206 mm).
 - 2. Pittsburgh Paints; 6-7 SpeedHide Interior/Exterior Masonry Latex Block Filler: Applied at a dry film thickness of not less than 6.0 to 12.5 mils (0.152 to 0.318 mm).
 - 3. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils (0.203 mm).

2.4 EXTERIOR PRIMERS

- A. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.
1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
 2. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 3. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).

2.5 INTERIOR PRIMERS

- A. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.
1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
 2. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
 3. Sherwin-Williams; PrepRite Masonry Primer B28W300: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
- B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
 2. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
 3. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
- C. Interior Wood Primer for Acrylic-Enamel and Semigloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.
1. Benjamin Moore; Moorcraft Super Spec Alkyd Enamel Underbody and Primer Sealer No. 245: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
 2. Pittsburgh Paints; 6-855 SpeedHide Latex Enamel Undercoater: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
 3. Sherwin-Williams; PrepRite Wall and Wood Primer B49W200 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
- D. Interior Wood Primer for Full-Gloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.
1. Benjamin Moore; Moorcraft Super Spec Alkyd Enamel Underbody and Primer Sealer No. 245: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
 2. Pittsburgh Paints; 6-6 SpeedHide Interior Quick-Drying Enamel Undercoater: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).

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3. Sherwin-Williams; PrepRite Wall and Wood Primer B49W200 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
- E. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.
1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
 2. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
 3. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
- F. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.
1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
 2. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 3. Sherwin-Williams; Galvite HS B50WZ30: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).

2.6 EXTERIOR FINISH COATS

- A. Exterior Full-Gloss Alkyd Enamel: Factory-formulated full-gloss alkyd enamel for exterior application.
1. Benjamin Moore; Moore's IMC Urethane Alkyd Enamel M22: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
 2. Pittsburgh Paints; 7-814 Pittsburgh Paints Industrial Gloss-Oil Interior/Exterior Enamel: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
 3. Sherwin-Williams; Industrial Enamel B-54 Series: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

2.7 INTERIOR FINISH COATS

- A. Epoxy Coatings: Factory-formulated high performance water-based epoxy.
1. Benjamin Moore & Co.; Acrylic Epoxy Gloss "A", Hardener "B", M43/M44.
 2. Pittsburgh Paints Architectural Finishes, Inc.; Aquapon, Waterborne Epoxy, 98-1/98-98.
 3. Sherwin-Williams Company (The); Industrial & Marine, Water Based Catalyzed Epoxy, B70Wseries.
- B. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application.
1. Benjamin Moore; Moorecraft Super Spec Latex Flat No. 275: Applied at a dry film thickness of not less than 1.2 mils (0.031 mm).

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2. Pittsburgh Paints; 6-70 Line SpeedHide Interior Wall Flat-Latex Paint: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
 3. Sherwin-Williams; ProMar 200 Interior Latex Flat Wall Paint B30W200 Series: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
- C. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.
1. Benjamin Moore; Moorcraft Super Spec Latex Eggshell Enamel No. 274: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
 2. Pittsburgh Paints; 6-400 Series SpeedHide Eggshell Acrylic Latex Enamel: Applied at a dry film thickness of not less than 1.25 mils (0.032 mm).
 3. Sherwin-Williams; ProMar 200 Interior Latex Egg-Shell Enamel B20W200 Series: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).
- D. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.
1. Benjamin Moore; Moorcraft Super Spec Latex Semi-Gloss Enamel No. 276: Applied at a dry film thickness of not less than 1.2 mils (0.031 mm).
 2. Pittsburgh Paints; 6-500 Series SpeedHide Interior Semi-Gloss Latex: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
 3. Sherwin-Williams; ProMar 200 Interior Latex Semi-Gloss Enamel B31W200 Series: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
- E. Interior Full-Gloss Acrylic Enamel: Factory-formulated full-gloss acrylic-latex interior enamel.
1. Benjamin Moore; Moore's IMC Acrylic Gloss Enamel No. M28: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
 2. Pittsburgh Paints; 90-374 Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 3. Sherwin-Williams; ProMar 200 Interior Latex Gloss Enamel B21W201: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
- 2.8 INTERIOR WOOD STAINS AND VARNISHES
- A. Open-Grain Wood Filler: Factory-formulated paste wood filler applied at spreading rate recommended by manufacturer.
1. Benjamin Moore; Benwood Paste Wood Filler No. 238.
 2. Sherwin-Williams; Sher-Wood Fast-Dry Filler.
- B. Interior Wood Stain: Factory-formulated alkyd-based penetrating wood stain for interior application applied at spreading rate recommended by manufacturer.
1. Benjamin Moore; Benwood Penetrating Stain No. 234.
 2. Pittsburgh Paints; 77-560 Rez Interior Semi-Transparent Oil Stain.
 3. Sherwin-Williams; Wood Classics Interior Oil Stain A-48 Series.
- C. Clear Sanding Sealer: Factory-formulated fast-drying alkyd-based clear wood sealer applied at spreading rate recommended by manufacturer.

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1. Benjamin Moore; Moore's Interior Wood Finishes Quick-Dry Sanding Sealer No. 413.
 2. Pittsburgh Paints; 6-10 SpeedHide Quick-Drying Interior Sanding Wood Sealer and Finish.
 3. Sherwin-Williams; Wood Classics Fast Dry Sanding Sealer B26V43.
- D. Interior Waterborne Clear Satin Varnish: Factory-formulated clear satin acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.
1. Benjamin Moore; Stays Clear Acrylic Polyurethane No. 423, Satin.
 2. Pittsburgh Paints; 77-49 Rez Satin Acrylic Clear Polyurethane.
 3. Sherwin-Williams; Wood Classics Waterborne Polyurethane Satin, A68 Series.
- E. Interior Waterborne Clear Gloss Varnish: Factory-formulated clear gloss acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.
1. Benjamin Moore; Benwood Interior Wood Finishes Polyurethane Finishes High Gloss No. 428.
 2. Pittsburgh Paints; 77-45 Rez Full-Gloss Acrylic Clear Polyurethane.
 3. Sherwin-Williams; Wood Classics Waterborne Polyurethane Gloss, A68 Series.
- F. Paste Wax: As recommended by manufacturer.

2.9 EXTERIOR WOOD STAINS AND VARNISH

- A. Open-Grain Wood Filler: Factory-formulated paste wood filler applied at spreading rate recommended by manufacturer. (MPI #91)
1. Benjamin Moore
 2. Sherwin-Williams
 3. Pittsburgh Paint
- B. Exterior Wood Stain: Factory-formulated solvent based semitransparent wood stain for exterior application applied at spreading rate recommended by manufacturer. (MPI #13)
1. Benjamin Moore
 2. Pittsburgh Paints
 3. Sherwin-Williams
- C. Clear Sanding Sealer: Factory-formulated fast-drying alkyd-based clear wood sealer applied at spreading rate recommended by manufacturer. (MPI #102)
1. Benjamin Moore
 2. Pittsburgh Paints
 3. Sherwin-Williams

PART 3 - EXECUTION

3.1 EXAMINATION

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- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
 - 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.

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3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 4. 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] [SSPC-SP 10/NACE No. 2].
 - 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.
 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

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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.

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- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
 - F. Mechanical items to be painted include, but are not limited to, the following:
 - 1. Uninsulated metal piping.
 - 2. Uninsulated plastic piping.
 - 3. Pipe hangers and supports.
 - 4. Tanks that do not have factory-applied final finishes.
 - 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - 6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
 - 7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
 - G. Electrical items to be painted include, but are not limited to, the following:
 - 1. Switchgear.
 - 2. Panelboards.
 - 3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
 - H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
 - I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
 - J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
 - K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats, unless otherwise indicated or specified.
 - L. 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:

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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. Testing agency will perform appropriate tests for the following characteristics as required by Owner:
 - a. Film thickness
 - b. Paint composition
 - c. Gloss
3. 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 SCHEDULE OF PAINT MATERIALS

- A. All products are those of Benjamin Moore & Co.
- B. Surface Prep
 1. SP-1: Clean all surfaces to be coated, with Benjamin Moore M83 Oil and Grease Emulsifier, or suitable cleaning solution.
 2. SP-2: Spot prime bare substrate.

3.8 SCHEDULE OF PAINT MATERIALS

Number Key Material

Interior Primers

- 1 216-00 Regal First Coat
- 2 217-00 Alkyd Enamel Underbody

Interior Finish coats

- 3 215 Regal Flat Finish Wall Satin
- 4 319 Regal Eggshell Finish Aqua Velvet
- 5 310 Regal Pearl Finish Aqua Velvet
- 6 333 Regal Semi-gloss finish Aqua Glo
- 7 235 Satin Impervo

Stains & Clear Finishes

- 8 413 Quick Dry Sanding Sealer
- 9 234 Benwood Penetrating Stain
- 10 404-00 Benwood Satin finish Varnish
- 11 422 Stays Clear Low Lustre Acrylic Polyurethane
- 12 423 Stays Clear High Gloss Acrylic Polyurethane

Exterior Primers

- 13 102-00 Moores Latex Exterior Primer
- 14 100-00 Moorwhite Alkyd Primer

Exterior Finish Coats

- 15 105 Moorlife Flat
- 16 103 Moorgard Low Lustre
- 17 096 Moor Glo soft Gloss
- 18 110 Moores House Paint Alkyd Gloss

Metal Primers

- 19 M05 Rapid Dry Metal Primer
- 20 M04 Acrylic Metal Primer
- 21 M32 Polyamide Epoxy Metal Primer

Specialty coatings

- 22 M22 Urethane Alkyd Enamel
- 23 M43/M44 Acrylic Epoxy
- 24 M88 Latex Block Filler
- 25 M53 Sweep-up Spray Latex Flat
- 26 M51 Sweep-up Alkyd Flat
- 27 Universal Wall Primer/Sizer

Note: Deep accent colors shall be top coated with Stays Clear acrylic Polyurethane.

3.9 SCHEDULING OF PAINTING

A. Exterior Surfaces

		Coats			
		1 st	2 nd	3 rd	4 th
1.	*Galvanized metal	19	7	7	
2.	*Ferrous Metal	19	7		
3.	Sheetrock	13	16		

*Includes new miscellaneous steel, ferrous metal, exposed angles and lintels, miscellaneous metal, vent pipes above roofs, support for equipment on roof, hollow metal doors and frames, other metal doors, fans, air handling units, miscellaneous equipment on roofs, pipes, ducts and conduits.

B. Interior Surfaces	1 st	Coats		
		2 nd	3 rd	4 th
1. Ferrous metal (includes stairs, railing, etc.)	19	7		
2. Masonry: (epoxy)	24	23	23	
(paint)	24	4		
3. Gyp. Board/ (eggshell fin)	1	4		
Gyp. Board/ (semi-gloss fin)	1	5		
Gyp. Board/ (epoxy)	1	23	23	
4. Stained wood/millwork/	9	*8	*11	*11
5. Wood Painted	2	7	7	
6. Exposed structures including steel beams, trusses, decking, ducts, conduits, etc.	25			

*Sand lightly between coats.

3.10 ACCENT COLORS

- A. One (1) wall, in each space where painting is called for, shall have one (1) accent wall.

END OF SECTION 09 91 00

SECTION 10 00 00- SPECIALTIES

PART 1- GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Sanitizing Eyewear Cabinet
- 2. Fire Blanket and Cabinet
- 3. Flammable Liquids Storage Cabinet
- 4. Corrosive Material Storage Cabinet
- 5. "Knox Box" units

- B. Related Sections include the following:

- 1. Division 9 Section "Gypsum Board Assemblies" for light gauge metal framing and gypsum board.
- 2. Division 9 Section "Painting" for field applied finishes.
- 3. Division 16 Section "Wires and Cables" for electrical power supply.

PART 2 - PRODUCTS

2.1 SANITIZING EYEWEAR CABINET

- A. Basis-of-Design Product: Campbell Rhea; Model No. 6782 Goggle cabinet or a comparable product of one of the following:

- 1. Sellstrom Manufacturing Co
- 2. Brodhead Garrett

- B. Construction: Sturdy, steel cabinets featuring timer-controlled, built-in germicidal lamp to sanitize eyewear between wearings. Completely factory assembled with door locks and UL approved three-wire electrical system.

2.2 FIRE BLANKET AND CABINET

- A. Basis-of-Design Product: Campbell Rhea; Model No. 9960 for blanket and container or a comparable product of one of the following:

1. Modern Metal Products
2. Potter Roemer
3. Larsen's Manufacturing

B. Blanket Construction: 100% wool blanket with flame retardancy.

2.3 FLAMMABLE LIQUIDS STORAGE CABINET

A. Construction: Constructed of 18 gauge powder coated steel with a double-wall insulating air barrier. The cabinet shall have adjustable leveling feet and a three point lock with a fail-safe closing mechanism. The cabinets shall be UL listed and Factory Mutual tested and approved.

2.4 CORROSIVE MATERIAL STORAGE CABINET

A. Construction: Constructed of powder coated steel with a double-wall insulating air barrier. The cabinet shall have adjustable leveling feet and a self closing mechanism. Each shelf includes a polyethylene tray to protect the shelves from the corrosives. Steel cabinets are OSHA and NFPA Code 30 approved.

1.1 KNOX BOX

A. Furnish and install "knox Box" 3200 RTS, heavy duty, recessed, black in color, box 4 inches W by 5 inches H by 3-1/4 inches D. Provide two (2) units, to be installed where directed by Architect.

END OF SECTION 10 00 00

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 DESCRIPTION OF WORK

- A. This section includes the following types of visual display boards (see drawings for locations):
 - 1. Porcelain Enamel Markerboards.
 - 2. Vinyl Fabric Faced Cork Tackboards

1.03 RELATED SECTIONS AND WORK

- A. Rough Carpentry
- B. Finish Carpentry

1.04 SUBMITTALS

- A. Shop Drawings: Provide shop drawings for each type of markerboard, and tackboard required. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
- B. Samples: Provide the following samples of each product for initial selection of colors, patterns, and textures, as required, and for verification of compliance with requirements indicated.
 - 1. Samples for initial selection of color, pattern, and texture:
 - 2. Porcelain Enamel Markerboard and Chalkboards: Manufacturer's color charts consisting of actual sections of porcelain enamel finish showing the full range of colors available for each type of markerboard required.
 - 3. Vinyl fabric faced Cork Tackboards: Manufacturer's color charts consisting of actual sections of vinyl fabric, showing the full range of colors, textures, and patterns available for each type of vinyl fabric faced cork tackboard indicated.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the chalkboard manufacturer for both installation and maintenance of the type of sliding chalkboard units required for this project.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.
 - 1. Allow for trimming and fitting wherever taking field measurements before fabrication might delay the work.

1.07 WARRANTY

- A. Porcelain Enamel Markerboard Warranty: Furnish the manufacturer's written warranty, agreeing to replace porcelain enamel chalkboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed.
 - 1. Warranty Period: 50 years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Porcelain Enamel Markerboards, Tackboards, and Trim:

Carolina Chalkboard Co.

Claridge Products and Equipment, Inc.

Greensteel, Inc.

2.02 MATERIALS

- A. Porcelain Enamel Markerboards: Provide balanced, high pressure laminated porcelain enamel chalkboards of 3 ply construction consisting of face sheet, core material, and backing.

Markerboards: Facing Sheet: 24 gage DMB porcelain enamel coated steel laminated to 3/8" particleboard and balanced with moisture proof .015" aluminum backing sheeting bonded with flexible adhesive. Trim frames: Extruded aluminum components consisting of 238T chalktray, 69T display rail with cork insert, 158T side trim, and 67T mullion as required. Colors of markerboards and trim: Selected by Architect from manufacturer's standard color selections.

1. Cover Coat: Provide the manufacturer's standard matte finish cover coat, color selected from the manufacturer's standards.
 2. Core: Provide the manufacturer's standard 3/8" thick particleboard core material complying with the requirements of ANSI A208.1, Grade 1-M-1.
 3. Backing Sheet: Provide the manufacturer's standard 0.015" thick aluminum sheet backing.
 4. Laminating Adhesive: Provide the manufacturer's standard moisture resistant thermoplastic type adhesive.
 5. Provide 4 assorted dry marker pens, and 1 eraser, for each markerboard.
- C. Cork-Faced Tackboards: Provide 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.
1. Backing: Make panels rigid by factory laminating cork face sheet under pressure to 1/4" thick hardboard backing.

2.03 ACCESSORIES

- A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062" thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.
1. Markertray and Chalktray: Furnish manufacturer's standard continuous box type aluminum markertray with slanted front and cost aluminum end closures for each markerboard and chalkboard.
 2. Map Rail: Furnish map rail at the top of each unit, complete with the following accessories:
 3. Display Rail: Provide continuous cork display rail approximately 1 or 2 inches wide, as indicated, integral with the map rail.
 4. End Stops: Provide one end stop at each end of the map rail.
 5. Map Hooks: Provide two map hooks for each 4' of map rail or fraction thereof.
 6. Metal Flag Holder: Adjustable holder in each space having one or more marker-boards, having matching trim, accommodate 1/2" flagstaffs, and security mounted on vertical markerboard trim.

2.04 FABRICATION

- A. Porcelain Enamel Markerboards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.
- B. Assembly: Provide factory assembled chalkboard and tackboard units, except where field assembled units are required.
 - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with a minimum number of joints, balanced around the center of the board, as acceptable to the architect.
 - 2. Provide the manufacturer's standard vertical joint system between abutting sections of chalkboard.
 - 3. Provide manufacturer's standard mullion trim at joints between chalkboard and tackboard.

2.05 FINISHES

- A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish designations prefixed by "AA" conform to the system established by Aluminum Association for designating aluminum finishes.
- C. Class II Clear Anodized Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.4 mil or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.01 LOCATIONS

- A. Refer to drawings for locations, sizes and configuration of markerboard and tackboard units.

3.02 INSTALLATION

- A. Deliver factory built markerboard and tackboard units completely assembled in one piece without joints, wherever possible. Where dimensions exceed panel size, provide two or more pieces of equal length as acceptable to the Architect. When overall dimension require delivery in separate units, prefit components at the

factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

- B. Install units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.
- C. Coordinate job site assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.03 ADJUST AND CLEAN

- A. Verify that accessories required for each unit have been properly installed and that operating units function properly.
- B. Clean units in accordance with the manufacturer's instructions.

END OF SECTION 10 11 00

SECTION 10 12 00 - DISPLAY CASES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Non-illuminated bulletin boards.
- 2. Illuminated display cases.

B. Related Sections:

- 1. Division 10 Section "Visual Display Surfaces" for tackboards.
- 2. Division 16 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 visual display surface background and adjustable shelves.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Display cases shall withstand the effects of earthquake motions according to ASCE/SEI 7.
 - 1. Component Importance Factor is 1.0.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

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 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 Initial Selection: For units with factory-applied color finishes, and as follows:
 - 1. Actual sections of visual display surfaces.
 - 2. Section of header panel for color selection.
- D. Samples for Verification: For each type of product indicated.
 - 1. Visual Display Surface: Not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
 - 2. Trim: 6-inch- (152-mm-) long sections of each trim profile.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.
- F. Maintenance Data: For visual display surfaces, operating hardware[, **and illuminated units**] to include in maintenance manuals.

1.6 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.

1.7 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. Particleboard: ANSI A208.1, Grade M, made with binder containing no urea formaldehyde.
- B. Vinyl Fabric: FS CCC-W-408D, Type II,; weighing not less than 13 oz./sq. yd. (440 g/sq. m); with flame-spread index of 25 or less when tested according to ASTM E 84.
- C. Extruded-Aluminum Bars and Shapes: ASTM B 221 (ASTM B 221M), Alloy 6063.
- D. Aluminum Tubing: ASTM B 429, Alloy 6063.
- E. 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.
- F. High-Pressure Plastic Laminate: NEMA LD 3.
- G. 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 TACKBOARD ASSEMBLIES

- A. Vinyl-Fabric-Faced Tackboard : 1/4-inch- (6-mm-) thick, vinyl-fabric-faced cork sheet factory laminated to 1/4-inch- (6-mm-) thick particleboard backing.

2.3 GLASS ENCLOSED CABINET (G.E.C.)

- 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. Nonilluminated Bulletin Boards:
 - a. Claridge Products and Equipment, Inc.—Imperial Cabinets
 - b. AARCO Products, Inc.
 - c. PolyVision Corporation; a Steelcase company.
- B. General: Factory-fabricated unit consisting of manufacturer's standard wall-mounted cabinet with tackboard assembly on back inside surface and operable glazed doors at front.
- C. Aluminum-Framed Cabinet: Extruded aluminum with baked-enamel finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.
- D. Cabinet Corners: Square.
- E. 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: 2.
- F. Tack Surface: Vinyl-fabric-faced tackboard assembly.
- G. Size: 36" high x 48" wide x 3 1/4" thick.
- H. Mounting: Surface mounted.

2.4 DISPLAY CASE

- 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. AARCO Products, Inc.
 2. Claridge Products and Equipment, Inc.
 3. PolyVision Corporation; a Steelcase company.
- 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: Manufacturer's standard species with transparent finish.
 4. Aluminum Finish: Baked enamel.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range.
- 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: As indicated on Drawings.
 2. Number of Shelves: As indicated on Drawings.

- E. Adjustable Shelf Standards and Supports: B04112; recess mounted in rear surface. Provide standards full height of display case.
- F. Tack Surface: Vinyl-fabric-faced 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. Size: As indicated on Drawings.

2.5 FABRICATION

- A. Fabricate bulletin boards and 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.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Baked-Enamel Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

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 bulletin boards and 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 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. Bulletin Boards: Attach units to wall surfaces with manufacturer's standard concealed hardware.
- C. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches (400 mm) 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 (600 mm) o.c.
- D. Comply with requirements in Division 16 for connecting illuminated display cases.
 - 1. After installation is complete, install new fluorescent lamps.
- E. Install display case shelving level and straight.

3.3 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 10 12 00

SECTION 10 14 00 - SIGNS

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. Panel signs.
- 2. Dimensional characters (letters and numbers).
- 3. Plaques
- 4. Signage accessories.

- B. Related Sections include the following:

- 1. Division 1 Section "Temporary Facilities and Controls" for temporary project identification signs.
- 2. Division 10 Section "Visual Display Surfaces" for building directories.
- 3. Division 15 Section "Mechanical Identification" for labels, tags, and nameplates for mechanical equipment.
- 4. Division 16 Section "Electrical Identification" for labels, tags, and nameplates for electrical equipment.
- 5. Division 16 Section "Interior Lighting" for illuminated exit signs.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and braille layout.
 - 2. Wiring Diagrams: For signs with illuminated characters.
- C. Samples for Initial Selection: For each type of sign material indicated that involves color selection.
- D. Samples for Verification: For each type of sign, include the following Samples to verify color selected:

1. Panel Signs: Full-size Samples of each type of sign required.
2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter and number) required. Show character style, material, finish, and method of attachment.
3. Casting: Show representative texture, character style, spacing, finish, and method of attachment.
4. Approved samples will not be returned for installation into Project.

E. Qualification Data: For Installer.

F. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by signage manufacturer.

B. Source Limitations: Obtain each sign type through one source from a single manufacturer.

C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:

- a. Illuminated Exit Signs: Refer to Division 16.
- b. Fire Doors: Connecticut State Building Code and Connecticut State Fire Safety Code
- c. Room Capacity: Connecticut State Fire Safety Code
- d. Elevator Signs: Connecticut State Building Code
- e. Stairway Identification: Connecticut State Building Code and Connecticut State Fire Safety Code
- f. Signs for Accessible Spaces: Connecticut State Building Code, Americans with Disabilities Act Architectural Guidelines (ADAAG), and Uniform Federal Accessibility Standards (UFAS).

1.5 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

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. Basis-of-Design Product: The design for each sign 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 PANEL SIGNS

- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally.
- B. Basis-of-Design Product: Seton Signway System with Customized Braille Signs, or a comparable product of one of the following:
 1. Allenite Signs; Allen Marking Products, Inc.
 2. American Graphics Inc.
 3. Andco Industries Corp.
 4. ASE, Inc.
 5. DURA Architectural Signage
 6. Kaltech Industries Group, Inc.
 7. Mills Manufacturing, Inc.
 8. Mohawk Sign Systems.
 9. Seton Identification Products.
- C. Melamine Sheet: Manufacturer's standard and as follows:
 1. Color: As selected by Architect from manufacturer's full range.
- D. Characters: Form letters and numbers by blast engraving the background. Apply polyurethane paint to background as required to achieve ADA Compliant contrast ratio. Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Comply with requirements indicated for finish, style, and size.
 1. Material: Melamine Sheet.

2.3 PANEL SIGN TYPES

A. Interior Signs:

1. Material: Melamine Sheet.
2. Perimeter: Unframed.
3. Copy: Tactile and braille.
4. Character Style: Helvetica.
5. Text: As indicated in the Sign Schedule.
6. Message: Fixed.
7. Sizes: Per Drawings

a. Character: Minimum 1-inch- (25-mm-) high characters.

- B. Symbols of Accessibility: Provide 6-inch- (150-mm-) high symbol fabricated from opaque nonreflective vinyl film, 0.0035-inch (0.089-mm) nominal thickness, with pressure-sensitive adhesive backing suitable for both exterior and interior applications.

2.4 ACCESSORIES

- A. Mounting Methods: Use concealed fasteners fabricated from materials that are not corrosive to sign material and mounting surface.
- B. 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.

2.5 CAST METAL LETTERS

- A. Provide and install cast metal letters, with text and locations on building exterior as indicated on Drawings.
1. Material: Baked enamel letter cast from aluminum alloy and surfaced smooth.
 2. Finish: Primed and spray coated with two coats of baking enamel, each coat baked separately.
 3. Letter Size: Height: 1'-6"
 4. Letter Style: Helvetica Medium Style
 5. Mounting: Concealed Studs, with stainless steel spacers and non-metallic separator between dissimilar materials.
- B. Manufacturers
1. The Southwell Co., San Antonio, TX
 2. Advance Corporation
 3. Matthews International Corp., Pittsburgh, PA

2.6 CAST BRONZE PLAQUE

- A. Provide and install a cast bronze plaque as follows:
1. Material: Lead free cast bronze.
 2. Border Style: Raised flat band.

3. Background finish: Dark oxide stain with leatherette texture.
4. Size: 48" high x 36" wide.
5. Mounting: Concealed studs.
6. Sign Text Content: Contractor shall coordinate with the Owner's Representative to determine the information that should be included on the Plaque, prior to completing the submittal for review.

B. Manufacturers

1. The Southwell Co., San Antonio, TX
2. Advance Corporation
3. Matthews International Corp., Pittsburgh, PA

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, provided under other sections of Work are sized and located to accommodate signs.
- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
 1. Install signs level, plumb, and at heights indicated, with sign surfaces free from 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 (75 mm) of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
 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. Where panel signs are scheduled or indicated to be mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.

- C. Dimensional Characters: Mount characters using standard fastening methods recommended in writing by manufacturer for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
 - 1. Flush Mounting: Mount characters with backs in contact with wall surface.
 - 2. Projected Mounting: Mount characters at projection distance from wall surface indicated.

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 SIGNAGE SCHEDULE

- A. Refer to Door Schedule and Floor Plans in Drawings.

END OF SECTION 10 14 00

SECTION 10 14 53 – SITE SIGNAGE

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

- A. The General Conditions, Supplementary Conditions, and Division 1 – General Requirements apply.

1.2 SECTION INCLUDES

- A. Provide and install site signage as shown on the drawings and as specified herein, including but not limited to the following:
 - 1. Traffic signs.
 - 2. Accessible parking signs and bollards.
 - 3. Signage accessories.

1.3 RELATED SECTIONS

- A. Section 03 30 01 - Portland Cement Concrete (Site)
- B. Section 32 12 00 – Bituminous Concrete Pavement and Markings

1.4 REFERENCES:

- A. "Form 816" shall mean the State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 816-2004 or its latest edition and any supplemental specifications.
- B. "NAAMM" Shall mean National Association of Architectural Metal Manufacturers.

National Association of Architectural Metal Manufacturers
800 Roosevelt Rd.
Bldg. C, Suite 312
Glen Ellyn, IL 60137
Phone: (630) 942-6591
Fax: (630) 790-3095

1.5 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- C. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
- D. Samples for Verification: For each type of sign, include the following samples to verify color selected:
 - 1. Panel Signs: Full-size Samples of each type of sign required.
 - 2. Approved samples will be returned for installation into Project.
- E. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each sign type through one source from a single manufacturer.
- B. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1.6 COORDINATION

- A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

PART 2 - PRODUCTS

2.1 PANEL SIGNS

- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 - 1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally.
- B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of 5005-H15.
 - 1. Edge Condition: Square cut.

2. Corner Condition: Rounded to radius indicated.
- C. Graphic Content and Style: Provide sign copy that complies with requirements indicated on Drawings and specified herein for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.
- 2.2 PANEL SIGN TYPES
- A. Traffic Signs:
1. Material: Conform to Form 816, Article 12.08.02 - Materials for Aluminum Sheet.
 2. Background Color and Material: Conform to Form 816, Article M18.13 - Sign Face - Sheet Aluminum.
 3. Copy Color and Material: Conform to Form 816, Article M18.13 - Sign Face - Sheet Aluminum.
 4. Sign Posts: Conform to Form 816, Article M18.14 - Metal Sign Posts.
 5. Mounting: Conform to Form 816, Article M18.15 - Sign Mounting Bolts.
- B. Accessible Parking Signs:
1. Material: 0.080-inch aluminum.
 2. Background Color and Material: Blue, conforming to Form 816, Article M18.13 - Sign Face - Sheet Aluminum.
 3. Copy Color and Material: White, conforming to Form 816, Article M18.13 - Sign Face - Sheet Aluminum.
 4. Sign Posts: Conform to Form 816, Article M18.14 - Metal Sign Posts.
 5. Mounting: Conform to Form 816, Article M18.15 - Sign Mounting Bolts.
- C. Symbols of Accessibility: Provide 6-inch high symbol fabricated from opaque nonreflective vinyl film, 0.0035-inch nominal thickness, with pressure-sensitive adhesive backing suitable for both exterior and interior applications.
- 2.3 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 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 range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.4 SHEET ALUMINUM FINISHES

- A. Sign finish and color shall conform to Form 816, Article M18.13 - Sign Face - Sheet Aluminum.

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 provided under other sections of Work are sized and located to accommodate signs.
- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION




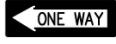



- A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated on the drawings, with sign surfaces free from distortion and other defects in appearance.

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.

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SIGN SCHEDULE

SIGNS								
NO.	SIZE (H x W)	COLORS (LETTERS/ BACKGROUND)	MESSAGE		MUTCD REF.	CONNDOT REF.	NOTE	QTY.
①	12' x 24'	BLUE/WHITE	HANDICAPPED PARKING		R7-8	31-0629 (D)		6
②	18' x 9'	BLUE/WHITE	VAN ACCESSIBLE		--	31-0648		1
③	12' x 18'	RED/WHITE	NO PARKING ANYTIME		R7-1	31-0630(D)		8
④	36' x 11'	BLACK/WHITE /BLACK	ONE WAY		R6-1(L)	31-1188		1
⑤	12' x 18'	RED/WHITE	AUTHORIZED VEHICLES ONLY					1
⑥	30' x 30'	WHITE/RED (DIAMOND GRADE)	STOP		R1-1	31-0532		8
⑦	30' x 30'	WHITE/RED (ENG. GRADE)	DO NOT ENTER		R5-1	31-1109		1

END OF SECTION

SECTION 10 21 00 - CUBICLES

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. Curtain tracks and curtain carriers.
- 2. Cubicle curtains.

- B. Related Sections include the following:

- 1. Division 6 Section "Miscellaneous Carpentry" for wood blocking for mounting items requiring anchorage.
- 2. Division 9 Section "Acoustical Panel Ceilings" for metal framing and furring for mounting items requiring anchorage.

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 (71 deg C).
- 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

- C. Product Data: Include durability, fade resistance, and fire-test-response characteristics for each type of curtain fabric indicated.

- 1. Include data on each type of applied curtain treatment.

- D. 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.

- 1. Include details on blocking above ceiling.

- E. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension assembly members.
2. Method of attaching track hangers to building structure.
3. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, and access panels.

F. Samples for Initial Selection: For each type of curtain fabric indicated.

G. Samples for Verification: Full-size units of each type of the following products:

1. Curtain Fabric: 12-inch- (305-mm-) square swatch or larger Sample 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 (100 mm) square.
3. Curtain Track: Not less than 4 inches (100 mm) long.
4. Curtain Carrier: Full-size unit.

H. Cubicle Schedule: Use same room designations as indicated on Drawings.

I. Product Certificates: Signed by manufacturers of tracks and curtains certifying that products furnished comply with requirements.

J. Maintenance Data: For tracks and curtains to include in maintenance manuals specified in Division 1.

1.5 PROJECT CONDITIONS

K. 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.

L. Field Measurements: Where cubicles are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 EXTRA MATERIALS

M. 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. Curtains: Two (2) full-size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Basis-of-Design Product: The design is based on the product named:

1. Coral of Chicago. Full range of fabrics from book CPQ - 71/2 Collection.

2.2 CURTAIN TRACKS

- A. Cubical track: Arnco No. 1200 ceiling mounted 1 3/8" x 3/4" x .075" extruded anodized aluminum track manufactured by A.R. Nelson Co., Inc. or approved equivalent. Track: Slotted on underside to receive carriers. Provide two wheeled No. 12 carriers spaced 6" o.c. along rack. Each carrier: Have chrome plated hook hung on stainless steel bead chain.

2.3 CURTAINS

- A. Cubical Curtain: Arc - Com Fabrics, Inc., Series Tea Garden, No. AC-32620, meeting NFPA 701, color as selected by Architect.

2.4 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 (305 mm) added fullness.
 2. Length: Equal to floor-to-ceiling height, with 20-inch (508-mm) mesh top, and minus distance above finished floor at bottom as follows:
 - a. Cubicle Curtains: 12 inches (305 mm).
 3. Top Hem: Not less than 1 inch (25.4 mm) and not more than 1-1/2 inches (38 mm) wide, triple thickness, reinforced with integral web, and double lock stitched.
 4. Mesh Top: Top hem not less than 1 inch (25.4 mm) and not more than 1-1/2 inches (38 mm) wide, triple thickness, reinforced with integral web, and double lock stitched. Double lock stitch bottom of mesh directly to 1/2-inch (12.7-mm) triple thickness, top hem of curtain fabric.
 5. Bottom Hem: Not less than 1 inch (25.4 mm) and not more than 1-1/2 inches (38 mm) wide, double thickness and double lock stitched.
 6. Side Hems: Not less than 1/2 inch (12.7 mm) and not more than 1-1/4 inches (31.8 mm) wide, with double turned edges, and single lock stitched.
 7. Vertical Seams: Not less than 1/2 inch (12.7 mm) wide, double turned and double stitched.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install tracks level and plumb, according to manufacturer's written instructions. Provide track fabricated from one continuous length up to 16 feet (4.9 m).
 1. Curtain Track Mounting: Surface.

- B. Surface Track Mounting: Fasten surface-mounted tracks at intervals of not less than 24 inches (610 mm). Fasten support at each splice and tangent point of each corner. Attach track to suspended ceiling grid with manufacturer's proprietary clip.
- C. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.
- D. Curtain Carriers: Provide curtain carriers adequate for 6-inch (152-mm) spacing along the full length of the curtain plus an additional carrier.
- E. Curtains: Hang curtains on each curtain track.

3.2 PROTECTION

- A. Protect installed recessed track openings with nonresidue adhesive tape to prevent debris from ceiling finishing operations from impeding carrier operation.

END OF SECTION 10 21 00

SECTION 10 21 13 - TOILET COMPARTMENTS

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 high-density polyethylene (HDPE) units as follows:
 - 1. Toilet Enclosures: Floor anchored, Overhead braced.
 - 2. Urinal Screens: Wall hung.
 - 3. Dressing Compartments: Floor anchored, Overhead braced.
- B. Related Sections include the following:
 - 1. Division 10 "Toilet 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.
 - 2. Show locations of reinforcements for compartment-mounted grab bars.
- 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- (150-mm-) square Samples of same thickness and material indicated for Work.

1.4 PERFORMANCE REQUIREMENTS

- A. Panel Material: Provide solid, high-density polyethylene (HDPE) panel material with the following characteristics:
 - 1. Panel materials are flame resistant and shall have passed NFPA 701 tests performed by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- E. Comply with requirements in CID-A-A-60003, "Partitions, Toilets, Complete."
- B. If required, insert fire-test-response requirements for phenolic-core or solid-polymer units. See "Fire-Test-Response Characteristics" Article in the Evaluations.

1.6 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. 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. 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.
- C. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch (25 mm) 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.

- D. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; polymer or stainless steel.
 - 1. Polymer Color and Pattern: Contrasting with pilaster, as selected by Architect from manufacturer's full range of colors and patterns.
- E. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's standard design; polymer, extruded aluminum or stainless steel.
- F. 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: Stainless steel.
- G. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- H. Support Posts for Urinal Screens: Manufacturer's standard aluminum post with floor shoe for anchoring to floor construction.
Revise below to suit Project.
- D. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, 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

- I. 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.
- J. 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.

- K. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) 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 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 (13 mm).
 - b. Panels and Walls: 1 inch (25 mm).
- L. 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 (50 mm) 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.
- D. Wall-Hung and Post-Supported Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING

- M. 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 10 21 13

SECTION 10 22 13 - WIRE MESH PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following items fabricated from wire mesh:
 - 1. Heavy-duty, interior partitions.
- B. See Division 8 Section "Door Hardware" for lock cylinders and keying for wire mesh partition gates.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each exposed finish.
- D. Maintenance data.

1.3 DELIVERY, STORAGE, AND HANDLING

- 1. Deliver keys to Owner FOR ALL GATES.

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. Acorn Wire & Iron Works, Inc.
 - 2. California Wire Products Corporation.
 - 3. G-S Company (The).
 - 4. Indiana Wire Products, Inc.
 - 5. Jesco Industries, Inc.
 - 6. King Wire Partitions, Inc.
 - 7. Miller Wire Works, Inc.
 - 8. Newark Wire Works Inc.

9. SpaceGuard Products.
10. Standard Wire & Steel Works.
11. Wire Crafters, Inc.

2.2 MATERIALS

- A. Steel Wire: ASTM A 510 (ASTM A 510M).
- 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: Cold-formed structural-steel tubing, ASTM A 500.
- F. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.
- G. Panel-to-Panel Fasteners: Manufacturer's standard steel bolts.
- H. Postinstalled Expansion Anchors in Concrete: Fabricated from corrosion-resistant materials; 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. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
 2. 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 (32 mm) wide, formed from 0.04-inch- (1-mm-) thick, metallic-coated steel sheet; with bolted connections and 1/4-inch- (6-mm-) diameter bolts.
- K. Shop Primers: Provide primers to comply with applicable requirements in Division 9 painting Sections.
- L. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664.

- M. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

2.3 HEAVY-DUTY WIRE MESH PARTITIONS

- A. Mesh: 0.192-inch- (4.8-mm-) diameter, intermediate-crimp steel wire woven into 2-inch (50-mm) diamond mesh.
- B. Vertical and Horizontal Panel Framing: 1-1/2-by-3/4-by-0.0966-inch (38-by-19-by-2.5-mm) cold-rolled, C-shaped steel channels; with 3/8-inch- (9.5-mm-) diameter bolt holes spaced not more than 18 inches (450 mm) o.c. along center of framing.
- C. Horizontal Panel Stiffeners: 1-1/2-by-3/4-by-1/8-inch (38-by-19-by-3-mm) cold-rolled steel channels with wire woven through, or two 1-by-1/2-by-1/8-inch (25-by-13-by-3-mm) cold-rolled steel channels bolted or riveted toe to toe through mesh.
- D. Top Capping Bars: 3-inch-by-4.1-lb (76-mm-by-1.9-kg) hot-rolled steel channels.
- E. Posts for 90-Degree Corners: 2-by-2-by-1/8-inch (50-by-50-by-3-mm) steel angles with 3/8-inch- (9.5-mm-) diameter bolt holes aligning with bolt holes in vertical framing; with floor anchor clips.
- F. Line Posts: 3-inch-by-4.1-lb (76-mm-by-1.9-kg) or 3-1/2-by-1-1/4-by-0.1265-inch (89-by-32-by-3.2-mm) steel channels; with 5-by-18-by-1/4-inch (125-by-450-by-6-mm) steel base plates punched for attachment to floor.
- G. Three- and Four-Way Intersection Posts: 2-by-2-inch (50-by-50-mm) tubular steel, with 3/8-inch- (9.5-mm-) diameter bolt holes aligned for bolting to adjacent panels.
- H. Floor Shoes: Steel, cast iron, or cast aluminum, 2 inches (50 mm) 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 (38-by-19-by-3-mm) steel channels or C-channels, banded with 1-1/2-by-1/8-inch (38-by-3-mm) flat steel bar cover plates on 3 sides, and with 1/8-inch- (3-mm-) thick angle strike bar and cover on strike jamb.
 - 1. Hinges: Full-surface type, 3-1/2-by-3-1/2-inch (89-by-89-mm) 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 manufacturer's standard cylinder operated by key outside and recessed knob inside.
- J. Accessories: Sheet metal base.
- K. Finishes: Baked-enamel finish.
 - 1. Color As selected by Architect from manufacturer's full range.

2.4 FABRICATION

- A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-size components as recommended by wire mesh item manufacturer. Provide bolts, hardware, and accessories as required for complete installation.
 - 1. Fabricate wire mesh items to be readily disassembled.
 - 2. Welding: Weld corner joints of framing and grind smooth, leaving no evidence of joint.
- 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 three- and four-way intersections using intersection posts.
 - c. Fabricate partition and door framing with slotted holes for connecting adjacent panels.
 - 3. Fabricate wire mesh partitions with 3 inches (76 mm) 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.

2.5 FINISHES

- A. Galvanizing: Where indicated, hot-dip galvanize wire mesh items to comply with ASTM A 123/A 123M. Hot-dip galvanize hardware for hot-dip galvanized wire mesh items to comply with ASTM A 153/A 153M.
- B. Shop Priming: Apply shop primer to uncoated surfaces of wire mesh items, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.
 - 1. Do not apply primer to galvanized surfaces.
- C. Shop Coat Finish: Manufacturer's standard one-coat, shop-coat finish.
- D. Baked-Enamel Finish: Manufacturer's standard one-coat, baked-enamel finish with minimum dry film thickness of 1 mil (0.025 mm).

- E. Powder-Coated Finish: Manufacturer's standard baked finish.

PART 3 - EXECUTION

3.1 ERECTION

A. Wire Mesh Partitions:

1. Anchor wire mesh partitions to floor with 3/8-inch- (9.5-mm-) diameter, postinstalled expansion anchors at 12 inches (305 mm) o.c. through floor shoes located at each post and corner.
 - a. Shim anchor clips as required to achieve level and plumb installation.
 - b. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.
2. Anchor wire mesh partitions to walls at 12 inches (305 mm) o.c. through back corner panel framing with fasteners appropriate to substrate.
3. Secure top capping bars to top framing channels with 1/4-inch- (6-mm-) diameter "U" bolts spaced not more than 28 inches (700 mm) o.c.
4. Provide line posts at locations indicated or, if not indicated, as follows:
 - a. On each side of sliding door openings.
 - b. For partitions that are 7 to 9 feet (2.1 to 2.7 m) high, spaced at 15 to 20 feet (4.6 to 6.1 m) o.c.
 - c. For partitions that are 10 to 12 feet (3.0 to 3.7 m) high, located between every other panel.
 - d. For partitions that are more than 12 feet (3.7 m) high, located between each panel.
5. 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.
6. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.
7. Install doors complete with door hardware.
8. Weld or bolt sheet metal bases to wire mesh partitions and doors.
9. Bolt accessories to wire mesh partition framing.

- B. Adjust doors to operate easily without binding.

- C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint; paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

- D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas; repair galvanizing to comply with ASTM A 780.

END OF SECTION 10 22 13

SECTION 10 22 26 - OPERABLE PANEL PARTITIONS

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. Electronically operated, hinged panel partitions.
 - 2. Manually operated, paired panel partitions.

1.3 DEFINITIONS

- A. NIC: Noise isolation class.
- B. NRC: Noise reduction coefficient.
- C. NVLAP: National Voluntary Laboratory Accreditation Program.
- D. STC: Sound transmission class.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
 - 1. Sound Transmission Requirements: Operable panel partition assembly tested in a full-scale opening, 14 by 9 feet (4267 by 2743 mm), for laboratory sound transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.
 - 2. Noise Reduction Requirements: Operable panel partition assembly, identical to partition tested for STC, tested for sound absorption performance according to ASTM C 423 and rated for not less than the NRC indicated.

1.5 SUBMITTALS

- A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable panel partition, component, and accessory specified. Include data on acoustical performance, surface-burning characteristics, and durability.

- B. Shop Drawings: Show location and extent of operable panel partitions. Include plans, elevations, sections, details, numbered panel installation sequence, attachments to other construction, and accessories. Indicate dimensions; weights; conditions at openings and for storage; and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, and direction of travel. Show blocking to be provided by others. Include the following:
1. Calculations: Calculate requirements for supporting operable panel partitions and verify capacity of carriers and track components to support loads; indicate deflection limits for partition and adjacent construction.
 2. Electric Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, and mounting arrangements.
 3. Wiring Diagrams: Detail wiring for power and control systems and differentiate between manufacturer-installed and field-installed wiring and between components provided by operable panel partition manufacturer and those provided by others.
- C. Setting Drawings: For embedded items and cutouts required in other work, including support beam punching template.
- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
1. Include similar Samples of accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below and of same thickness and material indicated for the Work. If finishes involve normal color pattern or texture variations, include sample sets showing the full range of variations expected.
1. Fabric: Full width by not less than 36-inch- (1000-mm-) long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat.
 2. Panel Face Material: Manufacturer's standard-size unit, not less than 3 inches (75 mm) square.
 3. Panel Edge Material: Not less than full width by 3 inches (75 mm) long.
 4. Chair Rail: Manufacturer's standard-size unit, 6-inch (150-mm) length.
- F. Product Certificates: Signed by manufacturers of operable panel partitions certifying that products furnished comply with requirements.
- G. 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.
- H. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

- I. Product Test Reports: From a qualified testing agency indicating that each operable panel partition complies with requirements, based on comprehensive testing of current products.
- J. Maintenance Data: For the following to include in maintenance manuals specified in Division 1:
 - 1. Panel face finishes 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.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified in writing by the operable panel partition manufacturer as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.
- B. Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
- C. Fire-Test-Response Characteristics: Provide operable panel partitions with the following fire-test-response characteristics, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: As follows, per ASTM E 84:
 - a. Flame Spread: 25 or less.
 - b. Smoke Developed: 450 or less.
 - 2. Fire Growth Contribution: Textile wall coverings complying with the acceptance criteria of UBC Standard 8-2.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify operable panel partition openings and storage arrangements by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening and storage dimensions and proceed with fabricating operable panel partitions without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

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. Panel-Face Finish Material: Furnish full-width in quantity to cover both sides of two panels when installed.

PART 2 - PRODUCTS

2.1 PRODUCTS AND 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. Advanced Equipment Corp.
 - 2. Foldoor/Holcomb & Hoke Mfg. Co., Inc.
 - 3. Hufcor Inc.
 - 4. Modernfold, Inc.
 - 5. Panelfold, Inc.

2.2 MATERIALS

- A. Steel Frame: Steel sheet, not less than 0.0478-inch (1.2-mm) nominal specified thickness for uncoated steel.
- B. Steel Face/Liner Sheets: Tension-leveled steel sheet, not less than 0.0329-inch (0.825-mm) nominal specified thickness for uncoated steel.

- C. Gypsum Board: ASTM C 36.
- D. Plywood: DOC PS 1.
- E. Particleboard: ANSI A208.1.
- F. Medium-Density Fiberboard: ANSI A208.2.

2.3 OPERABLE PANEL PARTITIONS

- A. Panel Construction: Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
- B. Dimensions: Fabricate operable panel partitions, from manufacturer's standard sizes, to form an assembled system of dimensions indicated on Drawings and verified by field measurements.
- C. Cap-Trimmed Edges: Protective aluminum perimeter-edge trim with tight hairline joints concealing edges of panel and finish facing.
- D. Trimless Edges: Fabricate exposed panel edges so finish facing wraps uninterrupted around panel, covering edge and resulting in an installed partition with facing visible on vertical panel edges, without trim, for minimal sightlines at panel-to-panel joints.
- E. Operable Panel Partition Characteristics: Comply with requirements indicated in the Operable Panel Partition Schedule at the end of Part 3.
- F. Trim: Manufacturer's standard aluminum trim, finished as follows:
 - 1. Clear anodized.
 - 2. Color anodized, manufacturer's standard color.
 - 3. Painted, manufacturer's standard neutral color.
 - 4. Painted, as selected by Architect from manufacturer's full range.
- G. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

2.4 SEALS

- A. General: Provide types of acoustical seals indicated that produce operable panel partitions complying with acoustical performance requirements and the following:
 - 1. Seals made from materials and profiles that minimize sound leakage.

2. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended, closed, and in place.
- B. Vertical Seals: Deep-nesting, interlocking astragals mounted on each edge of panel, with continuous PVC acoustical seal.
 - C. Horizontal Top Seals: Continuous-contact, extruded-PVC seal exerting uniform constant pressure on track when extended.
 - D. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.
 1. Automatically Operated: Extension and retraction of bottom seal automatically operated by movement of partition, with operating range not less than the 2-inch operating clearance between retracted seal and floor finish.

2.5 FINISH FACING

- A. General: Provide finish facings that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.
 1. Apply one-piece, seamless facings free from air bubbles, wrinkles, blisters, and other defects, with edges tightly butted, and with no gaps or overlaps. Horizontal seams are not permitted. Tightly secure and conceal raw and selvage edges of facing for finished appearance.
 2. Where facings with directional or repeating patterns or directional weave are indicated, mark facing top and attach facing in same direction.
 3. Match facing pattern 72 inches (1830 mm) above finished floor.
- B. Vinyl-Coated Fabric Wall Covering: Manufacturer's standard mildew-resistant, washable, vinyl-coated fabric wall covering; complying with CFFA-W-101-B for Type indicated; Class A.
 1. Antimicrobial Treatment: Additives capable of inhibiting growth of microbes, including, but not limited to, *Staphylococcus aureus*, *Escherichia coli*, and *Aspergillus niger*.

2.6 SUSPENSION SYSTEMS

- A. Suspension Tracks: Steel with adjustable steel hanger rods for overhead support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch (2.5 mm) between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.

1. Panel Guide: Aluminum; finished with factory-applied, decorative, protective finish.
 2. Head Closure Trim: As required for acoustical performance; with factory-applied, decorative, protective finish.
- B. Carriers: Steel trolley system as required for configuration type, size, and weight of partition and for easy operation; with steel ball-bearing wheels.
1. Multidirectional Carriers: Capable of negotiating 90-degree L, T, and X intersections without track switches.
- C. Steel Finish: Factory-applied, corrosion-resistant, protective coating, unless otherwise indicated.

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 operable panel partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with ASTM E 557, operable panel partition manufacturer's written installation instructions, Drawings, and approved Shop Drawings.
- B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed.
- C. Match operable panel partitions for color and pattern by installing panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

3.3 ADJUSTING

- A. Adjust operable panel partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.4 CLEANING AND PROTECTION

- A. Clean soiled surfaces, on completing installation of operable panel partitions, to remove dust, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.

- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure operable panel partitions are without damage or deterioration at time of Substantial Completion.
- C. Replace panels that cannot be cleaned and 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 operable panel partitions.
 - 1. Test and adjust seals, hardware, carriers, tracks, and other operable components. Replace damaged or malfunctioning operable components.
 - 2. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
 - 3. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout."
 - 4. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
 - 5. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.

3.6 OPERABLE PANEL PARTITION SCHEDULE

- A. Electronically Operated Hinged Panel Partition:
 - 1. Basis of Design Product: Modernfold Acousti-Seal 933EG.
 - 2. Partition Operation and Configuration: Electronically operated hinged panels.
 - 3. Steel-Frame Panel Construction: Faced with steel sheet.
 - 4. Panel Construction: Manufacturer's standard panel construction complying with requirements indicated.
 - 5. Panel Weight: 7 lb/sq. ft maximum.
 - 6. Panel Thickness: Not less than 3.25 inches panel.
 - 7. Edges: Trimless.
 - 8. Initial Closure: Lead Jamb.
 - 9. Final Closure: Stack Jamb.
 - 10. Finish Facing: Factory applied, Class 'A' rated Reinforced Vinyl with woven backing weighing not less than 15 ounces per linear yard.
 - a. Color/Pattern: As selected by Architect from manufacturer's full range.
 - 11. STC: Not less than 41 STC rating.
 - 12. Electrical motor shall consist of 208-Volt, 3-Phase, 1-Horsepower, 60-Hertz Motor.
 - 13. Pass Door: Provide (1) pass door that is same thickness as the panels. Door shall be equipped with ADA approved friction latch and flush pulls for panic operation. Panels shall include luminated exit signs above each side of pass door. No threshold will be permitted.

14. Automatic Safety Stop: Provide infra-red detector system to create safety zone surrounding the partition. System shall immediately and completely stop the partition from operating and sound an alarm should the safety zone be intruded.

B. Manually Operated Paired Panel Partition:

1. Basis of Design Product: Modernfold Acousti-Seal 932
2. Partition Operation and Configuration: Manually operated paired panels.
3. Steel-Frame Panel Construction: Faced with steel sheet.
4. Panel Construction: Manufacturer's standard panel construction complying with requirements indicated.
5. Panel Thickness: Nominal 3 inch panel.
6. Finish Facing: Factory Applied, class 'A' rated Reinforced Vinyl with woven backing weighing not less than 27 ounces per linear yard.
 - a. Color/Pattern: As selected by Architect from manufacturer's full range.
7. STC: Not less than 50 STC rating.

END OF SECTION 10 22 26

SECTION 10 28 00 - TOILET ACCESSORIES

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. Toilet and bath accessories.
- B. Related Sections include the following:
 - 1. Division 10 Section "Toilet Compartments" for compartments and screens.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. Samples: For each accessory item to verify design, operation, and finish requirements.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- C. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.
- E. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.
- B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.

1. Other manufacturers' products with equal characteristics may be considered. See Division 1 Section "Substitutions."
2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
 1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:
 1. Toilet and Bath Accessories:
 - a. American Specialties, Inc.
 - b. Bobrick Washroom Equipment, Inc.
 - c. Bradley Corporation.
 - d. McKinney/Parker Washroom Accessories Corp.
- B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Toilet and Bath Accessory Schedule at the end of Part 3.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.
- B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16 (ASTM B 16M), rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.
- C. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch (0.9-mm) minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).
- E. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.
- F. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.
- G. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
- H. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- I. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

- A. General: One, maximum 1-1/2-inch- (38-mm-) diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.

- D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
 - 1. Provide galvanized steel backing sheet, not less than 0.034 inch (0.85 mm) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.
- E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
 - 1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - 2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- F. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
- C. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

- A. Basis-of-Design Product: The design for each accessory 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.
- B. Toilet Tissue Holder: Bobrick No. B-663, satin finish stainless steel. Single-roll dispenser.
- C. Roll Paper- Towel Dispenser, Surface Mounted: Bobrick No. B-2860, Satin Finish.
- C1. Roll Paper- Towel Dispenser, Semi-Recessed: Bobrick No. B-38616, Satin Finish.
- D. Mirror: Bobrick B290 stainless steel framed mirror with galvanized steel back, 1/4" select float glass mirror, 15 year guarantee, concealed locking screws. Sizes as indicated.
- E. Grab Bar: Bobrick No. B-6206.99 series, sizes and shapes as required per drawings.
- F. Grab Bar: Swing up, Bobrick Model B-4998.99.
- G. Soap Dispenser: Bobrick Model B2112.
- H. Shower Curtain Rod: Bobrick: B-207, Satin Finish.
- I. Shower Curtain & Hooks: Bobrick: B-204-2 Vinyl Curtain with B-204-1 Hooks.
- J. Sanitary Napkin Disposal, Surface Mounted: Brobrick: B-270, Satin Finish.
- K. Mop & Broom Holder: Bobrick: B-223. (Locate at each Janitor Closet and at each Mop Sink
- L. Folding Shower Seats: Large seat-Bobrick Model No. B-5181 and Small seat-Bobrick Model No. B-5191
- M. Towel Hook: Bobrick B-2116 heavy-duty robe hook with concealed mounting. (One per shower location.)
- N. Soap Dish: Bobrick B-4380 heavy-duty recessed type. (One per shower.)

END OF SECTION 10 28 00

SECTION 10 44 00 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Portable fire extinguishers.
 - 2. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
 - 3. Mounting brackets for fire extinguishers.
- B. Related Sections include the following:
 - 1. Division 7 Section "Through-Penetration Firestop Systems" for firestopping sealants at fire-rated cabinets.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Initial Selection: For fire-protection cabinets with factory-applied color finishes.
- C. Samples for Verification: For each type of exposed factory-applied color finish required for fire-protection cabinets, prepared on Samples of size indicated below.
 - 1. Size: 6 by 6 inches (150 by 150 mm) square.
- D. Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- D. 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.

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.

1.6 SEQUENCING

- A. Apply decals on field-painted fire-protection cabinets after painting is complete.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the 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 (ASTM B 209M).
 - 2. Extruded Shapes: ASTM B 221 (ASTM B 221M).
- C. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).
- D. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.3 PORTABLE FIRE EXTINGUISHERS

- A. Manufacturers:
 - 1. Ansul Incorporated.
 - 2. Badger Fire Protection.
 - 3. Buckeye Fire Equipment Company.
 - 4. JL Industries, Inc.
 - 5. Kidde Fyrnetics.
 - 6. Larsen's Manufacturing Company.
- B. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Valves: Nickel-plated polished brass body.
 - 2. Handles and Levers: Stainless steel.
 - 3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- C. General Purpose: Multipurpose Dry-Chemical Type UL-rated (Class A) 2-A:10-B:C nominal capacity, with monoammonium phosphate-based dry chemical in enameled steel container.
- D. Commercial Kitchen Areas: Regular Dry-Chemical Type UL-rated (Class-K) unit, with siliconized sodium bicarbonate powder with free flowing and non-caking additives.
- E. Trade / Shop Areas: Type - As required by local and state Fire Marshal.

2.4 FIRE EXTINGUISHER CABINET

- A. Manufacturers:
 - 1. JL Industries, Inc.
 - 2. Kidde Fynetics.
 - 3. Larsen's Manufacturing Company.
 - 4. Modern Metal Products; Div. of Technico.
- B. Cabinet Type: Suitable for fire extinguisher.
- C. Cabinet Construction: Nonrated or 1-hour fire rated, as required based on location
- D. Cabinet Material: Enameled-steel sheet.
 - 1. Shelf: Same metal and finish as cabinet.
- E. Semirecessed Cabinet: Cabinet box partially recessed in walls of shallow 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).
 - 1. Rolled-Edge Trim: 1-1/4-inch (32-mm) backbend depth.
- F. Cabinet Trim Material: Steel sheet.
- G. Door Material: Steel sheet.
- H. Door Style: Solid opaque panel with frame.
- 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.
 - 2. Provide manufacturer's standard hinge permitting door to open 180 degrees.
- J. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
 - 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Silk-screened.
 - 3) Lettering Color: Red.
 - 4) Orientation: Horizontal.

K. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:
 - a. Exterior of cabinet, door, and trim, except for those surfaces indicated to receive another finish.
 - b. Interior of cabinet and door.

2.5 MOUNTING BRACKETS

A. Manufacturers:

1. Ansul Incorporated.
2. Badger Fire Protection.
3. Buckeye Fire Equipment Company.
4. JL Industries, Inc.
5. Larsen's Manufacturing Company.

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: Red.

C. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

2.6 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.

1. Weld joints and grind smooth.
2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- (1.1-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material.
 - a. 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 (13 mm) thick.
2. Miter and weld perimeter door frames.

- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.7 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. Finish fire-protection cabinets after assembly.
- D. 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.

2.8 STEEL FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.
- B. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.
 - 1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.
- B. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

1. Fire-Protection Cabinets: 54 inches (1372 mm) above finished floor to top of cabinet.
2. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.

- B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide semirecessed fire-protection cabinets.
2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 00

SECTION 10 51 13 - METAL LOCKERS

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. Wardrobe lockers, heavy duty, double tier, quiet type, flush front design.
Size: 15" Wide x 15" Deep x 72" High-with sloped tops
2. Shop Lockers, heavy duty, double tier, quiet type, doors and side panels with punched diamond perforations.
 - a. Size: 15" Wide x 15" Deep x 72" High with sloped tops.
 - b. Size: 15" Wide x 18" Deep x 72" High with sloped tops.—Locations: Rooms B135 & B137.
3. Gym Lockers, heavy duty, double tier and single tier, quiet type, doors and side panels with punched diamond perforations.
Size: 12" Wide x 12" Deep x 72" High and 15" Wide x 15" Deep x 72" High with sloped tops.
4. Benches and Pedestals

- B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete bases.
2. Division 6 Section "Miscellaneous Carpentry" for wood furring and grounds.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker and bench.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.
1. Show locker fillers, trim, base, sloping tops, and accessories. Include locker-numbering sequence.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare Samples from the same material to be used for the Work.

1. Lockers.

- E. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain locker units and accessories through one source from a single manufacturer.
- B. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.
- C. Accessible Lockers: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)", ICC/ANSI A117.1 and FED-STD-795, "Uniform Federal Accessibility Standards."
- D. Protect lockers from damage during delivery, handling, storage, and installation. DELIVERY, STORAGE, AND HANDLING
- E. Deliver master keys, control keys, and combination control charts to Owner.

1.5 COORDINATION

- A. Coordinate size and location of concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

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 Locker Security Systems, Inc.
 - 2. General Storage Systems; Div. of North American Steel.
 - 3. Hadrian Manufacturing, Inc.
 - 4. Interior/Medart.
 - 5. Lyon Metal Products, Inc.
 - 6. Penco Products, Inc.; Subsidiary of Vesper Corporation.
 - 7. Republic Storage Systems Co., Inc.
- B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Summary Section 1.2.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 366/A 366M, matte finish, suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.
- B. Expanded Metal: ASTM F 1267, Type II (flattened), 3/4-inch (19-mm) mesh, minimum 0.0747 inch (1.90 mm) thick, with at least 70 percent open area.
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, commercial quality, G60 (Z180) coating designation; mill phosphatized; suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.
- D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, commercial quality, coating Class C; mill phosphatized; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher-leveled flatness.
- E. Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.

2.3 LOCKER CONSTRUCTION

- A. Body: Form backs, tops, bottoms, sides, and intermediate partitions from steel sheet; flanged for double thickness at back vertical corners. Comply with the following:
 - 1. Back-Material Sheet Thickness: Wardrobe (Corridor) lockers – 24 Ga. knock down. Gym & Shop lockers – 16 Ga. Welded.
 - 2. Side-Material Sheet Thickness: Wardrobe (Corridor) lockers – 24 Ga. knock down. Gym & Shop lockers – 16 Ga. Welded.
 - 3. Exposed Ends: Form exposed ends of nonrecessed lockers from minimum 0.0598-inch-thick steel sheet.
- B. Frames: Form channel frames from minimum 0.0598-inch-thick steel sheet; lapped and welded at corners. Form continuous integral door strike on vertical frame members. Provide resilient bumpers to cushion door closing.
 - 1. Latch Hooks: Form from minimum 0.1046-inch-thick steel; welded or riveted to door frames.
 - 2. Cross Frames: Form intermediate channel cross frames between tiers from minimum 0.0598-inch-thick steel sheet. Weld to vertical frame members.
- C. Wardrobe (Corridor) Locker Doors: One-piece steel sheet, formed into channel shape at vertical edges and flanged at right angles at top and bottom edges. Fabricate to prevent springing when opening or closing, and to swing 180 degrees. Comply with the following:
 - 1. Sheet Thickness: 14 Gauge steel minimum.
 - 2. Reinforcement: Brace or reinforce inner face of doors more than 15 inches wide.
 - 3. Reinforcing and Sound-Dampening Panels: Brace or reinforce inner face of doors with manufacturer's standard reinforcing angles, channels, or stiffener panels.

4. Acoustical Treatment: Fabricate lockers for quiet operation with manufacturer's standard rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact.
 - a. Sound-Dampening Panels: Manufacturer's standard, designed to stiffen door surface and reduce sound levels when door is slammed, of die-formed metal with full perimeter flange and sound-dampening material. Spot weld panel to inside of door.
 5. Concealed Vents: Provide slotted perforations in top and bottom horizontal return flanges of doors.
- D. Gymnasium & Shop Locker Doors: One-piece steel sheet, formed into full channel shape on lock side of adequate depth to fully conceal the lock bar, channel formation on the hinge side and right angle formations along the top and bottom. Doors shall have diamond shaped perforations $\frac{3}{4}$ " wide by $1\frac{1}{2}$ " high to provide air flow while leaving sufficient metal for rigidity and strength. Fabricate to prevent springing when opening or closing, and to swing 180 degrees. Comply with the following:
1. Sheet Thickness: 14 Gauge steel minimum.
 2. Reinforcement: Reinforce with 16 Gauge channel welded to latch side of door. Channel shall be $\frac{7}{8}$ " wide.
- E. Hinges: Steel, full loop, five or seven knuckle; tight pin; minimum 2 inches (51 mm) high. Weld to inside of door frame and attach to door with at least two factory-installed fasteners that are completely concealed and tamper resistant when door is closed.
1. Provide at least three hinges for each door more than 42 inches (1067 mm) high and at least two hinges for each door 42 inches (1067 mm) high or less.
- F. Recessed Handle and Latch: Manufacturer's standard housing, formed from 0.0359-inch- (0.90-mm-) thick nickel-plated steel or stainless steel, with integral door pull, recessed for latch lifter and locking devices; nonprotruding latch lifter; and automatic, prelocking, pry-resistant latch, as follows:
1. Provide minimum three-point latching for each door more than 42 inches (1067 mm) high; minimum two-point latching for each door 42 inches (1067 mm) high or less.
 2. Wardrobe Lockers: Provide built-in recessed combination locks with master key access.
 3. Gymnasium & Shop Lockers: Padlock type latches. Combination padlocks to be provided by owner.
- 2.4 LOCKER ACCESSORIES
- A. Interior Equipment: Furnish each locker with the following items, unless otherwise indicated:

1. Hooks: Manufacturer's standard zinc-plated, ball-pointed steel. Provide one double-prong ceiling hook, and not fewer than two single-prong wall hooks for single-, double-, and triple-tier units. Attach hooks with at least two fasteners.

- B. Number Plates: Manufacturer's standard etched, embossed, or stamped, aluminum number plates with numerals at least 3/8 inch (9 mm) high. Number lockers in sequence indicated. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

- C. Continuously Sloping Tops: Manufacturer's standard, fabricated from minimum 0.0359-inch- (0.90-mm-) thick steel sheet, for installation over lockers with separate flat tops. Fabricate tops in lengths as long as practicable, without visible fasteners at splice locations, finished to match lockers. Provide fasteners, filler plates, supports, and closures, as follows:
 1. Closures: Vertical-end type.
 2. Sloped top corner fillers, mitered.

- D. Recess Trim: Manufacturer's standard; fabricated from minimum 0.0478-inch- (1.20-mm-) thick steel sheet, minimum 2-1/2-inch (64-mm) face width, and finished to match lockers. Fabricate trim in lengths as long as practicable.

- E. Filler Panels: Manufacturer's standard; fabricated from minimum 0.0478-inch- (1.20-mm-) thick steel sheet in an unequal leg angle shape, and finished to match lockers. Provide slip joint filler angle formed to receive filler panel.

- F. Boxed End Panels: Manufacturer's standard; fabricated from minimum 0.0598-inch- (1.50-mm-) thick steel sheet, with 1-inch- (25-mm-) wide edge dimension, finished to match lockers, and designed for concealing exposed ends of nonrecessed lockers.

- G. Finished End Panels: Manufacturer's standard; fabricated from minimum 0.0239-inch- (0.60-mm-) thick steel sheet, finished to match lockers, and designed for concealing exposed ends of nonrecessed lockers.
 1. Provide one-piece panels for double-row (back-to-back) locker ends.

2.5 BENCHES AND PEDESTALS

- A. Locker benches shall be laminated maple, 1 1/4" full finished thickness. All corners are to be rounded and sanded. Top and edges shall have two coats of a clear finish with one coat on the bottom. Bench tops shall be 9 1/2" wide. Tops to be mounted on pedestals consisting of 1 1/2" O.D. tubing with 10 gauge steel flanges welded to each end.

2.6 LOCKER FABRICATION

- A. Unit Principle: Fabricate each locker with an individual door and frame, individual top, bottom, back, and shelves, and common intermediate uprights separating compartments.

- B. Gym and shop lockers shall be All -Welded Construction: Preassemble lockers by welding all joints, seams, and connections, with no bolts, screws, or rivets used in assembly. Grind exposed welds flush.

- C. Fabricate 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. Weld frame members together to form a rigid, one-piece assembly.
 - 1. Form locker-body panels, doors, shelves and accessories from one-piece steel sheet, unless otherwise indicated.

2.7 FINISHES, GENERAL

- A. Finish all steel surfaces and accessories, except prefinished stainless-steel and chrome-plated surfaces.
- B. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. 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.

2.8 STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond. Use manufacturer's standard methods.
- B. Powder-Coated Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer finish consisting of a thermosetting powder topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
- C. Color and Gloss: As selected by Architect from manufacturer's full range.

3 EXECUTION

3.7.1.1 EXAMINATION

3.7.1.1.1 Examine concrete bases for suitable conditions where metal lockers are to be installed.

3.7.1.1.1.1 Proceed with installation only after unsatisfactory conditions have been corrected.

3.7.1.2 INSTALLATION

3.7.1.2.1 Install metal lockers and accessories level, plumb, rigid, and flush according to manufacturer's written instructions.

- 3.7.1.2.2 Assemble knocked-down lockers with standard fasteners, with no exposed fasteners on door faces and face frames.
- 3.7.1.2.3 Connect groups of all-welded lockers together with standard fasteners, with no exposed fasteners on face frames.
- 3.7.1.2.4 Anchor lockers to floors and walls at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Install anchors through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.
- 3.7.1.2.5 Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 - 3.7.1.2.5.1 Attach recess trim to recessed lockers with concealed clips.
 - 3.7.1.2.5.2 Attach sloping top units to lockers, with closures at exposed ends.
- 3.7.1.2.6 Attach boxed end panels with concealed fasteners to conceal exposed ends of non-recessed lockers.
- 3.7.1.2.7 Attach finished end panels with fasteners only at perimeter to conceal exposed ends of non-recessed lockers.
- 3.7.1.3 ADJUSTING, CLEANING, AND PROTECTION
 - 3.7.1.3.1 Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.
 - 3.7.1.3.2 Clean interior and exposed exterior surfaces and polish stainless-steel and nonferrous-metal surfaces.
 - 3.7.1.3.3 Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.
 - 3.7.1.3.4 Touch up marred finishes, or replace locker units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 13

SECTION 10 75 00 - FLAGPOLE

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. Under this Section the Contractor shall provide and install all flagpoles and hardware items.

1.3 RELATED SECTIONS

- A. Section 03 30 01 – Portland Cement Concrete (Site)

1.4 QUALITY ASSURANCE

- A. Industry Reference Standards:
 - 1. Form 816: "State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 816-2004 and any supplements."
 - 2. Installer Qualifications: Engaged firm must be able to provide evidence to indicate five (5) years documented experience in the installation work specified herein.
 - 3. Required Submittals: Manufacturer's recommendations for flagpole installation.
 - 4. Manufacturer's Product Data: Submit manufacturer's technical data for each manufactured product.
 - a. Flagpole and appurtenances
 - b. Flag
 - 5. Submittals Schedule: Before Installation
 - a. Shop Drawings
 - b. Manufacturer's Product Data

1.5 PROJECT CONDITIONS

- A. Existing Conditions: Examine all work that the Work of this section is contingent upon and report any deficiencies to the Owner's Representative. Commencement of work shall be construed to mean complete acceptance of the preparatory work of others. No adjustment will be made for discrepancies brought to the Owner's Representative's attention after work has begun.
- B. Coordination: Coordinate all Work of this section with work by others and by the Owner. Failure to coordinate properly will not reduce the obligation to meet the standards of acceptance of the various elements of Work contained herein.
- C. Sequencing and Scheduling: No construction of the flagpole is to commence until the site work in the area is generally complete.

PART 2 - PRODUCTS

2.1 MATERIAL REQUIREMENTS

- A. Flagpole: The flagpole shall be Fiberglass Model with ground sleeve as manufactured by Futura IV and distributed by Flagman of America, 37 Old Avon Village, Avon, CT 06001, (203) 678-0275. Flagman model no. G535E.
 - 1. Height above ground: 30'
 - 2. Butt Diameter: 5.5"
 - 3. Top Diameter: 2.5"
 - 4. Color: White
 - 5. Pole Appurtenances: revolving trunk with cover, nylon halyard, snap hook, fiberglass ground sleeve, and plastisol-covered counter weight, polyester guide rope, and access door/lock assembly with keys.
 - 6. Flash Collar: White Aluminum - FC-7
- B. Alternative Flagpole: 35' Fiberglass flagpole as manufactured by Futura IV and distributed by Patrioticware.com, Kansas City, MO, 64111 (816) 968-1192, Patrioticware.com model no. 2358.
- C. Alternative Flagpole: Fiberglass Reinforced Plastic Flagpole Model #PLP-35X as manufacturer by PLP Composite Technologies, Inc. Fitzwilliam, NH 03447 and distributed by M.E. O'Brien and Sons, Inc. (860) 568-8222.
 - 1. Height above ground: 35'
 - 2. Butt Diameter: 7"
 - 3. Top Diameter: 3"
 - 4. Color: White
 - 5. Pole Appurtenances: aluminum ball, polyester halyard, cleat, fiberglass flash collar, fiberglass ground sleeve.
 - 6. Flash Collar: White Aluminum - FC-7

- D. Flags: United States, 5' x 8', 100% polyester, 1 x 1 ply fabric. CT State flag 5' x 8', Nylon.
- E. Note: Phone numbers are provided here for the Contractors convenience. Due to the continually changing phone market, Contractor is responsible for verifying the accuracy of the phone numbers listed.

2.2 CONCRETE FLAGPOLE FOUNDATION

- A. Concrete: Conform to the requirements of Form 816-2004, Article M.03.01, Class "C" and ASTM C-94. Batch mixing at project site not acceptable.
- B. Compressive strength: 3,500 psi at 28 days.
- C. Entrained air: 5 to 7%.
- D. Reactive aggregates and calcium chloride are not allowed.
- E. Water: Potable.

2.3 CONCRETE ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

2.4 CONCRETE CURING MATERIALS

- A. Conform to Article 4.01.03, Item F7 "Curing", Form 816-2004.

2.5 CONCRETE FLAGPOLE FOUNDATION

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 – EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS

- A. Pre-installation Approval: Secure approval of the location and grading of the area prior to the installation of the flagpole.

3.2 INSTALLATION

- A. Install flagpole in accordance with the manufacturer's installation instructions for the size of flagpole specified. Contractor shall provide a detail for the foundation as per the manufacturer's recommendations.

3.3 CONCRETE PLACEMENT

- A. Remove loose material from compacted subbase surface immediately before placing concrete.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed.
- D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery, at project site, or during placement.
- F. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
- G. Cold-Weather Placement: Comply with ACI 306.1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- H. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R.

3.4 CONCRETE CURING AND PROTECTION

- 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 follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Curing Methods: Conform to Article 4.01, Form 816-2004.
- C. Protect concrete from damage. Remove and replace concrete that is broken, damaged, or defective.

3.5 PROTECTION AND CLEAN-UP

- A. All waste materials left from the installation of the flagpole shall be removed and disposed of legally off site.
- B. No burning or burying of waste materials on-site will be allowed.
- C. The Contractor shall protect all the Work of this section and keep it in first class condition until completion of the contract.

END OF SECTION

SECTION 11 12 33 - VEHICLE ACCESS GATE

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 SECTION INCLUDES

- A. Providing and installing vehicle access gate including foundations, anchoring components and any appurtenances for a complete installation.

1.3 SUBMITTALS

- A. Product Data: Fabricator's/manufacturer's specifications and technical data indicating material compliance and specified options.
- B. Certification: The Contractor shall submit notarized materials certificates at his own expense, from metal fabricator and galvanizer, certifying that the following materials comply with the specified requirements:
 - 1. All hot-dipped galvanized items have met the ASTM serial designations as indicated in this specification.
 - 2. All powder coating meets the ASTM serial designations as indicated in these specifications.
 - 3. Submit galvanizer's completed QC/QA form.
- C. Shop Drawings: Show fabrication and installation details of vehicle barrier gates. Provide fully dimensioned shop drawings (plans, elevations, and details) for all specified improvements for review and approval by both the Engineer and the galvanizer prior to fabrication.
 - 1. Submit shop drawings of nonstandard fabrications, all tubular fabrications, all fabrications involving any dimension which exceeds the size of the galvanizer's kettle, and any fabrication involving materials of different thicknesses to the galvanizer prior to fabrication to determine the suitability of the material for the specified metal coating.
 - 2. Shop drawings shall detail all profiles, sizes, connection attachments, size and type of fasteners, anchorage, joints and accessories.
 - 3. Indicate welding connections, using standard AWS welding symbols. Indicate net welding length and all field installations.

4. Indicate all materials and finishes.
5. Shop drawings to be prepared and sealed by a P.E., licensed in the State of Connecticut, and stating that design meets or exceeds current building code requirements.

1.4 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A professional steel fabrication shop that has demonstrated a minimum of (5) five years experience in successful completion of steel vehicle barrier gate fabrication projects of similar magnitude.
- B. **Source Limitations:** Obtain vehicle barrier gates through one source from a single manufacturer.
- C. **Materials and methods of construction shall comply with the following standards:**
 1. American Institute of Steel Construction (AISC), "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", latest edition with supplements.
 2. American Welding Society (AWS). Latest standards of AWS D 1.1 and AWS B 3.0.
 3. American Society for Testing and Materials (ASTM). Standards ASTM A 36, A 500 and A 501.
 4. National Association of Architectural Metal Manufacturers (NAAMM) Pipe Railing Manual.
 5. American Iron and Steel Institute (AISI) Standards as referenced herein.
 - a. ASTM A 123 - Hot-Dip Galvanized Coatings
 - b. ASTM A 385 - Providing High Quality Zinc Coating (Hot Dip)
 - c. ASTM A 780 - Repair of Damaged Hot Dip Galvanized Coatings
 6. Steel Structures Painting Council. (SSPC) SP10.
 7. **Allowable Tolerances:** Machine, file, and shop assemble mechanical joints to fit within 1/32". Installation of freestanding items to 1/4" of indicated position, plumb and level. Size of each element of -an assembly shall be correct within 1/8".
- E. **Pre-Construction Conference for Metal Fabrications:** Contractor shall schedule a meeting to be attended by Contractor, Engineer, fabricator, and galvanizer. Agenda shall include the following: Project schedule, scope of metal fabrications, coordination between fabricator and galvanizer, finish of surfaces, application of coatings, submittals, color matching, field touch-up procedures, and approvals.

1.5 STORAGE AND HANDLING

- A. Store completed vehicle barrier gates in a dry, well-ventilated, weather-tight place.
- B. Deliver, store, and handle metal fabrication items to prevent damage and deterioration. Use nylon slings and padded cables for handling.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify vehicle access gate dimensions by field measurements prior to preparation of shop drawings and fabrication, to ensure fitting of work. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating vehicle barrier gates without field measurements. Allow for trimming and fitting wherever taking of field measurements before fabrication might delay work only upon prior approval from Engineer. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

- A. Coordinate installation of anchorages for vehicle access gates. Furnish Setting Drawings, templates, and directions for installing anchorages, including anchor bolts, and items with integral anchors, that are to be embedded in concrete. Deliver such items to Project site in time for installation.

1.8 WARRANTY

- A. Manufacturer shall submit to the Owner written product warranties for a minimum period of 18 months from date of substantial completion of all work performed under each phase of this contract and upon acceptance of the products. The Contractor shall promptly furnish, without cost to the Owner, any and all parts and labor which prove defective in material and workmanship.

PART 2 - PRODUCTS

2.1 VEHICLE ACCESS GATE

- A. Fabricator/Manufacturer: Under this contract the vehicle access gate may be fabricated by a steel fabricator or supplied as an off the shelf product. The design of the gate may vary depending on the fabricator or manufacturer. Gate design must be strong enough to withstand minor vehicle damage.
- B. General: Provide steel chemically suitable for galvanizing metal coatings complying with the following requirements: Carbon below 0.25 percent, silicon below 0.24 percent, phosphorous below 0.05percent, and manganese below 1.35 percent. Notify galvanizer if steel does not comply with these requirements.

- C. Metal Surfaces: Provide materials smooth and free of pitting, seam marks, roller marks, rolled-trade names, stains, discolorations, roughness and other imperfections where exposed to view on finished units.
- D. Steel Pipe for Access Gate Framework and Posts:
 - 1. Steel Pipe: ASTM A53, Grade A, schedule 40 standard weight.
 - 2. Steel Plates, Angles and Shapes: ASTM A 36.
 - 3. Brackets, Flanges, and Anchors: Formed metal of same type of material and finish as railings or fence framework.
- E. Access gate shall have some form of locking mechanism to lock the gate in the open or closed position.
- F. Degree of gate swing from open to close: 90 degrees

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 required for color match, strength, corrosion resistance, and compatibility in fabricated items.
- B. Galvanized Repairing Paint for re-galvanizing complying with military (Ships) or SSPC - Paint-2- Repairing Paint: High zinc dust content re-galvanizing welds in galvanized steel, with military specifications MIL-P-21035

2.3 FABRICATION

- A. Fabricate all vehicle access gates in accordance with the requirements of ASTM A 143, ASTM A 384, and ASTM A 385 and approved shop drawings.
 - 1. Provide metal fabrications work square, plumb, straight, and within allowable tolerances.
 - 2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 3. Remove burrs from cut edges and finish edge sand corners to match exposed parts of structures. Ease exposed edges to small uniform radius, unless specific radius or chamfer is indicated.
 - 4. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- B. Assemble vehicle access gates in shop to greatest extent possible to minimize field splicing, welding and assembly. Disassemble units only as necessary for shipping and handling

limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

- C. Inspect materials to insure they are free from defects impairing strength, durability, appearance; having structural properties to sustain or withstand strains and stresses to which subjected. Exposed elements throughout project shall have the same texture and color for adjacent locations.
- D. Welded Connections: Fabricate vehicle access gates with welded connections as indicated on approved shop drawing. Welding shall be in accord with AWS Standards, performed by qualified welders. Do not distort member or deface exposed finish.
 - 1. Weld connections continuously. Grind all exposed welds smooth blend and refinish to match factory finish. Weld corners and seams continuously. Fabricate items with joints tightly fitted and secure. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours and finish of adjoining surfaces.
 - 2. Fabricate joints which will be exposed to weather in a manner to exclude water. Seal weld all joints and connections as required to produce a water tight assembly.
 - 3. Provide internal vent holes and concealed drainage holes as required and where indicated by galvanizer in preparation of unit assembles for hot dip galvanizing. Exposed weep or drainage holes that would allow entry of water into assemblies after field installation will not be permitted. Following galvanizing, plug exposed vent holes with lead weight, prior to priming.
 - 4. Provide weep holes or another means to drain entrapped water in hollow sections of vehicle access gate members that are exposed to exterior or to moisture from condensation or other sources.
 - 5. Obtain fusion without undercut or overlap.
 - 6. Remove flux immediately.

2.4 GALVANIZING

- A. Hot-Dip Galvanizing: Provide coating for iron and steel fabrications applied by the hot-dip process with 0.05 to 0.09 percent nickel and other earthy materials in the galvanizing kettle forming an alloy, DELTAGALV by Duncan Galvanizing or substitute approved by Engineer meeting all requirements of this specification.
- B. Comply with ASTM A 23 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards. Galvanizing shall provide a visually acceptable substrate for applied coatings, and be free of lumps, globules, or heavy deposits.

2.5 FINISH: Factory-Applied 'POWDER-COAT' Finish Coating

- A. Galvanizing of all components shall provide an acceptable substrate for applied powder-coatings. No lacquer, urethane or other coatings which would prevent proper adhesion of powder-coating shall be applied to the tube.
- B. Insure surfaces to be coated are clean and dry and free of grease, dust, rust, etc. All coated parts shall first receive phosphating and chromating treatments to improve the adhesion of the surface coating.
- C. Factory-applied Powder-coat Finish: Provide factory-applied powder-coat finish using TGIC-Polyester Powder-coat (with the exception of threaded rods or bolts, which shall be sprayed with powder coat touch-up after installation). All vehicle barrier gate components shall be coated on all surfaces, of a color to match the framework. All coated surfaces shall comply with the adhesion specifications listed in ASTM F 1043.
 - 1. TGIC-Polyester Powder-coating: TGIC-Polyester Powder shall be applied to the galvanized steel or iron in such a manner that the coating will not peel off. The TGIC-Polyester shall be applied at a film thickness of 3 to 6 mils by electrostatic spray process and bake finished per manufacturer's directions.
 - 2. The TGIC-Polyester shall be applied without voids, tears or cuts that reveal the substrate and shall thoroughly adhere to the metal without peeling when scratched with a pick device or knife blade point.
 - 3. TGIC-Polyester Powder Coat finish shall conform to and be capable of passing the Cross Hatch test per ASTM D3359, Method B. Failure to satisfactorily pass this test shall be a basis for rejection. Contractor shall pay for testing if testing is required. Engineer shall approve testing agency.
 - 4. Color to be determined from full range of standard color available.

2.6 CONCRETE FOUNDATION

- A. Concrete foundation shall meet the requirements of Article M.03.01, Form 816 and shall be Class "C".
- B. The concrete shall contain not less than five (5) nor more than seven (7) percent entrained air at the time the concrete is deposited in their forms.
- C. All other concrete requirements shall conform to Section 03 30 01 as specified herein.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install vehicle access gate as detailed and in conformance with the manufacturer's/fabricator's installation instructions. Set gate accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

- B. Do not weld, cut, or abrade surfaces of vehicle barrier gate components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
- C. Set gate posts plumb within a tolerance of 1/16 inch in 3 feet.
- D. Adjust vehicle access gates before anchoring to ensure alignment at abutting joints.

3.2 CONNECTIONS

- A. **Welded Connections:** Use fully welded joints for permanently connecting vehicle access gate components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in shop or in field.

3.3 CLEANING

- A. **Galvanized Surfaces:** Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 PROTECTION/CLEAN-UP

- A. The Contractor shall protect and maintain all installed vehicle barrier gates during the life of the contract. Repair and replace all items that are disturbed, damaged, or destroyed prior to acceptance, from any cause at no cost to the Owner.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units at no cost to the Owner.
- C. Protect finishes of installed items from damage during construction period with temporary protective coverings approved by Engineer. Remove protective coverings at the time of Substantial Completion.
- D. As work proceeds, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris related to this work.

END OF SECTION

SECTION 11 13 00 - LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Dock bumpers.
- B. See Division 5 Section "Metal Fabrications" for curb angles at edges loading dock platform.

1.2 DEFINITIONS

- A. Operating Range: Maximum amount of travel above and below the loading dock level.
- B. Working Range: Recommended amount of travel above and below the loading dock level for which loading and unloading operations can take place.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

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.

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2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
 3. Basis-of-Design Product: The design for each type of loading dock equipment is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM 36/A 36M.
- B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from steel plate complying with ASTM A 572/A 572M, Grade 55 (380).
- C. Steel Tubing: ASTM A 500, cold formed.
- D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- E. Wood: DOC PS 20 dimension lumber, select structural grade, kiln dried.
- F. Pressure-Treated Wood: DOC PS 20 dimension lumber, select structural grade, kiln dried, and pressure treated with waterborne preservatives to comply with AWPA C2.
- G. Steel and Iron Hardware: Hot-dip galvanized according to ASTM A 153/A 153M.

2.3 DOCK BUMPERS

- A. Manufacturers:
 1. Beacon Industries, Inc.
 2. Chalfant Dock Equipment.
 3. Durable Corporation.
 4. Flexon, Inc.
 5. Hugger Dock Equipment Company.
 6. Kelley Company, Inc.; a United Dominion Company.
 7. Marnan Products, Inc.
 8. Pawling Corporation.
 9. Pioneer Loading Dock Equipment.
 10. R. C. Musson Rubber Co.
 11. Rite-Hite Corporation.
 12. Serco; a United Dominion Company.
 13. Super Seal Mfg. Ltd.
 14. Superior Bumper Products Inc.

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- B. Molded-Rubber Bumpers: Fabricated from molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Type A Shore durometer hardness of 80, plus or minus 5, when tested according to ASTM D 2240; of size and configuration indicated. Fabricate units with not less than two predrilled anchor holes.
 - C. Anchorage Devices: Hot-dip galvanized.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install loading dock equipment as required for a complete installation.
- B. Dock Bumpers: Attach dock bumpers to face of loading dock in a manner that complies with requirements indicated for spacing, arrangement, and position relative to top of platform and anchorage.
 - 1. Welded Attachment: Plug-weld anchor holes in contact with steel inserts and fillet weld at other locations.
 - 2. Bolted Attachment: Attach dock bumpers to preset anchor bolts embedded in concrete or to cast-in-place inserts or threaded studs welded to embedded-steel plates or angles. If preset anchor bolts, cast-in-place inserts, or threaded studs welded to embedded-steel plates or angles are not provided, attach dock bumpers by drilling and anchoring with expansion anchors and bolts.
 - 3. Screw Attachment: Attach dock bumpers to wood construction with lag bolts as indicated.
- C. Adjust loading dock equipment for proper, safe, efficient operation.

3.2 LOADING DOCK EQUIPMENT SCHEDULE

- A. Molded-Rubber Dock Bumper
 - 1. Configuration: T shape. Thickness 3 inches (75 mm).

END OF SECTION 11 13 00

SECTION 11 40 00 - FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. Work of this Section shall conform to the requirements of the Contract Documents.

1.02 BIDS

- A. Fabricated equipment must be built by a company continually in business for at least a 5-year period.
- B. Bids must be based on equipment of manufacturers specified. Substitutions will only be allowed prior to receiving bids, and upon review and approval by Architect.
- C. Alternate bids to any item as called for in the specifications may be made separately at time of original bid in order to receive consideration.
- D. Owner, Owners Representative, Architect and Food Service Consultant reserves right to reject or accept any bid that is in the best interest of the Owner or User. All bids shall have a cost list of each item of equipment.

1.03 WORK INCLUDED

- A. Cooperate in every way with other contractors in order that whole installation may result in the highest grade possible.
- B. Only such valves, traps, faucets, shut-offs, reducing pressure valves, relief valves and other specialty items required within equipment and as hereinafter specified, included in this work.
- C. Make all necessary cut-outs and knock-outs where required on equipment to accommodate electrical receptacles, switches or other electrical outlets and equipment, together with such cut-outs as required for passage of gas or plumbing piping, etc.
- D. Stack and remove rubbish waste material, crating, etc., resulting from work and keep the premises clean at all times. Upon completion of the installation, thoroughly and finally clean all equipment ready for use.

1.04 POWER AVAILABLE

- A. Electric Voltage: 120/208/480 volt, 60 cycle, 1 & 3 ph,
- B. Water Pressure: 40 to 50 PSI, temperature 120 degrees Fahrenheit max at hand washing and work sinks. 140 degrees Fahrenheit max at pot sink and dishwashers.
- C. Gas: 6" W.C. min – 8" W.C. max

1.05 GENERAL CHARACTERISTICS OF EQUIPMENT

A. Electrically Operated

1. Electrically operated equipment: listed by Underwriters Labs., Inc.
2. Motors: up to and including 1/2 h.p., shall be 120/60/1
3. Motors: over 1/2 h.p., 208/60/3, or as otherwise indicated
4. Ranges, food warmers, etc., over 1.5 k.w., 208/60/3, unless otherwise specified
5. Electrically heated equipment, etc., 1.5 k.w. and under, 120/60/1
6. 1 ph. electrical plug-in units with 3 wire cords; 3 wire cap
7. 3 ph. electrical plug-in units with 4 wire cords; 4 wire cap
8. Motor driven equipment: equipped with starting switch
9. Motors: equipped with overload protection
10. Wiring on fixtures, including operating switches and pilots, furnished by Kitchen Equipment Contractor.

B. Submit in writing to Architect and Food Service Consultant for approval, schedule showing proposed electrical characteristics of each piece of equipment and disconnect means provided.

C. Punch holes for, and install hood and walk-in cooler/freezer lights and concealed conduits. The interconnection of same, including control switch, wiring, etc., by Electrical Contractor.

1.06 WORK EXCLUDED FROM THIS DIVISION

A. The following work in conjunction with Food Service Installation, done by others.

1. Electrical Contractors

- a. Make connections to all food service equipment as shown.
- b. Furnish disconnect switches.
- c. Interconnecting of all hood lights and control switches.
- d. Interconnecting of control switches as required on equipment shown, and all other components which come as part of any equipment shown on plan.

2. Plumbing Contractor

- a. Make hot and cold water waste and gas connections to all kitchen equipment shown, furnishing all necessary shut-offs, traps, grease traps, line runs, etc., and install all faucets, pot fillers,

filters and pressure regulators, furnished by Kitchen Equipment Contractor.

- b. Interconnecting of any and all other components that come as part of any other equipment shown.
 - c. Provide floor drains and floor sinks where shown and indirect piping to floor drains and floor sinks as indicated on drawings.
3. Ventilation Contractor
- a. Furnish size, shape and location of vent collars for hood and make connections to these collars. Collars by Kitchen Equipment Contractor
4. General Contractor
- a. Provide and/or coordinate all work to the floors, walls, and ceiling of the space.
 - b. Provide wall blocking where required and as indicated K.E.C.

1.07 SUBCONTRACTORS

- A. The name and addresses of all Subcontractors furnished to Architect/Owner and Food Service Consultant at time of submitting shop drawings. Selection of Subcontractors must be approved by them; and if in their judgment any fail to prosecute work in strict accordance with drawings and contract, after due notice from Owner or his agent, shall discharge same, but this in no way releases Kitchen Equipment Contractor from his obligations and responsibility under the contract.
- B. Every Subcontractor bound by terms and provisions of the contract so far as applicable to his work. Nothing contained herein shall create any contractual relations between any Subcontractor and Owner.

Note: Kitchen Equipment Contractor fully responsible to Owner for acts and omissions of his Subcontractors.

1.08 SHOP DRAWINGS, ETC.

- A. Immediately upon award of Contract and within 4 weeks, submit to Architect/Owner and Food Service Consultant, 3 sets of drawings for approval. Submit 1/4" scale roughing drawings showing locations of plumbing, and electrical connections with all requirements indicated at point of connection; use of a legend or numbered connection plan will be cause for drawing rejection. Prior to fabrication, Kitchen Equipment Contractor shall submit to Architect for approval 3 sets 1/2" scale shop drawings showing plan, elevations and isometric views covering all items of work. Drawings to show dimensions and details of construction, installation and relations to adjoining and related work where same requires cutting or close fitting. Show reinforcement, anchorage, etc., required for complete installation. After correction and approval of above -- submit 6 sets for record, then afterwards as many additional copies as required by client.
- B. Submit in same manner as above, drawings showing masonry bases, depressed floors, positions of walls, requirements for ceiling hangers, wall blocking, and any and all special information necessary for complete and correct correlation of various trades and satisfactory installation of all equipment shown on drawings.

- C. Manufacturer's names, cuts, descriptive data, analysis of tests, rated capacities and other information necessary for approval of standard manufactured articles and equipment furnished to Architect/Owner and Food Service Consultant for approval before ordering or purchasing. This submission made in same manner as above. All cuts marked with item number, mechanical characteristics, accessories furnished and bound in folders.

1.09 GENERAL

- A. No machine or equipment acceptable from any manufacturer not having had equipment of approximately the same type and design as that specified operating successfully for at least 5 years. Machines installed for test purposes shall not come within the category of successful commercial operation.
- B. Architect/Owner and/or Food Service Consultant privileged to inspect material and fabrication at Kitchen Equipment Contractor's factory at any time.
- C. Before proceeding with shop work, Kitchen Equipment Contractor to verify all measurements at premises. Where required dimensions are not immediately obtainable and delay in waiting for these dimensions would cause work to be seriously delayed, the matter shall be referred to Architect for a decision. In obtaining measurements, Kitchen Equipment Contractor shall consider work requirements of other trades, and equipment designed and fabricated to provide necessary clearance for surrounding and adjoining work.
- D. Kitchen Equipment Contractor responsible for making any and all necessary adjustments to complete his work in a workmanlike manner, as approved by Architect/Owner.
- E. Dimensions as indicated on drawings and specifications are approximate, and are to be adjusted if and where necessary to suit job conditions and field measurements.
- F. Tops of tables, shelves, tops and exterior panels of cabinets, counters, doors, drainboards, etc., to be constructed of a single sheet of metal. Where size of equipment requires more than 1 sheet of metal, sheets butt joined with joints continuously welded full length. No joints less than 18" from an edge or end of a piece of equipment. In addition, all joints shall have battens or stiffeners welded to jointed material, ground smooth and polished.
- G. Appliances of rigid construction free from objectionable vibration and quiet in operation.
- H. Electrical heating elements shall conform to latest standards of National Electrical Manufacturer's Association and Underwriters Labs., Inc., where applicable standards have been set up by such agencies.
- I. Motors of ample power to operate machines for which designated under full load operating conditions without exceeding nameplate ratings. Horsepower requirements on driven equipment determined by manufacturer, based on normal operation of maximum capacity.
- J. Motors drip-proof, splash-proof or totally enclosed type, having two-hour duty cycle and ball bearings (except small timing motors which may have sleeve bearings). All motors shall have windings impregnated to resist moisture. Motors located where adjacent to deposits of dust, lint, etc., totally enclosed type.

1.10 STAINLESS STEEL (S.S.)

- A. Where S.S. is specified, it shall be Type 304, nickel bearing iron alloy, containing approximately 17.0% to 19% chromium, 8% to 10% nickel, not more than 0.2% carbon, and not more than 2.0% of other alloying elements; designed being austenitic (non-magnetic).
- B. S.S. free from scale with all surfaces polished to a high commercial finish. All welding and exposed welds hereinafter specified, must be ground down and polished smooth to a #4 finish so that no evidence of welding will appear. Unexposed welds on under side of counter or tables ground smooth and treated with an acid solution to remove weld discoloration and oxidization and to arrest corrosion.
- C. Undersides of all counters, work tables, sinks, drain boards, etc., after fabrication, to have one (1) heavy coat of sound deadening material applied as allowed by local codes.
- D. Gauges for sheet iron and sheet metal, U.S. Standard.
- E. Rivets, welds, bolts, screws, nuts and washers to be steel except where brass or S.S. is fastened, in which case they shall be brass or S.S., respectively. Where dissimilar metals are fastened, welds, bolts, rivets, screws, nuts and washers, highest grade metal. Spacing and extent of welds, rivets, bolts and screws such as to insure suitable fastening and prevent bulging of metals fastened.

1.11 SANITATION

- A. All custom built equipment constructed in accordance with standard No. 2, 4 & 7 of National Sanitation Foundation Testing Laboratory, manufactured by a company approved by N.S.F. and carry their stamp of approval. Kitchen Equipment Contractor must have "Registered" numbered seal of N.S.F. approval.

1.12 OPERATING INSTRUCTIONS

- A. Kitchen Equipment Contractor shall leave all items of equipment in good, operating condition, and furnish the services of a "Qualified" competent manufacturer's representative to instruct Owner's employees in proper use and care of equipment. Representative on call for as long a period as is necessary to assure Owner that such instruction is thoroughly understood.
- B. Kitchen Equipment Contractor or his qualified manufacturer's representative, thereafter, shall make all necessary calls during warranty period. Kitchen Equipment Contractor must include this service in bid.

1.13 SAMPLES

- A. Prior to Award of Contract, when requested, Kitchen Equipment Contractor shall supply Architect with samples of fabricated equipment, such as corner of table with a rolled or inverted "V" edge, corner of dish table, overshef, drawer assembly, table leg with foot and gusset, or as specifically requested.

1.14 GUARANTEE

- A. Kitchen Equipment Contractor shall guarantee in writing his workmanship, material and equipment for a period of 2 years from date of final payment and acceptance of installation, and shall remedy any defect due to faulty workmanship or materials which may appear within guarantee period. Manufacturer's instruction manuals on equipment, etc., turned over to the Owner in duplicate, bound in a folder and marked accordingly.

1.15 EQUIPMENT CONSTRUCTION AND STANDARDS

- A. Where initials S.S. are used, they refer to "stainless steel;" C.P. refers to "chrome plated;" N.I.C. refers to "not in contract;" G.I. refers to "galvanized iron;" F.D. refers to "floor drain", and F.S. refers to "floor sink."

1.16 WASTES AND OVERFLOWS

- A. Sinks to have DrainKing rotary stainless steel ball drain, Teflon seals, 2" outlet, brass housing to be chrome plated, S.S. strainer plate, Fisher tail piece with threaded connection Fisher #6129, rotary lever operated waste outlets and overflows, such as manufactured by Fisher Mfg Co, installed by Kitchen Equipment Contractor

1.17 WATER INLET LOCATION

- A. Located in all cases above the positive water level to prevent siphoning of liquid into water system. Wherever conditions require water inlet below such level, a suitable type of vacuum breaker shall be placed on fixture and form part of same to prevent such siphoning.
- B. All faucets furnished by Kitchen Equipment Contractor as specified. Traps furnished by Plumbing Contractor

1.18 PITCH AND DRAINAGE

- A. Wherever a fixture is used with waste or drain outlet, surface shall have distinct pitch towards outlet. Drainboards and tables that contain or adjoin sinks shall have a definite pitch towards sinks. Where necessary, surfaces creased and grooved to give a definite pitch.

1.19 SINKS

- A. #14 gauge S.S. interior corners rounded to 1" radius horizontally and vertically, forming a cove in bottom. All joints butt edged. Sink sizes given, inside measurements.
- B. Bottom of each compartment creased to center and fitted with a rotary drain as described in section 1.16, hereinbefore specified. Waste lever not to protrude beyond body of sink. Sinks to have overflows installed by Kitchen Equipment Contractor
- C. Overflow to consist of 1-1/2" chrome plated brass strainer plate, fitted in back of each compartment at proper level directly connected to waste outlet with 1-1/2" chrome plated brass pipe.
- D. Back of sink extended integrally approximately 12" above working level, back 2-1/4" on 45 degree angle towards rear and then flanged down 1" and punched to accommodate faucets.
- E. Front and both ends, unless otherwise specified and shown, finished on top edge, 3" above working level, with 1-1/2" diameter, 180 degree welded integral roll. Exterior corners rounded to a 2-1/2" radius, all integrally welded.
- F. Sinks and drainboards finished on front and back edges only and left with straight edge on ends, so that drainboards may be welded thereto, forming integral units with top edge of rolled rim curbing formed on one horizontal plane across front to unit though surfaces of drainboards pitched to sinks.

- G. Multiple compartment sinks divided with double wall #14 gauge S.S. partitions, all corners rounded same as corners in sinks, continuously welded in place.
- H. Back, bottom and front of one continuous piece with no overlapping joints or open spaces between compartments.

1.20 SINK BOWL BUILT INTO TABLE TOP

- A. Sink constructed integral with table top #14 gauge S.S. having all interior corners coved vertically and horizontally forming a cove in bottom. To have overflow, lever waste outlet, etc..., as hereinbefore specified for sinks in spec section 1.19.
- B. All joints butt edged and welded, ground and polished, so that no evidence of welding will appear. All sink sizes inside measurements. Table top where shown, punched to receive deck type combination faucets, provided by Kitchen Equipment Contractor.

1.21 FAUCET AND BASKET DRAIN ASSEMBLY

- A. All pot and pan sinks, unless otherwise specified, furnished with (1) Fisher Mfg Co. stainless steel # 24589 pre-rinse unit ¾", and (1) Fisher Mfg Co. stainless steel #51179 faucet, ¾" with 14" swing spout. Complete with mixing faucets, nipples, elbows, and backflow preventers for Plumbing Contractor to install and connect. All preparation sinks, built-in work sinks and similar type sinks, unless otherwise specified, furnished with Fisher Mfg Co. stainless steel #60771 faucet, complete with mixing faucets, nipples and elbows for Plumbing Contractor to install and connect. All faucets specified to have standard lever type handle, NO LEAD Stainless Steel construction, polished to mirror finish, internal S.S. seats, two part swivel stems to prevent cross flow, ADA easy turn stems All plumbing fixtures shall be certified CSA, ASME A112.18.1/CSA B125.1, AB1953/HSC 116875, Vermont Bill S152, NSF/ANSI 61 sec 9, annex F and G, NSF/ANSI 372 low lead content, ASTM F2324. Where hand wash sinks are specified, handles are to be wrist action type, forged brass chrome-plated, 4" long, similar to Fisher Mfg Co 3984-2300. Unless otherwise specified, all sinks shall be fitted with Fisher Mfg Co DrainKing waist valve # 22306.

1.22 DRAINBOARDS

- A. #14 gauge S.S. full width of sink carried up approximately 12" at back and where adjacent to wall and finished same as heretofore described for back of sink, and having 3" high curbing at front and ends not adjacent to walls and finished with integral 1-1/2" diameter 180 degree roll, unless otherwise specified.
- B. Drainboards continuously welded to sinks.
- C. Drainboards 30" long or less shall have 1-1/2" #16 gauge S.S. tubular braces secured at underside near front and welded to S.S. gusset at leg anchor. All others to have legs and cross bracing with full length and width undershelf as specified for tables.

1.23 TABLES WITH S.S. TOPS

- A. Tops of #14 gauge S.S. 1 piece construction with all edges turned down into 2" integral 180 degree roll with all corners rounded to 2" radius forming a bullnosed corner. Corner welded and polished smooth.
- B. Table tops thoroughly cross braced with 4" X 1" S.S. channel stiffeners #14 gauge welded to underside.

All cross braces spaced not over 24" on center

- C. Table tops adjoining walls carried up approximately 12" and returned 1", down 1" at top and ends. Intersections of table top and raised edge coved to 1" radius.

1.24 LEGS AND CROSSRAILS

- A. 1-5/8" O.D. #14 gauge S.S. tubular-type with S.S. bullet shaped feet having minimum vertical adjustment of 1-1/2" without showing threading or adjusting bolts. Feet fully enclosed on bottom. Adjustment of feet by means of a threaded shank attached to foot and screwed into a properly secured threaded member inside of leg. Construction of leg such that it shall fit over shank of foot so no liquid or other material can work their way into legs or foot.
- B. Tops of legs attached to enclosed conical gussets of heavy gauge S.S. Gussets welded to #14 gauge S.S. 4" X 1" channels to underside on which they appear. Crossrails 1-1/2" O.D. #14 gauge S.S. coped and welded to legs approximately 10" A.F.F. or as specified.

1.25 OVERSHELF - TABLE TYPE

- A. #16 gauge polished S.S. with all edges turned down and finished in a 1-1/2" diameter 180 degree roll - corners bullnosed, welded 1 piece construction.
- B. Shelves supported by 1" O.D. #14 gauge S.S. tubular uprights, tapered at top and flared at bottom, secured to table top with concealed inner tie rods, bolts and nuts. Uprights spaced approximately 42" on center not to interfere with table top proper. When uprights are located in other areas in addition to each end of table then they shall be cantilevered.

1.26 OVERSHELF - WALL TYPE

- A. #16 gauge polished S.S. with back edge turned up 2", remaining ends turned down in 1-1/2" diameter 180 degree roll with corners bullnosed welded, ground and polished.
- B. Shelves supported by #12 gauge S.S. cantilever brackets. Shelf spaced 1" from walls when in place and secured to same with C.P. toggle bolts. Undersides secured to brackets with concealed welded studs, nuts and washers. Brackets spaced approximately 42" on center

1.27 UNDERSHELVES

- A. #16 gauge polished S.S. full length and width of table with all edges turned down into 2" wide channel. In way of table legs, shelf notched to fit contour of legs and fitted to same in neat, workmanlike manner to eliminate unsanitary crevices, fully welded, ground and polished.
- B. Undershelves reinforced on underside with welded 4" X 1" longitudinal channels of #14 gauge S.S. where applicable. All signs of welding on shelf surface removed.

1.28 DRAWERS

- A. Of #18 gauge S.S. all interior corners coved to a 1" radius both vertically and horizontally. All welds ground and polished to a uniform finish.

- B. Front of #14 gauge polished S.S. and will extend on both sides of drawer body to conceal slides, corners welded, ground and polished. Space between drawer front and body fully enclosed at bottom, back and both sides by means of a #20 gauge S.S. filler, spot welded to drawer front and body, to provide a fully sealed, vermin-proof enclosure. Drawer front provided with a 5" C.H.G. # P46-1010 S.S. pull handle fastened in place by means of a concealed screws.
- C. Drawer slides of #14 gauge S.S. fitted with 4 case hardened ball bearing rollers. Track attached to drawer is to have upper edge channel shaped to fit contour of roller rim to provide a positive drawer guide and prevent jarring. This drawer track firmly spot-welded to body. Outer track provided with auto stops to lock without the use of tools.
- D. Where specified, drawer provided with removable synthetic carving board. Carving board is to slide into enclosure under drawer made of #14 gauge S.S. and extending across underside of carving board, with both sides turned up and welded to slide assembly. The 2 sides provided with #14 gauge S.S. angles with stops at rear fastened in place 1/8" above top surface of carving board to provide guide and storage compartment when carving board is not in use. Carving board is to measure approximately 21" X 21" X 1" thick.
- E. Tool drawer 20" X 20" X 5" deep, bread drawer 20" X 20" X 10" deep. All drawers to have 4 pin paracentric keyed-alike built-in locks same as sliding and hinged doors. C.P. where exposed.

1.29 POT AND PAN RACKS AND CEILING HANGERS

- A. Unit 24" wide, of length as shown, of 2" X 1/4" S.S. bar throughout. Outer rail to have fully rounded ends of 1 piece all welded construction. Center rail located 12" below outer rail and fastened to same with V-shaped braces of 2" X 1/4" S.S. bar. All joints continuous welds. V-shaped braces spaced not over 60" on center. Racks fitted with removable sliding type S.S. pot hooks spaced 9" on center.
- B. Unit hung from iron structure, ceiling or slab by 1" O.D. #14 gauge S.S. tubing. It shall be flattened, rounded with ends fully welded and fastened to rack by 3/8" round head screws with cap nuts and lock-washers. Top of tubular ceiling hanger welded to #12 gauge S.S. disc approximately 4" diameter that in turn anchors to joists above. Ceiling hangers over 60" in length to have diagonal sway braces of 1" O.D. S.S.
- C. Proper anchorages, etc., installed in iron structure, ceiling joists or slab by Kitchen Equipment Contractor prior to final finish of ceiling. Top rail of unit 90" A.F.F.

1.30 EXHAUST HOOD

- A. Dimensions approximately as shown on contract drawings and mounted at 80" A.F.F. to underside of hood. Final dimensions to be determined in field by Kitchen Equipment Contractor. Proper anchorages, etc..., installed in ceiling joists, slab, etc..., by Kitchen Equipment Contractor prior to final finish of ceiling.
- B. Body of #18 gauge S.S. front, back and sides straight as shown. All joints flush welded. Where field joints occur, provide a pair of transverse frames, butted together and securely bolted following contour of hood structure. Framing 1-1/2" X 1-1/2" X 1/8" G.I. angle with all joints welded.
- C. Bottom rim of hood attached to channel of #14 gauge S.S. with mitred welded corners and butted field joints. Cross section inside of channel to measure approximately 2-1/2" horizontally, flanged upward

tightly against interior lining of hood.

- D. Above dishwashing machine, kettles and steamers, etc., hood provided with sloped baffle at back arranged at 45 degree angle of #18 gauge S.S. Baffles to have sliding dampers of #16 gauge S.S. mounted in #14 gauge S.S. channel tracks. Each damper to have S.S. handle fastened with concealed bolts. Exhaust Hood to be in conformance with IMC 2006 section 507.
- E. Section over ranges, etc., shall have built-in filters at back extending full length and arranged at an angle of 45 degrees easily removable without use of tools. Filters to be 20" X 20" X 2" thick, of S.S. and expanded metal construction or as further indicated on drawings. Filters set into #14 gauge S.S. filter frame, bottom of which is integrally installed with back of hood and grease gutter for easy cleaning. Quantity and size of openings in plenum chamber cut and determined in field and fitted with collars by Kitchen Equipment Contractor
- F. Hood provided with S.S. hangers spaced not more than 36" on center
- G. Section of hood below ceiling or soffit, enclosed with vertical facing of #18 gauge S.S. Panels not over 3' in width, removable where required, provided with recessed finger grip. Where panels meet at vertical joints flanged inward 1" to form a hairline joint. Channel extended 2" beyond perimeter of hood and provided with concealed full length angle member of 2" X 2" X 3/16" G.I. with clips for bolting to hanger angles, spaced approximately 3' on center. Hanger angles attached to 2" X 2" X 3/16" angle frame fastened to ceiling slab. Panels held in place at ceiling with 2" X 2" X 1/8" S.S. angle trim all around.
- H. Front (working side) provided with vapor-proof fluorescent lights approximately 48" in length. Actual wiring, however to current, by Electrical Contractor. Light fixture, with bulb(s), as provided by specified exhaust hood manufacturer, refer to Part 2 Products.
- I. Must be tested and must comply with the following codes UL-710, IMC2006 section 507, and NFPA 96 2008.

1.31 VENT STACKS

- A. Vent Stack of proper size to fit dishwashing machine end cowl, #18 gauge S.S., continuously welded. Both vents over openings of dishwashing machine, sized per manufacturers specifications and provided with a revolving damper of #16 gauge S.S. Damper attached to externally operated "T" handle made of 3/8" diameter S.S. rod and with tension spring to prevent it from rotating freely. Top of each vent shall terminate into duct above. Extend top to approximately 6" above finished ceiling to receive duct connections by others.

1.32 FIRE PROTECTION SYSTEM

- A. The system shall be a pre-engineered cartridge-operated type R-102 system utilizing Liquid Ansulex agent, with a Fixed Nozzle distribution network. It shall be furnished and installed in compliance with UL Standard 1254, UL Standard 300, NFPA 96-2008 and any prevailing statutes or codes including automatic shut-down of all cooking appliances per code section 44 of NFPA 17A-27-2002.
- B. System to provide connection to building Fire Alarm System per NFPA 17A; Section 3-2.1.5
- C. The extinguishing agent shall be a specifically formulated aqueous solution of organic salts contained in a S.S. tank with 3 gallons minimum capacity, and able to withstand test pressure of 330 PSI. A welded

S.S. bracket shall be provided for mounting the tank.

- D. The regulator releases mechanism shall be capable of providing sufficient expellant gas to discharge enough agent to meet the minimum nozzle discharge requirements. The mechanism shall have a visual indicator of "fired" condition. This mechanism shall be capable of being operated by fusible link detection, remote manual release and local manual release. The mechanism should be housed in a S.S. enclosure with cover containing identifications thereon.
- E. Each discharge nozzle to be listed with UL approval for placement and size. Each nozzle shall have a metal or rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up. All exposed piping to be chrome plated finish, and there shall be no exposed threads.
- F. Kitchen Equipment Contractor to furnish and install provisions to shut off all fuel supplies to all cooking appliances upon activation of the system, including micro switch. An automatic solenoid gas shut-off valve shall be furnished and installed by the Plumbing Contractor. The electrical wiring and relays for the solenoid valves to be furnished and installed by the Electrical Contractor. The Electrical Contractor to provide and install the automatic equipment necessary to shut off all electric cooking equipment.
- G. Upon completion of installation, the installer to perform a wet chemical test or at the time of the test, the authority having jurisdiction may allow the Contractor to use flushing concentrate and water solution. However, whichever is permitted, it must be in compliance with Code. This test shall activate the entire system, except the agent supply tank, which will be substituted by the test tank of like pressure and size. Following a satisfactory test, the original tank shall be replaced. The system shall then be certified to be in working order and all authorities shall be so advised in writing. Provide Owner with copies of all satisfaction/acceptance tests.
- H. The system to be furnished and installed by a factory distributor in accordance with the manufacturer's instructions. This shall include mounting of the system units, manual releases, nozzles, actuating devices, and the running of all pipe and control tubing applicable to the R-102 system. If and when requested, submittal drawings concerning the fire system shall have affixed the seal and signature of a licensed engineer for the State in which they are to be installed. A 1-year service contract and maintenance program to be provided.
- I. Contractor is required to submit a copy of the hood suppression system shop drawing to the Bureau of Facilities Planning for approval, as well as submission to the Architect. In addition, shop drawings when submitted, must be signed and sealed by an engineer licensed to practice in the State where the system is to be installed.

1.33 DISH TABLES - SOILED AND CLEAN

- A. #14 gauge polished S.S. with exposed edges finished in 3" high curbing with a 1-1/2" diameter, 180 degree rolled trim at top, corners bullnosed, welded. Where adjacent to wall, top carried up 12" integrally at top and ends. All joints in top welded and free of buckles and weld marks. When applicable, where top (also raised back), adjoins dishwashing machine, same flanged down 1" into machine and secured water tight, backsplash in this area brought forward diagonally to machine to form a baffle. Tops thoroughly cross braced with 4" X 1" channel stiffeners of #14 gauge S.S. and welded to underside. Cross bracing approximately 24" on center, running front to back. All corners in top rounded to 1" radius, vertically and horizontally.

1.34 PASS WINDOW AND SLIDE UP DOOR

- A. Where top of dish table extends through wall of dish room, carried up approximately 6" on both sides. Exposed front edge finished with a rounded 1" high "V" nosing, then turned down 2" to align with bottom of window buck.
- B. Dish window opening provided with #14 gauge S.S. buck on 4 sides, flanged out 2" on both sides of wall and returned 1/2" towards finished interior of dishwashing room and fitted with slide up door. Door of double wall #18 gauge S.S. construction with not less than 5/8" thick sound deadening material between panels and shall slide in #14 gauge S.S. channel tracks. Tracks fastened to S.S. window buck. Door hung by means of counter balancing sash weights set into overhead enclosure of #18 gauge S.S. Front of enclosure fitted with a removable #16 gauge S.S. panel for access to sash balances. Doors provided with C.P. brass handle fastened in place with concealed bolts and locking device, consisting of a C.P. brass slide bolt. Buck delivered to job site by Kitchen Equipment Contractor in ample time for setting in place by G.C. during wall construction.

1.35 REFUSE SINK

- A. 6" wide X 6" deep X full depth of table top, of #14 gauge S.S. with all interior corners rounded, bottom fitted with 1-1/2" threaded waste outlet, with S.S. strainer plate. Top of sink continuously welded, around its entire perimeter, to opening in table top.
- B. Sink provided with a removable snug fitting #16 gauge S.S. basket continuously perforated with 1/8" holes. Interior corners of basket rounded to match contour of sink. Basket supported by 1" high S.S. cross bars, spanning the 6" width, flush welded in place, so dish racks may slide over them without interference.

1.36 PRE-WASH SINK

- A. Approximately 21" X 21" X 7" deep, of #14 gauge S.S. integrally welded to table top, forming an integral unit with same. Sink bowl identical to that specified for sink built into table top including basket drain assembly with built-in overflow, etc. Sink pitched to a 2" IPS C.P. brass "lever" waste outlet and fitted with a #18 gauge S.S. snug fitting basket approximately 19" X 19" X 6" deep, with continuous perforation and reinforced top edges and 4 sides. Basket of all welded construction mounted on 2" high S.S. feet.
- B. Top of pre-wash sink fitted with S.S. guide for dish racks. Guide of 1-1/2" X 1-1/2" X #12 gauge S.S. angles with ends flared out to facilitate easy movement of racks. Guide welded to cross angles of same material, thus forming a removable frame. Dish table backsplash (unless otherwise specified and shown) in area where pre-wash sink is located, provided with Fisher Mfg Co. stainless steel pre-rinse unit model #33308 includes wall bracket, shortened riser pipe to 16", add on faucet with 12" swing spout, nipples, elbows, backflow preventer mounted on pre rinse unit, mixing faucet with S.S. seats and check valve stems to prevent cross flow, EPAAct 2005 certified.

1.37 SCRAP HOPPER

- A. Where shown, soiled dish table fitted with a neoprene hopper, set into die stamped 3/4" high raised opening.

1.38 WALL CABINET

- A. Wall cabinet is to be of length hereinafter specified, 15" front to back and 30" high at front with dust proof top sloped up 6" on 45 degree angle toward rear. Exterior bottom to be of flush type construction.
- B. Cabinet constructed of #18 gauge polished S.S. with all joints and crevices on cabinet front and sides, welded, ground and polished smooth to a uniform finish. Channel shaped cabinet front is to be fully enclosed inside of cabinet to eliminate openings between shelf and cabinet front. Interior to be provided with fixed in place bottom shelf and 2 removable adjustable intermediate shelves of #16 gauge S.S. shelves will have 1" wide channel edges on all sides with corners welded ground and polished and provided with clips to engage S.S. keyhold strips secured to interior of cabinet.
- C. Cabinet doors previously described in specifications. Door is to be fastened to cabinet by means of fully concealed heavy duty hinges. Each door must be fitted with keyed-alike type locking device.

1.39 SERVING COUNTER

- A. Of size and shape as shown. Top of #14 gauge polished S.S. rolled down in a 2" diameter 180 degree roll on all exposed edges with corners bullnosed, welded. Top secured to counter base by means of concealed S.S. studs, nuts and washers. Angle frame under top sheathed with sound deadening material.
- B. Base constructed with interior framing of 1-1/2" X 1-1/2" X 1/8" galvanized steel angle with all joints welded.
- C. Angle framework concealed on the interior with #18 gauge polished S.S. sheathing. Exterior facing of base cabinet and ends to have sheathing of Plastic Laminate paneling laminated to 3/4" thick solid core, exterior grade marine plywood, panel length not to exceed 36". Color and style of paneling selected by Architect. Each panel of length as indicated, full height of counter and splined hairline joints. Panels and trim secured to interior framing by means of concealed welded studs, nuts and washers. Or constructed of alternate materials as detailed on drawings.
- D. Interior of all available space provided with bottom and intermediate shelf of #16 gauge S.S. turned up approximately 2" at rear and ends, and down 1-1/2", and in 1/2" channel shape at front.
- E. Mounted on masonry base, height as indicated on drawings or 6" high 14 gauge S.S. legs with S.S. removable toe base, where indicated. All openings in top flanged downward approximately 1" around their entire perimeter. Top cut out for and provided with equipment as hereafter specified.

1.40 SOLID SURFACE SERVING COUNTER

- A. Of size and shape as shown. Top of minimum 1/2" thick solid surface, silicone mounted to minimum 1/2" thick exterior grade plywood with ten year installation warranty. Solid Surface type, fabricated to comply with Solid Surface commercial specifications. Color and style of solid surface as selected by Architect. Top secured to counter base by means of concealed S.S. studs, nuts and washers. Angle frame under top sheathed with sound deadening material.
- B. Base constructed identical to that as hereinbefore described in section 1.39 E.

1.41 HOT FOOD SECTION

- A. Top #14 gauge polished S.S. integral and continuous with counter and top, provided with 12" X 20" openings as shown.

- B. Each opening to have #14 gauge S.S. well measuring approximately 6-1/2" deep. Where top is flanged down into well, fitted with a breaker strip on 4 sides of opening. When and where food wells are used with drains, all drains are to be interpipied with 1-1/2" C.P. or S.S. piping by Kitchen Equipment Contractor, and extended to common point near floor drain for Plumbing Contractor to make indirect waste connections. Kitchen Equipment Contractor to furnish and install C.P. or S.S. shut-off valve extending for easy access.
- C. Each well heated as hereinafter specified, dry-moist type electric heater with individual thermostatic control and pilot light. Thermostat dials and pilot lights attached on attendant's side recessed into a panel installed inside of plate shelf areas or apron mounted as shown. All electric food wells connected to a common heavy toggle switch. Wiring concealed.
- D. Food wells to have bottom of housing fitted with sectional removable #16 gauge G.I. bottoms for access to wiring and elements. Counter base under hot food section to be lined with #18 gauge S.S.
- E. Each hot food section provided with the following #20 gauge Polar Ware Classic Anti-Jam inserts and covers: two S12104 pans with two 1/2 size lift-off covers and provide one dome-type 12" X 20" lift-off cover for each opening; two S12106 pans, three S12066 pans, four S20124 pans; four S12102 pans, four S20122 pans.

1.42 COLD PAN

- A. Of size and shape shown, approximately 20" wide, of length as shown on plan, 6" deep in the clear, unless otherwise indicated, constructed in accordance with NSF #7, integrally constructed into counter and top. To have sectional #18 gauge S.S. perforated false bottom in sections not over 18" wide, 1/2" channel edge on 4 sides. Interior lining to have all corners rounded to 1" radius vertically and horizontally, of #14 gauge S.S. all joints and crevices welded. Where cold pan is used as a salad bar, same to be 8" deep in the clear unless otherwise indicated.
- B. Insulation in all 4 sides and bottom of unit 2" thick polyurethane or equal. Refrigeration coils copper 1/2" O.D. and 3" on center Sweated to underside and embedded in insulation. Provide a copper tubular refrigeration coil, further sealed with hydrolene. Coils connected to compressor hereinafter specified, and shall have liquid line with solenoid valve and thermostat for control, provide a shut-off valve in liquid line ready and accessible to disengage same when required.
- C. Exterior sheathing of #18 gauge S.S. bottom pitched and fitted with a 1-1/2" drain outlet with threaded connection plumbing. Plumbing Contractor to extend drain line so as to flow into adjacent floor drain. Joint between top of cold pan and turned down edge of counter top provided with breaker strip around full perimeter of opening.
- D. Where shown, space under counter provided for installation of compressor. This section fitted with removable #18 gauge S.S. grill on attendant's side. Shall have not less than 75% rectangular perforation. Counter front panel and/or sides where possible in way of compressor housing louvered. Interior of housing reinforced with horizontal and vertical framework of 1-1/2" X 1-1/2" X 1/8" angle having all joints welded. Lower frame provided with #14 gauge channel stiffeners welded in place and fitted with rubber cushions. Channel spaced to properly support condensing unit. Housing approximately 24" left to right to properly admit compressors.
- E. Refrigeration coils connected to condensing unit, size as indicated on plan, air cooled, furnished complete

with all necessary copper tubing, thermostatic control valves dehydrators, expansion valves, sight glass, etc., to make a complete working unit with warranty and free service, guarantee for 1 year. Compressor connected to coils of cold pan in a satisfactory and operating manner. Compressor, etc., internally wired. Provide push button switch with pilot lite recessed in adjacent section in apron above housing to turn on/off cold pan as required.

1.43 SANDWICH SECTION

- A. Of size and shape as shown, approx 20" wide by length as shown, integral with counter and counter top, cut out approximately of size shown on plan and constructed in accordance to NSF #7 and provided with S.S. inserts listed in template shown. All openings in top turned down 1" having corners welded. Provided with telescoping cover constructed of 18 gauge S.S. Unit to be fabricated with raised rear four sided enclosed housing having edges flanged or hemmed to insure rigid construction. Housing to be further designed to accept a S.S. hinged sloped front section deep enough to provide full coverage of unit top opening and retain rigidity required for its size. The interlocking feature of housing and cover shall allow for a 60 degree angle when unit is in an open position providing maximum access to area below. To facilitate opening and closing of cover, front edge is constructed with integral hand lift insuring ease of operation along with S.S. hinges. Size of unit shall be relative to size of top opening.
- B. Work side to have a removable Richlite carving board, approximately 8" wide 1/2" thick provided with a S.S. waste chute and a S.S. scrap drawer located below chute. Carving board level with counter top.
- C. Refrigerated base to have 2" thick polyurethane or equal insulation. Exterior covering of #18 gauge S.S. Top, bottom and interior lining #16 gauge S.S. all welded water tight, having coved corner intersections vertically and horizontally. Bottom provided with a bell type refrigerator waste outlet.
- D. Interior cooled by a blower type refrigeration coil of ample capacity to maintain a temperature of 38 degree F. mounted in place and connected to compressor specified hereinafter. Unit fitted with condensate evaporator.
- E. Interior provided with wire type S.S. intermediate shelves. Door opening to have odorless bake lite, breaker strips around entire opening.
- F. Doors to have #16 gauge S.S. facing and #18 gauge S.S. interior pan shaped lining over 2" thick insulation. Door front and liner to have welded corners, polished to match adjacent finish, neoprene gasket. Hinges and latches of heavy duty construction C.P. latch "thru-the-door" lock and semi concealed. Hinges with adjustable offset and edge mounted.
- G. Where shown, space under counter provided for installation of compressor. This section fitted with removable #18 gauge S.S. grill on attendant's side. It will not have less than 75% rectangular perforation. Counter sides where shown, in way of compressor housing, to be louvered. Interior of housing reinforced with horizontal and vertical framework of 1-1/2" X 1-1/2" X 1/8" angle having all joints welded in place and fitted with rubber cushions. Channel spaced to properly support condensing unit. Housing approximately 24" left to right (or of size as shown on plan) to properly admit compressor.
- H. Refrigeration coils connected to size of condensing unit, size as indicated on plan, air cooled, furnished complete with all necessary copper tubing, thermostatic control valves, dehydrators, expansion valves, sight glass, etc., to make a complete working unit with warranty and free service guarantee for 1 year. Compressor connected to coils in a satisfactory and operating manner. Compressor, etc., internally wired. Provide "push-button" switch with "pilot lite" recessed in adjacent section in apron housing to turn on/off

compressor as required. Unit furnished with a completely installed and connected condensate evaporator.

1.44 TRAY SLIDE

- A. Of size and shape, as hereinafter specified and/or shown on contract drawings. Installed where shown, 12" wide, #14 gauge S.S. construction or in strict accordance to that as detailed on drawings.
- B. In general, unit mounted on #12 gauge S.S. ornamental type brackets secured to front trim of counter in a concealed manner with welded concealed studs. Back edge of turned up section made to fit tight with turned down front section of counter top and definitely free of voids, cracks and unsanitary joints.

1.46 SOLID SURFACE TRAY SLIDE

- A. Of size and shape, as hereinafter specified and/or shown on contract drawings. Installed where shown, 12" wide with bull nose edge detail, silicone mounted to minimum 1/2" thick exterior grade plywood with ten year installation warranty. Solid surface type, fabricated to comply with commercial specifications. Color and style of solid surface as selected by Architect. Constructed in strict accordance to that as detailed on drawings.
- B. In general, unit mounted on #12 gauge S.S. ornamental type brackets secured to front trim of counter in a concealed manner with welded concealed studs. Back edge of turned up section made to fit tight with turned down front section of counter top and definitely free of voids, cracks and unsanitary joints.

1.46 COUNTER AND CABINETS WITH SLIDING DOORS

- A. Tops #14 gauge polished S.S. with outer edges turned down vertically and integrally 2" then in 1-1/2" forming a channel edge on both exposed sides. Where adjacent to wall, top carried up approximately 6" or "as specified" and returned 1" at top and ends toward wall as hereinbefore specified for tables against walls, corners welded forming continuous unit. Tops fastened to cabinets by welded and concealed studs.
- B. Cabinets below tops constructed of #18 gauge polished S.S. with all joints and crevices welded. Tops of cabinets reinforced with a horizontal frame of 1-1/2" X 1-1/2" X 1/8" angle with cross braces on 18" centers. Framework of all welded construction. Bottom and intermediate shelves constructed of #16 gauge S.S. with 4" X 1" #16 gauge S.S. channel stiffeners not over 24" on center.
- C. Unit, unless otherwise specified and shown, mounted on 6" #14 gauge S.S. legs with adjustable bullet feet.

1.47 COUNTER AND CABINETS WITH SEMI-ENCLOSED BASE

- A. Top of #14 gauge polished S.S. finished 1/2" above working level with 2" diameter 180 degree roll, bullnosed corners on all exposed sides. Where adjacent to wall, top carried up approximately 6" (or as specified hereinafter and shown) and returned 1" at top and ends towards wall with corners welded forming a continuous unit. Top fastened to cabinet by means of welded and concealed studs.
- B. Cabinet below top to have #18 gauge S.S. enclosure. Front stiles of cabinet channel shaped. This channel fully enclosed inside of cabinet. Top reinforced by means of horizontal framework of S.S. 1-1/2" X 1-1/2" X 1/8" angle with cross braces not more than 18" on center. Framework of all welded construction and intermediate shelves in cabinet of #16 gauge S.S. turned up on all sides to eliminate crevices at shelf surface. Front edge of shelf channel shaped. Shelf surface reinforced by means of #16 gauge S.S. channel stiffeners spaced on not more than 24" on center. Mounted on 6" S.S. adjustable legs, or as

hereinbefore shown and specified.

1.48 BAIN MARIE

- A. Of size and shape as shown, approximately 20" wide (or as shown on drawing) and approximately 10" deep in the clear set into openings in table top continuously welded in place to form integral units, of #14 gauge S.S. having all interior corners, both vertical and horizontal, coved to 1" radius. Unit of size to accommodate removable S.S. 12" X 20" pans or interchangeable with Seco #6 or #14 S.S. panels. Furnish adaptor bar so as to use half size pans. Pans and panels to be as hereinafter specified.
- B. Bottom punched and provided (similar to that for sinks) with a 2" C.P. brass lever handle waste outlet. An overflow directly connected to waste outlet set at proper height and provided with S.S. strainer plate.
- C. Electrically heated bain maries shall be heated with a Hatco FR- type electric (k.w. as hereinafter specified) heating unit at bottom and provided with low water cut-off, magnetic contactor and thermostatic control, with pilot light. Elements installed in a manner so easy servicing and replacement is possible. All wiring concealed. Switches installed at working side where electric is shown.
- D. Gas heated bain maries shall be heated with a series of in-line loop burners, model 3612 as manufactured by Beacon Specialties. Burners installed 16" ON CENTER so as to provide full length heating under Bain Marie. Burners manifolded so as to have one gas connection. Provided with brass pilot valve, adjustable pilot light assembly and thermostat.
- E. Steam heated bain marie shall be heated with a 4 turn 3/4" I.P.S. brass or S.S. steam heating coil fastened to bottom of unit with S.S. straps and provided with a thermostatic control valve.
- F. Provide sectional removable pan-shaped #14 gauge perforated S.S. false bottom with corners rounded to contour of bain marie. Note that false bottom must not interfere with operation of Hatco unit. Sections not over 12" wide for easy handling, and with 1" channel all around. Unit provided with a deck type swing spout hot water faucet.
- G. Bain marie so constructed as to be used with or without panels by means of removing panels as required and placing pots, etc., directly into the open bain marie. All 4 sides of unit enclosed with #18 gauge S.S. in a good, approved, workmanlike manner.

1.49 DOORS

- A. Whether sliding or hinged type, not less than 1/2" thick overall, double paneled having 3/8" sound-deadening material between #16 gauge S.S. front and #18 gauge S.S. back, reinforced between panels by wide channels, running height of door and made of same material. Panels jointed with continuous welding. Doors and vent openings to have back panel boxed around vent opening and welded to front panel. Doors dust proof and entire front face without seams or joints.
- B. Sliding doors mounted on ball bearing type rollers, sliding in dust proof #14 gauge S.S. tracks overhead, fastened so as to eliminate vibration and jarring when doors are rolled. Doors fitted with limit stops. Bottom guide of #14 gauge S.S. for doors, open and flat, lining up with lower shelf of cabinet - slots so arranged that crumbs or dirt accumulating in the cabinet will drop to the floor when cabinet is cleaned. Recessed handles solid material, not stamped, of S.S. welded to front panel. Finger grips of ample depth to comfortably pull the door. Doors provided with keyed-alike s.s. faced cylinder locks, built-in flush.

- C. Hinged type doors flush fitting, unless otherwise specified, resting tightly against rabbetted frame. Hinged doors provided with Klein Model #Y-48 (or approved equal) keyed-alike S.S. faced cylinder locks with Model #12230-SM (or approved equal) handles. In case of pair of doors, each individually controlled as outlined and is to close against rubber bumpers.
- D. Outer edges smooth, free from burrs, projections and fins. Excess welded metal removed by precision grinding and polishing.

1.50 REFRIGERATORS AND REFRIGERATION UNITS

- A. Reach-in refrigerators, freezers, and refrigerated units, as shown unless otherwise specified, furnished by Kitchen Equipment Contractor. They shall meet all requirements as set forth for individual item number and complete with self-contained or remote compressors and motors. Cooling coils blower type, unless otherwise called for, provided with initial charge of approved CFC free refrigerant. Plumbing Contractor responsible for extending refrigerator drain line, where required, to spill into adjacent floor drain in approved manner. Extended drain line not less than 3/4" I.D. and C.P. or S.S. tubing.
- B. All refrigerated equipment, refrigerators and freezers, whether walk-in or reach-in, started and adjusted to maintain required temperatures, charged with approved refrigerant as required.
- C. All reach-in refrigerators, freezers, hot food warmers, etc., to have keyed-alike locks. Kitchen Equipment Contractor must request this at time of placing order to avoid correction at a later date at Kitchen Equipment Contractor's expense.
- D. Kitchen Equipment Contractor to provide 1 year's free service for all types of refrigerators and refrigeration equipment. Free service on all compressors, unit coolers, controls, etc., to include adjustments and repairs, irrespective of cause, whether mechanical, operational or manufacturing at no additional cost to Owner. Five (5) year warranty provided on all compressors.

1.51 WALK-IN REFRIGERATOR AND FREEZER

- A. General Description: To be N.S.F. approved units, of size and manufacturer as indicated on contract drawings, 8'-6" high, unless otherwise specified, completely furnished and assembled unit installed in an approved manner. As indicated on drawing, either installed into a 6-1/2" depressed floor area with flush type door sill and floor finish as shown on contract drawings, or installed directly on floor with interior ramp, and pre-fabricated aluminum floor with heavy duty structural underlayment floor, approximately 5,000 pounds per square feet of load. Where pre-fabricated floor with interior ramp indicated, unit to be finished with "First Choice" vinyl safety flooring provided and installed by Kitchen Equipment Contractor. Where depressed floor indicated, doors, floors, etc. to accommodate concrete-tile finished floors, provided and installed by G.C. after all boxes have been set in place. Walk-in freezers to maintain 0 degree to "minus" 10 degree Fahrenheit temperature. Walk-In refrigerators to maintain 35 degree to 36 degree Fahrenheit temperature.
- B. Finishes: Unexposed exterior of each unit to be .040 stucco aluminum finishes. All exposed exterior surfaces to be #20 gauge stucco S.S. finish. Interior, except floor, to be .040 stucco white aluminum finish. Floor as noted hereinbefore in spec section 1.51 A.
- C. Insulation:
 - 1. Insulation shall be 4" thick rigid urethane foam, foamed-in-place to bond to inner surfaces of metal

pans. Urethane foam to have a thermal conductivity (K factor) of not more than 0.118 BTU/hr./sq. ft. per degrees Fahrenheit/inch, and an overall coefficient of heat transfer (U factor) of not more than .029. The "R" factor shall be 34.

2. (Optional) Prefabricated urethane foam panels shall be supplied with a Class 1 fire hazard classification according to ASTM-E-84 as tested by Factory Mutual System. Panels shall have a flame spread rating of 25 or less and a smoke density of no greater than 450 degrees. Every panel shall bear a certifying Factory Mutual label.
 3. * These ratings are not intended to reflect hazards presented by this or any other material under actual fire conditions.
- D. Doors: Each walk-in shall be equipped with one standard 34"/36" x 78" hinged-type, flush mounted entrance door bearing the UL seal of approval, or of size as indicated on drawing. Each door section consists of a heavy reinforced steel "U" channel frame, foamed-in-place to give extra support and rigidity to the frame and to prevent racking, distortion, warping and twisting. Doors to be #20 gauge S.S. interior and exterior. Door and door panel sections to have 1/8" diamond tread kick plates, 36" high on interior and exterior. Walk-in entrance doors shall be equipped with a one-piece perimeter NSF approved PVC accordion type removable gasket. A magnetic core at top and side shall provide positive seal. An adjustable wiper gasket shall be mounted along the bottom edge of door. Door frames shall be provided with an LED light fixture, pilot light and switch assembly, and concealed wiring. Provide #12 gauge reinforced S.S. threshold and heater wire around the full perimeter (freezer door only). All doors hinged as shown, each with heated 14" x 24" "vision" panel.
- E. Standard Hardware: Shall be break-a-way type with cylinder lock and inside safety release handle so door can be opened from the inside even if locked. All latches designed for locking with keyed-alike locks. A positive action hydraulic door closer shall be included to insure gentle closing action of door and insure a positive seal. Hinges shall be cam-lift, self-closing, spring assist with door lift-off capability. Hinges shall be high-pressure zinc die cast with highly polished chrome finish, three per door.
- F. Filler Panels: The "exposed" open area of unit at left, right and top at front and sides neatly trimmed with #20 gauge stucco S.S. filler panels to close space between wall and ceiling. Filler panels between top of walk-in box and finished ceiling not to exceed 12" in height. Filler panels equal to exterior of unit. Top panels to be equipped with louvered sections not less than 40% of total square footage of panel (when condensing units are top-mounted).
- G. Wall Protection: Two rows of #16 gauge S.S. hat shaped rub rails with concealed fasteners; to be provided and installed at all exposed exterior walls. Top of rub rail to align with top of diamond tread kick plate on door and bottom rub rail to be 10" A.F.F.
- When corners are exposed, provide 6"x6"x60" #12 gauge S.S. corner guard.
- H. Lights: Walk-In boxes to be provided with 48" LED light fixtures, Kason model #1810, quantity as shown on plan. The walk-in refrigerator and freezer to have LED type vapor-proof light, Kason model #1806, with concealed wiring, etc., and toggle switch with pilot light mounted on exterior. Kitchen Equipment Contractor to provide bulbs. It is the responsibility of the Kitchen Equipment Contractor to install light fixtures, provide penetrations in ceiling panels, and seal the penetrations after Electrical Contractor has completed wiring.
- I. Sealants: Kitchen Equipment Contractor shall seal all lines, conduits, tubing, wiring, etc., passing

through walls and ceiling of walk-in units with high grade caulking compound, then install s.s. escutcheons where required.

- J. Alarm System: Each compartment shall be protected by a recessed # 75B Modularm system with battery back-up, which shall provide digital readout of ambient compartment temperature(s). The alarm shall be located in an area as indicated on the Food Service Equipment Drawings. The alarm shall require 120/60/1 electrical connections through suitable 1/2" conduit. Dry contacts for activation of remote notification equipment will be provided as part of the alarm for use when specified. Furnish and install identification labels for operating temperatures as required.
- K. Ceiling Support: When split ceilings are required due to ceiling panel span, these ceilings are to be supported by a self-support ceiling structure. The walk-in manufacturer is to provide the ceiling hanger brackets, the steel channels and the bearing steel channels. A detail must be provided on the manufacturer's submittal drawing. Note: When longer spans are required that exceed self-support capability then suspended ceilings are to be provided with manufacturer's detail.
- L. Flat Membrane Weather-Proof Roof: Shall be supplied for field installation on top of each walk-in that is located outdoors. Membranes to be fabricated from low-shrink polyester fabric coated with a permanent thermoplastic alloy and have a minimum thickness of 35 mil. Membrane shall be fire retardant, resistant to ultra-violet rays and micro-organisms. Membrane to be white in color to reflect maximum heat load from the sun. Fasteners and trim shall be provided to secure the membrane to the ceiling panels and in cases where walk-in is installed against a building; the membrane roof material will be flashed up the building walls by the equipment installation contractor. The manufacturer's detail must be provided on the submittal drawing.
- M. Condensers and Evaporators: Cooler unit, model as indicated on drawings; room air drawn through coil and discharged parallel to ceiling. The coil casing is to be aluminum with a removable drain pan. Drain line from evaporator coil to floor drain as indicated on contract drawings, attached to interior of box with clamps and installed in good, approved, workmanlike manner by Plumbing Contractor. Compressor of the hermetic and/or scroll type, with suction gas cooled motor, designed for operation with approved refrigerant. Unit complete with liquid line drier, shut-off valves, vibration isolators, heat exchanger, dual pressure control and water regulating valve (for water-cooled systems), electrical panel with circuit breaker and magnetic starter. All components and accessories in control box that pertains to the condensing unit only should be factory wired and piped.

For outdoor systems a weather-proof housing, thermostatically controlled crank case heater and low ambient controls for -20F conditions shall be provided.

Note: Electrical Contractor to provide and install fused disconnect switch where required, as well as conduit and wiring from same to terminals in condensing unit control panel. Also, interconnect conduit and wiring from condensing unit control panel to unit cooler junction box inside walk-in units.

Freezer Unit, model as indicated on drawing, to be electric defrost. The coil casing is to be aluminum with a removable drain pan. Electric heating elements and drain pan heaters. Unit shall include control kit for time initiated temperature terminated defrost plus automatic fan delay. Heat interchanger included. Drain line from evaporator coil to floor drain as indicated on contract drawings, attached to interior of box with clamps and painted to match interior finish; and installed in good, approved, workmanlike manner by Plumbing Contractor. Kitchen Equipment Contractor to install adequate amount of wrap-around, electric heater tape to assure defrosting of drain line, cable lapped not over 1" spacing. Provide Raychem Winter Guard Plus electrical heat tracing model H611050 (type 3), self regulating in

temperature, run in parallel, to be designed with a maximum temperature that cannot be surpassed, certified by the manufacturer's representative that the heat trace has been installed and tested in accordance to the manufacturer's specifications. Heater tape connected to electric by Electrical Contractor. After installation and before and after installing the thermal insulation, subject heat to testing using a 2500 VDC megger. Minimum insulation resistance should be 20 megohms regardless of length. The installer shall test for both heating cable bus wires to verify the connection of any splices or tees.

Equipment shall have BTU/hr capacity as indicated on drawing and maintain room temperature of 35 to 36 degree Fahrenheit, where refrigerator is specified, and 0 to "minus" 10 degree Fahrenheit, where freezer is specified.

Refrigerant piping to be hard seamless copper tubing. Refrigerant lines installed and covered with not less than 1" thick flexible foam plastic insulation applied in accordance with the manufacturer's recommendations. Refrigeration lines to run from compressor location where shown, above the walk-in units. Kitchen Equipment Contractor Note: All lines to be tested free from leaks prior to finish of insulated lines. Condensates drain lines outside of walk-in boxes, similarly insulated with 1/2" insulation. Each system shall have suction line filters and vibration eliminators field installed.

Thermostatic expansion valves properly sized to handle evaporator loads. Liquid lines shall have moisture indicating sight glass, drier, and shut-off valve field installed.

The temperature in each walk-in box controlled by means of a thermostat wired to actuate a solenoid valve in the liquid lines with the compressor operation controlled by the low pressure cut-out switch. Thermostats and low pressure controls adjusted to maintain room temperatures specified. Each system cleaned and dehydrated by maintaining a vacuum of 500 microns or lower for a minimum period of 5 hours. The vacuum pump used capable of developing a vacuum of 50 microns with its valve in a closed position. The required operating charge of refrigerant and oil shall then be added and each system tested for performance. All refrigerant lines sized for 1 lb. maximum pressure drop.

It is the purpose of the specification to provide a satisfactory refrigeration cycle, therefore, Kitchen Equipment Contractor must include the competent labor and qualified material to provide the owner with an efficient system.

- N. Mounting Methods: Condensers, when mounted on building roof, to be provided with adequate dunnage/ curbing by Kitchen Equipment Contractor. Dunnage/ curbing installed by G.C. or roofing contractor. Architect to specify dunnage/ curbing details.

Condensers, when mounted on ceiling of walk-in, to be provided with adequate air circulation, service, access, and vibration isolation.

1.52 MILLWORK EQUIPMENT

- A. General Description: Woodwork to be minimum 3/4" marine grade plywood throughout. Woodwork counters shall be constructed to support the full weight of operating appliances without any deflection of the counter top. Where cut-outs are required in counter tops, appropriate framing needs to be provided around the cut-out to fully support the top in level position.

All miter joints shall be tight with no gaps or open spaces. Filling of miter joints with crack filler prior to finishing is not acceptable. Loose joints shall be hairline, flat, in single plane, with no exposed screws, nails or other fasteners. All dimensions, reveals and joints shall be held exact.

All fixtures shall be assembled in single and complete units as the dimensions will permit shipment to and installation at the building. Large pieces requiring sections construction shall have their parts accurately fitted and aligned with each other, and provided with ample screws, glue and bolt blocks, tongues, grooves and splines, dowels, mortises and tenons, screws, bolts or suitable means of concealed fastening, as required to render the work of substantial, rigid and permanently secured in proper position.

Sufficient additional material shall be allowed to permit accurate scribing to walls, floors and related work, and due allowance made wherever possible for such shrinkage as may develop after installation. Single and sectional units shall be provided with adequate cleating, blocking, crating and other forms of protection as required to prevent damage, soiling and deterioration during transit, delivery, storage and handling.

Framing and blocking members shall be assembled with bolted and screwed connection and should be secured to the structural backing with cinch, expansion screws or toggle bolts, as required; spaced and installed to ensure ample strength and rigidity. Rails and stiles shall be mortised and tenoned, work neatly mitered and membered, all butt joints made flush and smooth, and all permanent joints made up with water resistant glue. All fixtures shall be assembled without face screws or nails, except where it may be necessary to attach trim items. All face screws or nails that are necessary shall be countersunk and plastic wood or wood plugs used to cover head and the plug neatly touched up. The heads of all screws used in any assembly shall be countersunk below the surface.

- B. Joints: Mortise and tenon, spline, dowel and/or pin block and glue work to avoid use of nails wherever practical. Make butt joints with an approved device of prevention of separation of members. Blind nail and conceal.
- C. Plastic Laminate (HDPL): Plastic laminate shall be bonded to all exposed surfaces with contact cement fast bond #30, as manufactured by 3-M Products Company, or equal, to minimum 3/4" fir faced plywood applied under high pressure. Reject plastic laminate or plastic backing shall be used to prevent warping, unless otherwise specified. All edges shall be carefully sanded to smooth finish, removing burns, nicks and cut marks.
 - 1. Plastic laminate joints shall be finished without wavy and unsightly joints. Joints need not be mitered except if specified. Hand sand edges to a slight chamfer.
- D. Doors, Hinged: Hinged doors shall be fabricated of 3/4" thick plywood with plywood full perimeter edging with plastic laminate on face and self-edging on exposed sides. Door hinges, pulls and catches shall be supplied and installed as detailed. All doors to have minimum of 3 concealed, heavy duty, European hinges per section.
 - 1. Provide S.S. channel trim on the perimeter of the door to guard plastic laminate from chipping.
- E. Doors, Sliding: Sliding doors shall be fabricated of solid core plywood with hardwood edges and constructed similar to hinged doors. Doors shall be mounted on E-Z Glides track. Doors shall be removable without the use of tools. Rubber stops shall be provided concealed in end stile or mullion.
- F. Doors, Tambour Sliding: Tambour sliding doors shall be fabricated of individual hardwood slats, 3/8" by 3/4" round on 2 edges and glued to 20 ounce duck canvas or reject elastic vinyl plastic or equal and shall be provided with hardwood end stile with integral door pull. Track shall be lined with laminated plastic or equally smooth surface and guides at top and bottom shall be fabricated hardwood. Provide lock-pin

for sliding doors.

G. Access Panels/Louver Panels:

1. Access Panels: Shall be fabricated of 3/4" thick marine grade plywood and shall be fabricated to be removable for access. Each access panel shall be provided with 2 magnetic catches at top and 2 3/16" positioning pins at bottom (unless otherwise specified or detailed on drawings).
2. Louvered Panels: Are required in woodwork at all locations where proper ventilation is necessary for the efficient performance and operation (exhaust and/or supply) of the food service equipment compressor.

Types (when specified):

- a. Louvered panel spaced to conceal equipment yet provide adequate ventilation.
- b. Kitchen Equipment Contractor to coordinate size, quantity and location of louvered opening for sufficient ventilation of food service equipment. Refer to drawing details for cut-outs and spacing.
3. Unless otherwise directed, panels shall be powder coated to match laminate selection.

H. Louvered Doors: Must have concealed hardware to resemble access panels. Doors to have nylon roller friction type heavy duty catch and heavy duty concealed S.S. adjustable hinge.

1. Plastic laminate fronts: provide kiln dried pine shutter type slats. Wood to be free of knots with smooth grain, epoxy painted to match laminate selection. No raw wood surfaces will be acceptable. Paint or laminate as needed between slats.
2. Slats to be fixed, positioned to conceal equipment from sight.
3. Provide black color screening/mesh on rear of door with protective edges to prevent tearing.

I. Drawers: Drawers shall have dovetail construction, well glued and blocked. Fronts shall be not less than 3/4" thick marine grade plywood. Sides and back shall be 1/2 " thick fabricated of Birch, Maple or Sycamore except where extension slides are used, in which case the side shall be 5/8" thick. Bottom shall be milled into fronts and sides. Drawers shall be provided with suitable stops. Provide pulls as detailed or specified.

1. The inside surfaces of all drawers shall receive one coat of Penetrating Primer and one coat of glass lacquer.

J. Painted Finishes: Painted finishes shall have exposed surfaces free from defects and blemishes that would show after being finished, regardless of grade specific. All surfaces specified to receive paint or enamel finish shall receive one crosscoat of lacquer type undercoat. The undercoat shall be of appreciable different color than that of the finish coat, and of proper ground color with relation to the finish coat. After the undercoat has been thoroughly dried, surfaces shall be sanded smooth and two coats of enamel shall be applied. Back painting shall be provided for all cabinet and woodwork prior to installation.

- K. Interior and Wall Shelves: Cabinet interiors and wall shelves shall be laminated as specified under Section C, Plastic Laminate.

- L. Granite Tops:
 - 1. Color and finish shall be selected by the Architect, and physical properties shall confirm to manufacturer's standard specifications for foodservice application. The material shall be homogenous; and not of a composite construction.
 - 2. Granite shall be 3/4" thick with 1-1/4" face for counter tops unless otherwise specified.
 - 3. General installed to conform to manufacturers standard details in order to maintain product warranty, i.e. cut outs for drop-in equipment.

- M. Solid Surface:
 - 1. Of size and shape as shown. Top of minimum 1/2" thick Solid Surface, silicone mounted to 3/4" thick exterior grade plywood with ten year installation warranty. Solid Surface/S.S. fabrication, fabricated to comply with Solid Surface commercial specifications. Color of Solid Surface as selected by Architect. Top secured to counter base by means of concealed S.S. studs, nuts and washers. Angle frame under top sheathed with sound deadening material.

PART 2 – PRODUCTS

BAKERY KITCHEN AREA

ITEM #B1 STORAGE SHELVING – QUANTITY AS PER PLAN

- A. Intermetro Industries model Metro Max Q. Size, shape and installed where shown on drawings. Unit to be 21" front to back, five shelves high and mounted on standard uprights with adjustable feet.

ITEM # B2 WALK-IN COOLER – ONE REQUIRED

- A. Master-Bilt. Size, shape and installed where shown on drawings. Provided with all pre-formed panels, 34"x78" door with vision panel, flush mount temperature alarm system, stucco S.S. exterior where exposed, 4" thick floor throughout, with interior ramp, and fully welded vinyl safety flooring, unless otherwise noted on contract drawings, and/or otherwise described in General Specifications.

Provide Master Controller system, with Reverse Cycle Defrost (Hot Gas Defrost). All electrical components are to be factory pre-wired and tested. No line voltage is required between evaporator coils and condensing units. Provide two pairs of low voltage wires, typically thermostat cables, to operate the Reverse Cycle Defrost valve and the compressor relay at the condensing unit.

Include Web2Walk-in capability, to enable operator to remotely monitor and program all data and setpoints either through wireless internet or cabled (cat 5) connection. Provide a set of NO/NC contacts so system can be integrated into building management or alarm system.

ITEM # B3 REFRIGERATION TO ITEM #B2

- A. Master-Bilt model MHLZ0081B & E1HZ0070A. Unit to be installed where shown on drawings, in accordance to that as described in General Specifications. Evaporator coils mounted within walk-in box, suspended from ceiling. Condensing units mounted on building roof (unless otherwise specified) and provided with weatherproof cowl and winterized controls. Units are to be supplied with R-404A refrigerant, unless otherwise specified.

ITEM # B4 WALK-IN FREEZER – ONE REQUIRED

- A. Master-Bilt. Size, shape and installed where shown on drawings. Provided with all pre-formed panels, 34”x78” door with vision panel, flush mount temperature alarm system, pressure port, stucco S.S. exterior where exposed, 4” thick floor throughout with fully welded vinyl safety flooring, unless otherwise noted on contract drawings, and/or otherwise described in General Specifications.

Provide Master Controller system, with Reverse Cycle Defrost (Hot Gas Defrost). All electrical components are to be factory pre-wired and tested. No line voltage is required between evaporator coils and condensing units. Provide two pairs of low voltage wires, typically thermostat cables, to operate the Reverse Cycle Defrost valve and the compressor relay at the condensing unit.

Include Web2Walk-in capability, to enable operator to remotely monitor and program all data and setpoints either through wireless internet or cabled (cat 5) connection. Provide a set of NO/NC contacts so system can be integrated into building management or alarm system.

ITEM # B5 REFRIGERATION TO ITEM #B5

- A. Master-Bilt model MHLZ0091B & E1LZ0090B. Unit to be installed where shown on drawings, in accordance to that as described in General Specifications. Evaporator coils mounted within walk-in box, suspended from ceiling. Condensing units mounted on building roof (unless otherwise specified) and provided with weatherproof cowl and winterized controls. Units are to be supplied with R-404A refrigerant, unless otherwise specified.

ITEM # B6 PORTABLE STORAGE SHELVING – QUANTITY AS PER PLAN

- A. Intermetro Industries model Metro Max Q. Size, shape and installed where shown on drawings. Unit to be 21” front to back, five shelves high and mounted on standard uprights with heavy-duty casters, front two with brakes.

ITEM # B7 SPARE NUMBER

ITEM # B8 WORK TABLE WITH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B9 WALL MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B10 INGREDIENT BIN – TWO REQUIRED

- A. Cambro model IB32. Unit to be installed where shown on drawings.

ITEM # B11 ADA WALL MOUNT HAND SINK – ONE REQUIRED

- A. IMC/Teddy model ADA-WS. Unit to be installed where shown on drawings. Provided with soap and towel dispenser and 3” wrist action handles.

ITEM # B12 PREP TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B13 WALL MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B14 SPARE NUMBER

ITEM # B15 REACH-IN REFRIGERATOR – ONE REQUIRED

- A. Existing. Unit to be installed where shown on drawings. This is an existing item and is to be handled as described in General Specifications.

ITEM # B16 REACH-IN FREEZER – ONE REQUIRED

- A. Existing. Unit to be installed where shown on drawings. This is an existing item and is to be handled as described in General Specifications.

ITEM # B17 PORTABLE WORK TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B18 INGREDIENT BIN – ONE REQUIRED

- A. Cambro model IB32. Unit to be installed where shown on drawings.

ITEM # B19 PORTABLE WORK TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B20 COUNTER MIXER – ONE REQUIRED

- A. Hobart model HL200. Unit to be installed where shown on drawings. Provided with S.S. bowl, “B” beater, “C” wing whip, “D” wire whip, “ED” dough hook and bowl scraper.

ITEM # B21 SPARE NUMBER

ITEM # B22 INGREDIENT BIN – TWO REQUIRED

- A. Cambro model IB32. Unit to be installed where shown on drawings.

ITEM # B23 PORTABLE WORK TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B24 COUNTER MIXER – ONE REQUIRED

- A. Hobart model HL200. Unit to be installed where shown on drawings. Provided with S.S. bowl, “B” beater, “C” wing whip, “D” wire whip, “ED” dough hook and bowl scraper.

ITEM # B25 ADA WORK TABLE WITH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B26 PORTABLE WORK TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B27 INGREDIENT BIN – ONE REQUIRED

- A. Cambro model IB32. Unit to be installed where shown on drawings.

ITEM # B28 SPARE NUMBER

ITEM # B29 PORTABLE WORK TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B30 COUNTER MIXER – ONE REQUIRED

- A. Hobart model HL200. Unit to be installed where shown on drawings. Provided with S.S. bowl, “B” beater, “C” wing whip, “D” wire whip, “ED” dough hook and bowl scraper.

ITEM # B31 INGREDIENT BIN – TWO REQUIRED

- A. Cambro model IB32. Unit to be installed where shown on drawings.

ITEM # B32 PORTABLE WORK TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B33 COUNTER MIXER – ONE REQUIRED

- A. Hobart model HL200. Unit to be installed where shown on drawings. Provided with S.S. bowl, “B” beater, “C” wing whip, “D” wire whip, “ED” dough hook and bowl scraper.

ITEM # B34 PORTABLE DRYING RACK – TWO REQUIRED

- A. Intermetro Industries model Metro Max. Size, shape and installed where shown on drawings. Unit to be 24” front to back, four shelves high and mounted on standard uprights with heavy-duty casters, front two with brakes. Provided with cutting board and tray drying rack system, TR2448XEA, for (2) shelves.

ITEM # B35 HOSE REEL WITH GUN, UNDERMOUNT – ONE REQUIRED

- A. Fisher model 29599. Unit to be installed where shown on drawings. Provided with all necessary components and accessories for full operation. Mounted by K.E.C.

ITEM # B36 GARBAGE DISPOSER – ONE REQUIRED

- A. Salvajor model 300-SA-ARSS. Unit to be installed where shown on drawings. Provided with ARSS controls and sink assembly.

ITEM # B37 POT & PAN WAREWASHER – ONE REQUIRED

- A. Champion model PP-3 CUSTOM. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B38 WALL MOUNT SLOTTED OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B39 WALL MOUNT HAND SINK – ONE REQUIRED

- A. IMC/Teddy model WS. Unit to be installed where shown on drawings. Provided with soap and towel dispenser and 3” wrist action handles.

ITEM # B40 S.S. CHEMICAL CABINET, FULL HEIGHT – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B41 WALL MOUNT HAND SINK – ONE REQUIRED

- A. IMC/Teddy model WS. Unit to be installed where shown on drawings. Provided with soap and towel dispenser and 3” wrist action handles.

ITEM # B42 SPARE NUMBER

ITEM # B43 FIRE PROTECTION SYSTEM – ONE REQUIRED

- A. Ansul model UL-300 (R-102). Unit to be installed where shown on drawing in strict accordance to that described in General Specifications. For the protection of the equipment installed under Item #B51, Exhaust Hood, hereinafter specified.

ITEM # B44 FLOOR MIXER – ONE REQUIRED

- A. Hobart model HL800. Unit to be installed where shown on drawings. Provided with S.S. bowl, “B” beater, “C” wing whip, “D” wire whip, “ED” dough hook, bowl scraper, bowl splash cover, 30 quart accessories, bowl truck and adapter.

ITEM # B45 S.S. WALL PANEL(S) – QUANTITY AS PER PLAN

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed in drawings. Installed from top of coved base to underside of hood, hairline joints with s.s. trim strips and secured to wall with heat resistant mastic. Stainless steel to be 20 GA (gauge).

ITEM # B46 SPARE NUMBER

ITEM # B47 HEAVY DUTY GAS RANGE – ONE REQUIRED

- A. U.S. Range model C836-7. Unit to be installed where shown on drawings. Provided with S.S. front, left and right ends, 24” high S.S. flue riser, rear gas connection, quick disconnect and restraining cables. Mounted on heavy duty casters, front two with brakes. Provided with T&S B-0605A pot filler and suitable S.S. bracket to hold filler when not in use.

ITEM # B48 PIZZA OVEN, STONE DECK – ONE REQUIRED

- A. Blodgett Oven model 1048 Double. Unit to be installed where shown on drawings. Provided with stone decks, S.S. front, left and right side. Flue diverter mounted on standard legs.

ITEM # B49 SPARE NUMBER

ITEM # B50 GAS CONVECTION OVEN – ONE REQUIRED

- A. U.S. Range model SGM-200S1. Unit to be installed where shown on drawings. Provided with S.S. draft diverter, S.S. front, left and right ends, gas manifold for double oven, quick disconnect and restraining cables. Mounted on heavy duty casters, front two with brakes.

ITEM # B51 TYPE I EXHAUST HOOD – ONE REQUIRED

- A. Halton model KVC. Size, shape and installed where shown on drawings. Provided with factory installed auto-start interconnect, recessed fluorescent lights, hood mounted switch for lights (unless otherwise specified) and S.S. trim from top of hood to underside of finished ceiling on all exposed sides. Exhaust hoods to be in accordance with all local and national codes, K.E.C. to verify. Refer to

food service contract drawings and General Specifications for further product information.

ITEM # B52 WORK TABLE WITH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B53 WALL MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # B54 PROOF BOX – ONE REQUIRED

- A. Anets model RPB-1. Unit to be installed where shown on drawings.

ITEM # B55 PROOF BOX – ONE REQUIRED

- A. Anets model RPB-1. Unit to be installed where shown on drawings.

ITEM # B56 SPARE NUMBER

DISHROOM AREA

ITEM # D1 PASS-THRU WINDOW – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # D2 SOILED DISH TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # D3 S.S. SCRAPER – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # D4 WALL MOUNT HAND SINK – ONE REQUIRED

- A. IMC/Teddy model WS. Unit to be installed where shown on drawings. Provided with soap and towel dispenser and 3” wrist action handles.

ITEM # D5 WALL MOUNT RACK SHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # D6 GARBAGE DISPOSER – ONE REQUIRED

- A. Salvajor model 300-SA-ARSS. Unit to be installed where shown on drawings. Provided with ARSS controls and sink assembly.

ITEM # D7 SPARE NUMBER

ITEM # D8 PRE-WASH SINK, BUILT-IN – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # D9 RACK CONVEYOR WAREWASHER – ONE REQUIRED

- A. Champion Industries model 66DRPW (R-L). Unit to be installed where shown on drawings. Provided with single point electrical connection and (2) complete sets of all purpose racks. Operation of unit to be right to left.

ITEM # D10 WAREWASHER ACCESSORY – ONE REQUIRED

- A. Champion Industries model MCR-90. Unit to be installed where shown on drawings.

ITEM # D11 TYPE II EXHAUST HOOD – ONE REQUIRED

- A. Halton model CH. Size, shape and installed where shown on drawings. Provided with S.S. trim from top of hood to underside of finished ceiling on all exposed sides. Exhaust hoods to be in accordance with all local and national codes, K.E.C. to verify. Refer to food service contract drawings and General Specifications for further product information.

ITEM # D12 ROLLER TABLE SECTION – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # D13 CLEAN DISH TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # D14 SPARE NUMBER

ITEM # D15 WALL MOUNT RACK SHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # D16 HOSE REEL WITH GUN, UNDERMOUNT – ONE REQUIRED

- A. Fisher model 29599. Unit to be installed where shown on drawings. Provided with all necessary components and accessories for full operation. Mounted by K.E.C.

ITEM # D17 PORTABLE DRYING RACK – TWO REQUIRED

- A. Intermetro Industries model Metro Max. Size, shape and installed where shown on drawings. Unit to be 24” front to back, four shelves high and mounted on standard uprights with heavy-duty casters, front two with brakes. Provided with cutting board and tray drying rack system, TR2448XEA, for (2) shelves.

LUNCH KITCHEN AREA

ITEM # L1 POT WASH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L2 SLOTTED OVERSHELF, WALL MOUNT – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L3 S.S. CHEMICAL CABINET – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L4 WALL MOUNT HAND SINK – TWO REQUIRED

- A. IMC/Teddy model WS. Unit to be installed where shown on drawings. Provided with soap and towel dispenser and 3” wrist action handles.

ITEM # L5 PORTABLE DRYING RACK – ONE REQUIRED

- A. Intermetro Industries model Metro Max. Size, shape and installed where shown on drawings. Unit to be 24” front to back, four shelves high and mounted on standard uprights with heavy-duty casters, front two with brakes. Provided with cutting board and tray drying rack system, TR2448XEA, for (2) shelves.

ITEM # L6 STORAGE SHELVING – QUANTITY AS PER PLAN

- A. Intermetro Industries model Metro Max Q. Size, shape and installed where shown on drawings. Unit to be 21” front to back, five shelves high and mounted on standard uprights with adjustable feet.

ITEM # L7 HOSE REEL WITH GUN, UNDERMOUNT – ONE REQUIRED

- A. Fisher model 29599. Unit to be installed where shown on drawings. Provided with all necessary components and accessories for full operation. Mounted by K.E.C.

ITEM # L8 WALK-IN COOLER – ONE REQUIRED

- A. Master-Bilt. Size, shape and installed where shown on drawings. Provided with all pre-formed panels, 34"x78" door with vision panel, flush mount temperature alarm system, stucco S.S. exterior where exposed, 4" thick floor throughout, with interior ramp, and fully welded vinyl safety flooring, unless otherwise noted on contract drawings, and/or otherwise described in General Specifications.

Provide Master Controller system, with Reverse Cycle Defrost (Hot Gas Defrost). All electrical components are to be factory pre-wired and tested. No line voltage is required between evaporator coils and condensing units. Provide two pairs of low voltage wires, typically thermostat cables, to operate the Reverse Cycle Defrost valve and the compressor relay at the condensing unit.

Include Web2Walk-in capability, to enable operator to remotely monitor and program all data and setpoints either through wireless internet or cabled (cat 5) connection. Provide a set of NO/NC contacts so system can be integrated into building management or alarm system.

ITEM # L9 REFRIGERATION TO ITEM #L8 – ONE REQUIRED

- A. Master-Bilt model MHHZ0081B & E1HZ0070A. Unit to be installed where shown on drawings, in accordance to that as described in General Specifications. Evaporator coils mounted within walk-in box, suspended from ceiling. Condensing units mounted on building roof (unless otherwise specified) and provided with weatherproof cowl and winterized controls. Units are to be supplied with R-404A refrigerant, unless otherwise specified.

ITEM # L10 WALK-IN FREEZER – ONE REQUIRED

- A. Master-Bilt. Size, shape and installed where shown on drawings. Provided with all pre-formed panels, 34"x78" door with vision panel, flush mount temperature alarm system, pressure port, stucco S.S. exterior where exposed, 4" thick floor throughout, with interior ramp, and fully welded vinyl safety flooring, unless otherwise noted on contract drawings, and/or otherwise described in General Specifications.

Provide Master Controller system, with Reverse Cycle Defrost (Hot Gas Defrost). All electrical components are to be factory pre-wired and tested. No line voltage is required between evaporator coils and condensing units. Provide two pairs of low voltage wires, typically thermostat cables, to operate the Reverse Cycle Defrost valve and the compressor relay at the condensing unit.

Include Web2Walk-in capability, to enable operator to remotely monitor and program all data and setpoints either through wireless internet or cabled (cat 5) connection. Provide a set of NO/NC contacts so system can be integrated into building management or alarm system.

ITEM # L11 REFRIGERATION TO ITEM #L8 – ONE REQUIRED

- A. Master-Bilt model MHLZ0091B & E1LZ0090B. Unit to be installed where shown on drawings, in accordance to that as described in General Specifications. Evaporator coils mounted within walk-in box, suspended from ceiling. Condensing units mounted on building roof (unless otherwise specified) and provided with weatherproof cowl and winterized controls. Units are to be supplied with R-404A refrigerant, unless otherwise specified.

ITEM # L12 PORTABLE STORAGE SHELVING – QUANTITY AS PER PLAN

- A. Intermetro Industries model Metro Max Q. Size, shape and installed where shown on drawings. Unit

to be 21” front to back, five shelves high and mounted on standard uprights with heavy-duty casters, front two with brakes.

ITEM # L13 PREP TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L14 HOSE REEL WITH GUN, UNDERMOUNT – ONE REQUIRED

- A. Fisher model 29599. Unit to be installed where shown on drawings. Provided with all necessary components and accessories for full operation. Mounted by K.E.C.

ITEM # L15 GARBAGE DISPOSER – ONE REQUIRED

- A. Salvajor model 300-SA-ARSS. Unit to be installed where shown on drawings. Provided with ARSS controls and sink assembly.

ITEM # L16 WALL MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L17 VEGETABLE CUTTER – ONE REQUIRED

- A. Robot Coupe model R4X. Unit to be installed where shown on drawings.

ITEM # L18 FOOD SLICER – ONE REQUIRED

- A. Hobart model 2912. Unit to be installed where shown on drawings.

ITEM # L19 REACH-IN REFRIGERATOR – ONE REQUIRED

- A. True Food Service model TR1R-2HS. Unit to be installed where shown on drawings. Provided with half doors. Top section fitted with (3) standard shelves per compartment. Entire bottom section fitted with pan slides 3” O.C. to hold 18x26 or 12x20 pans.

ITEM # L20 PORTABLE WORK TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L21 WASHER, ADA COMPLIANT – ONE REQUIRED

- A. Asko model W6324. Unit to be installed where shown on drawings. Provided with necessary components for proper installation and operation. This unit plugs into the dryer unit, item #L21A, hereinafter specified.

ITEM #L21A DRYER, ADA COMPLIANT – ONE REQUIRED

- A. Asko model T743C. Unit to be installed where shown on drawings. Provided with necessary components for proper installation and operation. This unit is a ventless dryer application.

ITEM # L22 ADA WALL MOUNT HAND SINK – ONE REQUIRED

- A. IMC/Teddy model ADA-WS. Unit to be installed where shown on drawings. Provided with soap and towel dispenser and 3” wrist action handles.

ITEM # L23 FIRE PROTECTION SYSTEM – ONE REQUIRED

- A. Ansul model UL-300 (R-102). Unit to be installed where shown on drawing in strict accordance to that described in General Specifications. For the protection of the equipment installed under Item #L44, Exhaust Hood, hereinafter specified.

ITEM # L24 DUAL-TEMP REFRIGERATOR/FREEZER – ONE REQUIRED

- A. True Food Service model TR1DTPT-2HS. Unit to be installed where shown on drawings. Provided with half-doors. Refrigerator section fitted with pan slides, per compartment, 3” O.C. to hold 18x26 or 12x20 pans. Freezer section fitted with (3) standard shelves per compartment.

ITEM # L25 WORK TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L26 TABLE MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L27 ADA WORK TABLE WITH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L28 SPARE NUMBER

ITEM # L29 TABLE MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L30 BLAST CHILLER FREEZER – ONE REQUIRED

- A. Hurrichill model AP3BCF30-1. Unit to be installed where shown on drawings.

ITEM # L31 WORK TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L32 TABLE MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L33 WORK TABLE WITH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L34 TABLE MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L35 SPARE NUMBER

ITEM # L36 CEILING MOUNT POT RACK – ONE REQUIRED

- A. Eagle Group/ Metal Masters model CM84PR. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L37 S.S. WALL PANEL(S) – QUANTITY AS PER PLAN

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed in drawings. Installed from top of coved base to underside of hood, hairline joints with s.s. trim strips, secured to wall with heat resistant mastic.

ITEM # L38 DOUBLE-DECK OVEN– ONE REQUIRED

- A. Blodgett Oven model 1048 Double. Unit to be installed where shown on drawings. Provided with stone decks, S.S. front, left and right side. Flue diverter mounted on standard legs.

ITEM # L39 HEAVY DUTY GAS RANGE – ONE REQUIRED

- A. Existing. Unit to be installed where shown on drawings. This is an existing item and is to be handled as described in General Specifications.

ITEM # L40 FLOOR TROUGH – ONE REQUIRED

- A. Eagle Group/ Metal Masters model ASFT-1830-FG. Unit to be installed where shown on drawings. Provided with ADA compliant subway grating.

ITEM # L41 TILT SKILLET – ONE REQUIRED

- A. Cleveland Range model SEM40TR. Unit to be installed where shown on drawings. Provided with pan support, 2" tangent draw off and double spray hose.

ITEM # L42 SPARE NUMBER

ITEM # L43 COMBINATION OVEN-STEAMER – ONE REQUIRED

- A. Cleveland Range model OEB-6.20/ OEB-10.20. Unit to be installed where shown on drawings. Provided with hand pressure spray gun installed where shown on drawing, (1) case of oven cleaner, Everpure water filter model Kleensteam II (9797-K2PF) with (6) replacement cartridges and mounted on stand CST-20-OBCA with pan racks CST-20-R.

ITEM # L44 TYPE I EXHAUST HOOD – ONE REQUIRED

- A. Halton model KVC. Size, shape and installed where shown on drawings. Provided with factory installed auto-start interconnect, recessed fluorescent lights, hood mounted switch for lights (unless otherwise specified) and S.S. trim from top of hood to underside of finished ceiling on all exposed sides. Exhaust hoods to be in accordance with all local and national codes, K.E.C. to verify. Refer to food service contract drawings and General Specifications for further product information.

ITEM # L45 REACH-IN REFRIGERATOR – ONE REQUIRED

- A. True Food Service model TR1R-2HS. Unit to be installed where shown on drawings. Provided with half doors. Top section fitted with (3) standard shelves per compartment. Entire bottom section fitted with pan slides 3" O.C. to hold 18x26 or 12x20 pans.

ITEM # L46 REACH-IN REFRIGERATOR – ONE REQUIRED

- A. True Food Service model TR1R-2HS. Unit to be installed where shown on drawings. Provided with half doors. Top section fitted with (3) standard shelves per compartment. Entire bottom section fitted with pan slides 3" O.C. to hold 18x26 or 12x20 pans.

ITEM # L47 WORK COUNTER, 33" WIDE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L48 SPARE NUMBER

ITEM # L49 SPARE NUMBER

ITEM # L50 SPARE NUMBER

ITEM # L51 DUAL-TEMP REFRIGERATOR/ FREEZER – ONE REQUIRED

- A. True Food Service model TR1DT-2HS. Unit to be installed where shown on drawings. Provided with half-doors. Refrigerator section fitted with pan slides, per compartment, 3" O.C. to hold 18x26 or 12x20 pans. Freezer section fitted with (3) standard shelves per compartment.

ITEM # L52 ADA WALL MOUNT HAND SINK – ONE REQUIRED

- A. IMC/Teddy model ADA-WS. Unit to be installed where shown on drawings. Provided with soap and towel dispenser and 3” wrist action handles.

ITEM # L53 WARMING & HOLDING MOBILE CABINET – TWO REQUIRED

- A. Alto-Shaam model 1200-UP/HD. Unit to be installed where shown on drawings. Provided with option 44088, water reservoir pan 1775 and pan cover 1774.

ITEM # L54 ADA WORK COUNTER WITH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L55 WALL MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L56 SPARE NUMBER

ITEM # L57 REACH-IN REFRIGERATOR – ONE REQUIRED

- A. True Food Service model TR2R-4HS. Unit to be installed where shown on drawings. Provided with half doors. Top section fitted with (3) standard shelves per compartment. Entire bottom section fitted with pan slides 3” O.C. to hold 18x26 or 12x20 pans.

ITEM # L58 WORK COUNTER WITH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L59 WALL MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L60 MILK COOLER – ONE REQUIRED

- A. True Food Service model TMC-49-S-SS. Unit to be installed where shown on drawings.

ITEM # L61 SERVING COUNTER – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L62 CASHIER COUNTER – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L63 SPARE NUMBER

ITEM # L64 V-RIBBED TRAY SLIDE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L65 DROP-IN COLD PAN – ONE REQUIRED

- A. Atlas Metal Industries model RM-4. Unit to be installed where shown on drawings.

ITEM # L66 FOOD PROTECTOR(S) – ONE REQUIRED

- A. Brass Smith model Z9500 Series. Size, shape and installed where shown on drawings. Provided with 1” diameter post extending 24” above counter top and 12” below counter top anchored to counter frame, black plastic sleeve where post extends thru counter top. Glass shelves to be quantity per drawings.

ITEM # L67 DROP-IN, HOT WELLS – ONE REQUIRED

- A. Atlas Metal Industries model WIHD+M-4. Unit to be installed where shown on drawings.

ITEM # L68 FOOD PROTECTOR(S) – ONE REQUIRED

- A. Brass Smith model Z9500 Series. Size, shape and installed where shown on drawings. Provided with 1” diameter post extending 24” above counter top and 12” below counter top anchored to counter frame, black plastic sleeve where post extends thru counter top. Glass shelves to be quantity per drawings.

ITEM # L69 V-RIBBED TRAY SLIDE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # L70 SPARE NUMBER

ITEM # L71 DROP-IN, HOT WELLS – ONE REQUIRED

- A. Atlas Metal Industries WIHD+M-4. Unit to be installed where shown on drawings.

ITEM # L72 FOOD PROTECTOR(S) – ONE REQUIRED

- A. Brass Smith model Z9500 Series. Size, shape and installed where shown on drawings. Provided with 1” diameter post extending 24” above counter top and 12” below counter top anchored to counter frame, black plastic sleeve where post extends thru counter top. Glass shelves to be quantity per drawings.

ITEM # L73 DROP-IN COLD PAN – ONE REQUIRED

- A. Atlas Metal Industries model RM-4. Unit to be installed where shown on drawings.

ITEM # L74 FOOD PROTECTOR(S) – ONE REQUIRED

- A. Brass Smith model Z9500 Series. Size, shape and installed where shown on drawings. Provided with 1” diameter post extending 24” above counter top and 12” below counter top anchored to counter frame, black plastic sleeve where post extends thru counter top. Glass shelves to be quantity per drawings.

ITEM # L75 MILK COOLER – ONE REQUIRED

- A. True Food Service TMC-49-S-SS. Unit to be installed where shown on drawings.

ITEM # L76 CONDIMENT CART – ONE REQUIRED

- A. Server Products model 07360. Unit to be installed where shown on drawings.

ITEM # L77 CAN RACK – THREE REQUIRED

- A. Channel Manufacturing model CSR-156. Unit to be installed where shown on drawings.

ITEM # L78 CONDIMENT CART – ONE REQUIRED

- A. Server Products model 07360. Unit to be installed where shown on drawings.

ITEM # L79 CONDIMENT CART – ONE REQUIRED

- A. Server Products model 07360. Unit to be installed where shown on drawings.

ITEM # L80 CONDIMENT CART – ONE REQUIRED

- A. Server Products model 07360. Unit to be installed where shown on drawings.

ITEM # L81 STORAGE SHELVING – QUANTITY AS PER PLAN

- A. Intermetro Industries model Metro Max Q. Size, shape and installed where shown on drawings. Unit to be 21” front to back, five shelves high and mounted on standard uprights with adjustable feet.

RESTAURANT KITCHEN AREA

ITEM # R1 STORAGE SHELVING – QUANTITY AS PER PLAN

- A. Intermetro Industries model Metro Max Q. Size, shape and installed where shown on drawings. Unit to be 21” front to back, five shelves high and mounted on standard uprights with adjustable feet.

ITEM # R2 PORTABLE STORAGE SHELVING – QUANTITY AS PER PLAN

- A. Intermetro Industries model Metro Max Q. Size, shape and installed where shown on drawings. Unit to be 21” front to back, five shelves high and mounted on standard uprights with heavy-duty casters,

front two with brakes.

ITEM # R3 MOPSINK – ONE REQUIRED

- A. Eagle Group/ Metal Masters model F1916. Provided with mop holder 321561, secured to S.S. channel and service wall faucet 312690.

ITEM # R4 WALK-IN COOLER – ONE REQUIRED

- A. Master-Bilt. Size, shape and installed where shown on drawings. Provided with all pre-formed panels, 34”x78” door with vision panel, flush mount temperature alarm system, stucco S.S. exterior where exposed, 4” thick floor throughout with fully welded vinyl safety flooring, unless otherwise noted on contract drawings, and/or otherwise described in General Specifications.

Provide Master Controller system, with Reverse Cycle Defrost (Hot Gas Defrost). All electrical components are to be factory pre-wired and tested. No line voltage is required between evaporator coils and condensing units. Provide two pairs of low voltage wires, typically thermostat cables, to operate the Reverse Cycle Defrost valve and the compressor relay at the condensing unit.

Include Web2Walk-in capability, to enable operator to remotely monitor and program all data and setpoints either through wireless internet or cabled (cat 5) connection. Provide a set of NO/NC contacts so system can be integrated into building management or alarm system.

ITEM # R5 REFRIGERATION TO ITEM #R4 – ONE REQUIRED

- A. Master-Bilt model MHHZ00818 & E1HZ0070A. Unit to be installed where shown on drawings, in accordance to that as described in General Specifications. Evaporator coils mounted within walk-in box, suspended from ceiling. Condensing units mounted on building roof (unless otherwise specified) and provided with weatherproof cowl and winterized controls. Units are to be supplied with R-404A refrigerant, unless otherwise specified.

ITEM # R6 WALK-IN FREEZER – ONE REQUIRED

- A. Master-Bilt. Size, shape and installed where shown on drawings. Provided with all pre-formed panels, 34”x78” door with vision panel, flush mount temperature alarm system, pressure port, stucco S.S. exterior where exposed, 4” thick floor throughout with fully welded vinyl safety flooring, unless otherwise noted on contract drawings, and/or otherwise described in General Specifications.

Provide Master Controller system, with Reverse Cycle Defrost (Hot Gas Defrost). All electrical components are to be factory pre-wired and tested. No line voltage is required between evaporator coils and condensing units. Provide two pairs of low voltage wires, typically thermostat cables, to operate the Reverse Cycle Defrost valve and the compressor relay at the condensing unit.

Include Web2Walk-in capability, to enable operator to remotely monitor and program all data and setpoints either through wireless internet or cabled (cat 5) connection. Provide a set of NO/NC contacts so system can be integrated into building management or alarm system.

ITEM # R7 SPARE NUMBER

ITEM # R8 REFRIGERATION TO ITEM #R6 – ONE REQUIRED

- A. Master-Bilt model MHLZ0091B & E1LZ0090B. Unit to be installed where shown on drawings, in accordance to that as described in General Specifications. Evaporator coils mounted within walk-in box, suspended from ceiling. Condensing units mounted on building roof (unless otherwise specified) and provided with weatherproof cowl and winterized controls. Units are to be supplied with R-404A refrigerant, unless otherwise specified.

ITEM # R9 PORTABLE STORAGE SHELVING – QUANTITY AS PER PLAN

- A. Intermetro Industries Metro Max Q. Size, shape and installed where shown on drawings. Unit to be 21” front to back, five shelves high and mounted on 74” high uprights with heavy-duty casters, front two with brakes.

ITEM # R10 S.S. CHEMICAL CABINET – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R11 POT WASH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R12 SLOTTED OVERSHELF, WALL MOUNT – ONE REQUIRED

- A. Intermetro Industries model Metro Max. Unit to be installed where shown on drawings.

ITEM # R13 PORTABLE DRYING RACK – QUANTITY AS PER PLAN

- A. Intermetro industries model Metro Max. Intermetro Industries model Metro Max. Size, shape and installed where shown on drawings. Unit to be 24” front to back, four shelves high and mounted on 74” high uprights with heavy-duty casters, front two with brakes. Provided with cutting board and tray drying rack system, TR2448XEA, for (2) shelves.

ITEM # R14 UNDERMOUNT HOSE REEL WITH GUN – ONE REQUIRED

- A. Fisher model 29599. Unit to be installed where shown on drawings. Provided with all necessary components and accessories for full operation. Mounted by K.E.C.

ITEM # R15 WALL MOUNT HAND SINK – ONE REQUIRED

- A. IMC/Teddy model WS. Unit to be installed where shown on drawings. Provided with soap and towel dispenser and 3”wrist action handles.

ITEM # R16 PREP TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R17 GARBAGE DISPOSER – ONE REQUIRED

- A. Salvajor model 300-SA-ARSS. Unit to be installed where shown on drawings. Provided with ARSS controls and sink assembly.

ITEM # R18 WALL MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R19 VEGETABLE CUTTER – ONE REQUIRED

- A. Robot Coupe model R4X. Unit to be installed where shown on drawings.

ITEM # R20 PORTABLE WORK TABLE – TWO REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R21 SPARE NUMBER

ITEM # R22 ADA WALL MOUNT HAND SINK – ONE REQUIRED

- A. IMC/Teddy model ADA-WS. Unit to be installed where shown on drawings. Provided with soap and towel dispenser and 3" wrist action handles.

ITEM # R23 FIRE PROTECTION SYSTEM – ONE REQUIRED

- A. Ansul model UL-300 (R-102). Unit to be installed where shown on drawing in strict accordance to that described in General Specifications. For the protection of the equipment installed under Item #R62, Exhaust Hood, hereinafter specified.

ITEM # R24 BLAST CHILLER/FREEZER – ONE REQUIRED

- A. Hurrichill model AP3BCF30-1. Unit to be installed where shown on drawings. Provided with germicide system kit, electro-fin coating and mounted on heavy duty casters, front two with brakes. Overall height not to exceed 33-1/2".

ITEM # R25 ADA WORK TABLE WITH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R26 WALL MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R27 FOOD SLICER – ONE REQUIRED

- A. Hobart model 2912. Unit to be installed where shown on drawings.

ITEM # R28 SPARE NUMBER

ITEM # R29 ICE MAKER WITH BIN – ONE REQUIRED

- A. Manitowoc Ice model SD-0602A / B-570. Unit to be installed where shown on drawings. Provided with S.S. exterior finish, AuCS option, Everpure water filter EV9324-01 (I-2000), subject to verification by manufacturer, and (6) replacement cartridges.

ITEM # R30 REACH-IN REFRIGERATOR – ONE REQUIRED

- A. True Food Service model TR1R-2HS. Unit to be installed where shown on drawings. Provided with half doors. Top section fitted with (3) standard shelves per compartment. Entire bottom section fitted with pan slides 3” O.C. to hold 18x26 or 12x20 pans.

ITEM # R31 S.S. WALL PANEL(S) – QUANTITY AS PER PLAN

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed in drawings. Installed from top of coved base to underside of hood, hairline joints with s.s. trim strips, secured to wall with heat resistant mastic.

ITEM # R32 GAS RESTAURANT RANGE – ONE REQUIRED

- A. U.S. Range model PS-6-24BG-2626. Unit to be installed where shown on drawings. S.S. front, left, and right end. S.S. double-deck high shelf.

ITEM # R33 CHAR-BROILER – ONE REQUIRED

- A. U.S. Range model C836-436A. Unit to be installed where shown on drawings. S.S. front, left, and right end. 17” high S.S. flue riser.

ITEM # R34 SPARE NUMBER

ITEM # R35 SPARE NUMBER

ITEM # R36 FRYER, BATTERY, GAS WITH FILTER – ONE REQUIRED

- A. Frymaster model H55-BLD-SC (H55 Series Dump). Unit to be installed where shown on drawings. Consisting of (1) fryer and (1) dump station. Provided with (2) half size baskets, (1) full size basket (per each fryer), basket lifts, digital controls, Foot Print PRO Filtration System and heat lamp. Battery provided with locking heavy duty casters, quick disconnects and restraining devices.

ITEM # R37 CONVECTION STEAMER – ONE REQUIRED

- A. Cleveland Range model 24CGM200. Unit to be installed where shown on drawing. Provided with pilotless ignition, boiler descaling pump kit, Everpure water filter EV9797-21 (Kleansteam II Single), subject to verification by manufacturer, and (6) replacement cartridges. Filter connected thru cold water supply only.

ITEM # R38 TYPE I EXHAUST HOOD – ONE REQUIRED

- A. Halton model KVC. Size, shape and installed where shown on drawings. Provided with factory installed auto-start interconnect, recessed fluorescent lights, hood mounted switch for lights (unless otherwise specified) and S.S. trim from top of hood to underside of finished ceiling on all exposed sides. Exhaust hoods to be in accordance with all local and national codes, K.E.C. to verify. Refer to food service contract drawings and General Specifications for further product information.

ITEM # R39 BUILT-IN HAND SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R40 FIRE PROTECTION SYSTEM – ONE REQUIRED

- A. Ansul model UL-300 (R-102). Unit to be installed where shown on drawing in strict accordance to that described in General Specifications. For the protection of the equipment installed under Item #R38, Exhaust Hood, hereinbefore specified.

ITEM # R41 WORK TABLE WITH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R42 SPARE NUMBER

ITEM # R43 WALL MOUNT OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R44 REACH-IN REFRIGERATOR/FREEZER – ONE REQUIRED

- A. True Food Service model TR1DT-2HS. Unit to be installed where shown on drawings. Provided with half-doors. Refrigerator section fitted with pan slides, per compartment, 3” O.C. to hold 18x26 or 12x20 pans. Freezer section fitted with (3) standard shelves per compartment.

ITEM # R45 CHEF’S TABLE WITH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R46 DROP-IN BAIN MARIE – ONE REQUIRED

- A. Wells model HT-400. Unit to be installed where shown on drawings.

ITEM # R47 PANTRY TYPE FAUCET – ONE REQUIRED

- A. T&S Brass model B-0305. Unit to be installed where shown on drawings.

ITEM # R48 WARMING AND HOLDING MOBILE CABINET – ONE REQUIRED

- A. Alto-Shaam model 750-S/HD. Unit to be installed where shown on drawings. Provided with full perimeter bumpers and heavy duty casters, front two with brakes.

ITEM # R49 SPARE NUMBER

ITEM # R50 OPEN TRAY REST – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R51 TWO-TIER OVERSHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R52 FOOD OVERHEAD WARMER – THREE REQUIRED

- A. Hatco model GR-48. Unit to be installed where shown on drawings.

ITEM # R53 OPEN TRAY REST – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R54 DROP-IN SOUP WELLS – TWO REQUIRED

- A. Wells model SS-10ULTD. Unit to be installed where shown on drawings. Provided with 7 and 11 quart insets with hinged lids and drain valve extension kit.

ITEM # R55 CHEF'S TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R56 HOT WELLS, BUILT-IN – THREE REQUIRED

- A. Wells model SS-206ULTD. Unit to be installed where shown on drawings.

ITEM # R57 SANDWICH/SALAD PREP REFRIGERATOR – ONE REQUIRED

- A. True Food Service model TSSU-60-18M-B. Unit to be installed where shown on drawings.

ITEM # R58 TWO-TIER OVERSHELF WITH HEAT – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item

and is to be constructed as described in General Specifications and as further detailed on drawings. Top tier to be inter-wired with Hatco heat lamp model GR-48.

ITEM # R59 WORK TABLE WITH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R60 S.S. WALL PANEL(S) – QUANTITY AS PER PLAN

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed in drawings. Installed from top of coved base to underside of hood, hairline joints with s.s. trim strips, secured to wall with heat resistant mastic.

ITEM # R61 RESTAURANT GAS RANGE – ONE REQUIRED

- A. U.S. Range model PS-6-24BG-2626. Unit to be installed where shown on drawings.

ITEM # R62 TYPE I EXHAUST HOOD – ONE REQUIRED

- A. Halton Model KVC. Size, shape and installed where shown on drawings. Provided with factory installed auto-start interconnect, recessed fluorescent lights, hood mounted switch for lights (unless otherwise specified) and S.S. trim from top of hood to underside of finished ceiling on all exposed sides. Exhaust hoods to be in accordance with all local and national codes, K.E.C. to verify. Refer to food service contract drawings and General Specifications for further product information.

ITEM # R63 SPARE NUMBER

ITEM # R64 SPARE NUMBER

ITEM # R65 PORTABLE DRYING RACK – ONE REQUIRED

- A. Intermetro Industries model Metro Max. Size, shape and installed where shown on drawings. Unit to be 24” front to back, four shelves high and mounted on standard uprights with heavy-duty casters, front two with brakes. Provided with cutting board and tray drying rack system, TR2448XEA, for (2) shelves.

ITEM # R66 HOSE REEL WITH GUN, UNDERMOUNT – ONE REQUIRED

- A. Fisher model 29599. Unit to be installed where shown on drawings. Provided with all necessary components and accessories for full operation. Mounted by K.E.C.

ITEM # R67 CLEAN DISH TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R68 DOOR TYPE, HIGH TEMP DISHWASHER – ONE REQUIRED

- A. Champion Industries model DHB-T. Unit to be installed where shown on drawings. Provided with (2) complete sets of all purpose racks and built-in 70-degree rise HW booster.

ITEM # R69 TYPE II EXHAUST HOOD – ONE REQUIRED

- A. Halton model CH. Size, shape and installed where shown on drawings. Provided with S.S. trim from top of hood to underside of finished ceiling on all exposed sides. Exhaust hoods to be in accordance with all local and national codes, K.E.C. to verify. Refer to food service contract drawings and General Specifications for further product information.

ITEM # R70 SPARE NUMBER

ITEM # R71 GARBAGE DISPOSER – ONE REQUIRED

- A. Salvajor model 300-SA-ARSS. Unit to be installed where shown on drawings. Provided with ARSS controls and sink assembly.

ITEM # R72 PRE-WASH SINK, BUILT-IN – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R73 SOILED DISH TABLE – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R74 DUAL-SIDED RACK SHELF – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R75 ICE MAKER WITH BIN – ONE REQUIRED

- A. Manitowoc Ice model QM-45A. Unit to be installed where shown on drawings. Provided with S.S. exterior finish, AuCS option, Everpure water filter EV9324-01 (I-2000), subject to verification by manufacturer, and (6) replacement cartridges.

ITEM # R76 WORK COUNTER WITH SINK – ONE REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawings. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed on drawings.

ITEM # R77 WALL MOUNT HAND SINK – TWO REQUIRED

- A. IMC/Teddy model WS. Unit to be installed where shown on drawings. Provided with soap and towel dispenser and 3" wrist action handles.

ITEM # R78 GLASS FILLER – ONE REQUIRED

- A. Fisher model 89494. Unit to be installed where shown on drawings.

ITEM # R79 UNDERCOUNTER REFRIGERATOR – ONE REQUIRED

- A. True Food Service model TUC-27-LP. Unit to be installed where shown on drawings.

ITEM # R80 AUTOMATIC COFFEE MAKER – ONE REQUIRED

- A. Bunn-O-Matic model 12950.0112. Unit to be installed where shown on drawings. Provided with (5) regular glass decanters, (5) decaf glass decanters and 500 paper filters. Water connection piped thru wall mounted Everpure filter EV9272-00, subject to verification by manufacturer, and (6) replacement cartridges.

ITEM # R81 S.S. WALL CABINET(S) – TWO REQUIRED

- A. Marlo Manufacturing. Size, shape, and installed where shown on drawing. This is a fabricated item and is to be constructed as described in General Specifications and as further detailed in drawings.

PART 3 - EXECUTION

3.01 GENERAL RELATED CONDITIONS

- A. In each item of equipment hereinafter specified under the "Schedule of Items of Equipment," these specifications shall only identify each respective item by name and number, as well as list various component parts provided for same.
- B. Therefore, it shall be intended that these respective items and their component parts shall be of material (mounted where applicable) constructed and furnished in strict accordance to that described in the general specifications for these items and integrally constructed where applicable.
- C. It shall also be intended that where buy-out (pre-fabricated) items are specified, same shall be definitely furnished with all the accessories as normally furnished by manufacturer for these items. Also in strict accordance with current manufacturer's engineering data sheet for each respective item.

3.02 EXAMINATION OF PLANS AND SPECIFICATIONS

- A. Prospective bidders for this work must examine these plans and specifications carefully before bidding, and must request from Architect in writing for an interpretation or correction of every apparent ambiguity, inconsistency or error therein. If necessary, such interpretation or correction shall be issued in writing as an addendum. No calls will be accepted.

3.03 SPECIAL NOTES

- A. It shall be the responsibility of Kitchen equipment Contractor to keep up to date with progress made in field on installation of all necessary roughing to adequately and properly operate and accommodate all equipment furnished by Kitchen equipment Contractor and as shown on drawings, to make as many visits to the job site as is necessary to check and assure that all roughing is being properly installed to accommodate this equipment. Include this service in bid.

- B. Kitchen equipment Contractor to cooperate with all trades so that the end results of his work will be a satisfactory, approved and accepted installation. Written reports of each visit shall be sent promptly to the Architect and the Food Service Consultant.

3.04 COORDINATION

- A. Procedure of construction is of paramount importance in executions of this project. Kitchen Equipment Contractor to carry on his work so that no delay in his operations or those of any other contractors occurs at any time.
- B. Kitchen equipment Contractor to verify with Architect as to opening date of the food service area, and schedule his fabrication and purchasing of equipment so that all will be in readiness, installed, connected, tested, demonstrated, etc., in ample time prior to the scheduled opening date.

3.05 DELIVERY AND INSTALLATION

- A. Shall mean and intend that Kitchen equipment Contractor shall deliver and assemble all equipment of contract in 1 piece in required locations in building, ready for water, waste, gas, electric and ventilating connections required by other contractors. Any pieces of equipment may be delivered sectionally, but all working surfaces butt-welded, ground and polished on premises so that upon completion, such item of equipment will have true, smooth, even and continuous surfaces. Butt joining and filling with solder not permitted. Kitchen equipment Contractor must verify door sizes, delivery platform, elevator size, etc., effecting delivery to food service areas for all items of equipment.

3.06 RESERVATIONS AND CONDITIONS

- A. It is the intent of this specification to complete the installation of all equipment covered herein in all phases ready for operation. Contractor shall carefully examine the plans and specifications for building construction contracts and determine there from the extent of his operations in all respects. All labor and materials not included in building construction contracts necessary to accomplish this intent are hereby included in this contract.
- B. Kitchen equipment Contractor shall attend job meetings when required for purpose of coordinating his work with other trades.
- C. All equipment shall be received at the building fully protected. It will be the responsibility of the Kitchen equipment Contractor to protect the equipment until completely installed and accepted.

3.07 EXISTING EQUIPMENT (RELOCATED AND/OR REINSTALLED)

- A. Prior to submission of bid for equipment listed in Schedule of Equipment, Kitchen equipment Contractor shall visit the existing kitchen and cafeteria areas and survey all existing equipment intended to be re-used (or not used) in the new kitchen and cafeteria to determine the extent of his work. Bid shall include the cost of dismantling and moving, all re-usable equipment to a temporary storage location designated by Architect/Owner. Necessary plumbing, duct, and electric disconnections shall be done by the respective trades.
- B. Kitchen equipment Contractor shall remove from the premises all old, not re-used kitchen equipment as identified by Owner. Disposal of all such equipment shall be at the discretion of Kitchen equipment Contractor, but shall be removed from the premises immediately when available.

- C. When new areas are completed, Kitchen equipment Contractor shall locate all new and re-usable existing equipment in their respective locations, assemble and set in place, as shown on drawings, left plumb and true ready for necessary final connections by others. Conditions listed in the specifications under "Delivery and Installation" shall apply to all re-usable existing equipment.

- D. Roughing drawings and all other necessary drawings and information covering the proper installation of all re-usable existing equipment shall be submitted by Kitchen equipment Contractor.

END OF SECTION

SECTION 11 52 13 - PROJECTION SCREENS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Front-projection screens.
- B. Related Sections include the following:
 - 1. Division 16 Sections for electrical wiring, connections, and installation of remote-control switches for electrically operated projection screens.

1.3 DEFINITIONS

- A. Gain: Ratio of light reflected from or refracted by screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per FS GG-S-00172D(1).
- B. Half-Gain Angle: The angle, measured from the axis of the screen surface, to the most central position on perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.

1.4 SUBMITTALS

- A. Product Data: For each type of screen specified.
- B. Shop Drawings: Show layout and types of projection screens. Include the following:
 - 1. Location of screen centerline relative to ends of screen case.
 - 2. Location of wiring connections.
 - 3. Location of seams in viewing surfaces.
 - 4. Connections to suspension systems for pendant- and recess-mounted screens.
 - 5. Anchorage details.
 - 6. Details of juncture of exposed surfaces with adjacent finishes.
 - 7. Frame details.
 - 8. Accessories.
 - 9. Wiring Diagrams: For electrically operated units.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain projection screens through one source from a single manufacturer. Obtain each screen as a complete unit, including necessary mounting hardware and accessories.

- B. Coordination of Work: Coordinate layout and installation of projection screens with other construction supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver projection screens until building is enclosed, other construction within spaces where screens will be installed is substantially complete, and installation of screens is ready to begin.
- B. Protect surfaces of rear-projection screens from damage due to abrasion, dust, and other conditions.

PART 2 - PRODUCTS

2.1 FRONT-PROJECTION SCREENS

- A. Material and Viewing Surface of Front-Projection Screens: Provide screens manufactured from mildew- and flame-resistant fabric of type indicated for each type of screen specified and complying with the following requirements:
 - 1. Matte-white viewing surface with gain characteristics complying with FS GG-S-00172D(1) for Type A screen surface.
 - 2. Material: Seamless woven-cloth proprietary fabric with a glass-fiber base.
 - 3. Mildew Resistance: Provide mildew-resistant screen fabrics as determined by FS 191A/5760.
 - 4. Fire-Test-Response Characteristics: Provide projection-screen fabrics identical to materials that have been tested for flame resistance according to both small- and large-scale tests of NFPA 701.
 - 5. Seamless Construction: Provide screens in sizes indicated without seams.
 - 6. Edge Treatment: Without black masking borders.
 - 7. Provide extra drop length of 36-inches (915-mm) to comply with the following requirements for fabric color and location of drop length:
 - a. Color: Same as viewing surface.
 - b. Location: At top of screen.
 - 8. Size of Viewing Surface:
 - a. 10'-0" Wide x 8'-0" High—Media Center.
 - b. 12'-0" Wide x 9'-0" High—Multipurpose & Cafeteria.
- B. Electrically Operated Screens, General: Provide manufacturer's standard UL-labeled units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Remotely control operation of each screen to comply with the following:
 - 1. Single-Station Control: 3-position control switch with metal device box and cover plate for flush wall mounting and for connection to 120-V, ac power supply.

- a. Provide key-operated switch.
2. End-Mounted Motor: Instant-reversing, gear-drive 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. Locate motor in its own compartment as follows:
 - a. On right end of screen, unless otherwise indicated.
3. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch- (9.5-mm-) diameter, metal rod with ends of rod protected by plastic caps.
 - a. Roller for end-mounted motor supported by self-aligning bearings in brackets.
- C. Electrically Operated Screens without Ceiling Closure: Units designed and fabricated for recessed, surface, or suspended installation with bottom of case entirely or partially open under screen compartment, to allow lowering and raising of screen, but closed under motor compartment, and as follows:
 1. Screen Case: Wood sides and top with metal-lined motor compartment, factory primed and constructed as follows:
 - a. Provide single or double top as standard with manufacturer.
 - b. Provide double top.
- D. Products: Subject to compliance with requirements, provide one of the following:
 1. Matte-White Viewing Surfaces:
 - a. Matte White; Bretford Manufacturing, Inc.
 - b. Matte White; Da-Lite Screen Co., Inc.
 - c. Panamax Seamless Matte White; Draper Shade & Screen Co., Inc.
 2. Electrically Operated Screens without Ceiling Closure, End-Mounted Motor:
 - a. Series 900; Bretford Manufacturing, Inc.
 - b. Senior Electrol; Da-Lite Screen Co., Inc.
 - c. Rolleramic; Draper Shade & Screen Co., Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install projection screens at locations indicated to comply with screen manufacturer's written instructions.

- B. Install front-projection screens with screen cases in position and relationship 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. Test electrically operated units to verify that screen, controls, limit switches, closure, and other operating components are in optimum functioning condition.

3.2 PROTECTING AND CLEANING

- A. Protect projection screens after installation from damage during construction. If damage occurs despite such protection, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.
 - 1. Provide temporary covering of rear-projection screens until time of Substantial Completion. Use type of covering approved by screen manufacturer that will effectively protect screen from abrasion, breakage, or other damage.

END OF SECTION 11 52 13

SECTION 11 61 43-STAGE CURTAINS

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 stage type curtains and rigging.
 - 1. Stage curtain including front curtain and valance

1.3 DEFINITIONS

- A. Batten: Steel pipe supporting curtain by means of cables or chains from overhead structural support.
- B. Overlap: Track that extends beyond curtain centerline to ensure closure of biparting curtain.
- C. Rigging: General term for hardware used to move scenery, lights, or curtains on or over the stage.
- D. Trim: Adjustment of height or level of curtain or equipment.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide rigging capable of withstanding the effects of the weight of stage curtains and other associated loads.

1.5 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.
 - 3. Include structural analysis data for rigging.

- C. Samples for Initial Selection: For each type of curtain indicated; include color charts showing the full range of colors, textures, and patterns available, together with a 12-inch- (300-mm-) square sample (any color) of each type fabric.
- D. Samples for Verification: For each type of fabric from dye lot to be used for the Work, with specified treatments applied, and showing complete pattern and texture repeat, if any. Mark top and face of fabric. Prepare Samples of size indicated below.
 - 1. Size: Not less than 36 inches (900 mm) square.
- E. Product Certificates: For each type of product, signed by product manufacturer.
 - 1. Fabric: Give name of flame-retardant chemical used, identification of applicator, treatment method, application date, allowable life span for treatment, and details of any restrictions and limitations.
 - 2. Rigging: Suspended battens and tracks comply with requirements.
- F. Qualification Data: For Installer. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- G. Maintenance Data: For stage curtains and rigging to include in maintenance manuals.
- H. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual experienced in installing stage curtains and rigging 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. 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: NFPA 701.
 - 2. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or treated with flame-retardant chemicals, and whether it will require retreatment after designated time period or cleaning.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify curtain openings and the dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

- A. Special Warranty for Rigging Equipment: 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.
- B. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CURTAIN FABRICS

- A. General: Provide fabrics inherently and permanently flame resistant to comply with requirements indicated. Provide fabrics from the same dye lot.
- B. Polyester Velour: Napped fabric of 100 percent polyester weighing not less than 23 oz./linear yard (715 g/linear meter), with pile height approximately 75 mils (1.9 mm); inherently and permanently flame resistant; 54-inch (1372-mm) minimum width.
 - 1. Products: Subject to compliance with requirements, provide one of the following: or an approved equal:
 - a. J. L. de Ball America, Inc.; Diablo.
 - b. KM Fabrics, Inc.; Prestige.
 - c. Frankel Associates, Inc.; Equivalent to Diablo or Prestige.
 - 2. Colors, Textures, and Patterns: As selected by Architect from manufacturer's full **range**
- C. Lining: 100 percent polyester; 54-inch (1372-mm) minimum width.

2.2 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 (50 mm) wide, and not less than 4 inches (102 mm) wide at borders, valance, and tormentors, with not less than a 1-inch (25-mm) tuck, and machine-sewn with no selvage material visible from front of curtain. Sew open ends of hems closed.
 - 2. Leading Edge Turnbacks: Provide turnbacks formed by folding not less than 12 inches (300 mm)] one-half width of face fabric back, with not less than a 1-inch (25-mm) tuck, and secured by sewing turnbacks vertically.
 - 3. Top Hems: Reinforce top hems by double-stitching 3-1/2-inch- (89-mm-) wide, heavy jute webbing to top edge with not less than 2 inches (50 mm) 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 (75-mm) double-stitched box pleats spaced at 12 inches (300 mm) o.c. along top hem reinforcement.
 5. Grommets: Brass, No. 3, centered on each box pleat and 1 inch (25 mm) from corner of curtain, for snaps or S-hooks.
 - a. For black curtains, provide brass or aluminum grommets with black finish.
 6. Bottom Hems:
 - a. For curtains that do not hang to the floor, provide hems not less than 3 inches (75 mm) deep with 3/4-inch (19-mm) weight tape.
 - b. For floor-length curtains, provide hems not less than 6 inches (150 mm) deep with separate, interior, 100 percent cotton, heavy canvas chain pocket equipped with proof coil chain. Stitch chain pockets so chain will ride 2 inches (50 mm) above finished bottom edge of curtain.
 - 1) Proof Coil Chain: Grade 30, No. 8, zinc plated, 3/16 inch (4.7 mm), ASTM A 413/A 413M.
 7. Velour Curtains: Fabricate with the fabric nap down.
 8. Lining: Provide lining for each curtain in same fullness as face fabric, and finished 2 inches (50 mm) shorter than face fabric. Attach lining to face fabric along bottom and side seams with 4-inch- (100-mm-) long strips of heavy woven cotton tape.
- B. Tie Lines: Braided soft cotton, black or white to best match curtain; not less than 5/8 inch (16 mm) wide by 36 inches (900 mm) long.

2.3 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 (450 mm) long, and secure with four flush rivets, plug welds, threaded couplings, or another equally secure method. Shop-paint completed pipe battens with black paint and with 1-inch- (25-mm-) wide yellow stripe at the center of each batten.
 1. Steel Pipe: ASTM A 53/ A 53M, Grade A, standard weight (Schedule 40), black, 1-1/2-inch (40-mm) nominal diameter, unless otherwise indicated.
- B. S-Hooks: Track manufacturer's heavy-duty plated-wire hooks.
- C. Snap Hooks: Track manufacturer's heavy-duty hooks.
- D. Supports, Clamps, and Anchors: Sheet steel in manufacturer's standard thicknesses, galvanized after fabrication according to ASTM A 153/A 153M, Class B.
- E. Trim and Support Cable: 1/4-inch- (6-mm-) diameter, 7x19 galvanized steel aircraft cable with a breaking strength of 7000 lb (3175 kg). 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.

- F. Trim and Support Chain: Grade 80 hardened alloy steel chain rated for overhead lifting, ASTM A 391/A 391M.
- G. Inserts, Bolts, Rivets, and Fasteners: Manufacturer's standard corrosion-resistant units.
- H. Steel straight and curved Tracks: Fabricate of roll-formed, galvanized, commercial-quality, zinc-coated steel sheet; complying with ASTM A 653/A 653M, G60 (Z180) coating designation, with continuous bottom slot, and with each half of track in one continuous piece.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Automatic Devices Company Silent Steel 200 series.
 - b. H & H Specialties Inc: 400 series.
 - c. First option in subparagraph below is for medium-duty track; second option is for heavy-duty track. Manufacturers offer straight steel track only.
 - 3. Minimum Base-Metal Thickness: Not less than 0.0677 inch (1.7 mm).

2.4 STEEL STRAIGHT -TRACK FABRICATION

- A. Heavy-Duty Track System: Equip track with heavy-duty, live-end, double-wheel pulley; heavy-duty, dead-end, single-wheel pulley; and adjustable, heavy-duty floor block; each with not less than 5-inch (125-mm) molded-nylon- or glass-filled-nylon-tired ball-bearing wheels, enclosed in steel housings. Provide single curtain carriers of molded nylon with a pair of neoprene-tired ball-bearing wheels riveted parallel to body. Provide one master carrier, for each leading curtain edge, of plated steel with two pairs of nylon tired ball-bearing wheels and with two line guides per carrier. Equip carriers with neoprene or rubber bumper to reduce noise, and heavy-duty, plated-steel swivel eye and manufacturer's standard trim chain for attaching curtain snap or S-hook. Provide end stops for track. Design adjustable floor block to maintain proper tension on operating line.
 - 1. Operating Line: Manufacturer's standard 3/8-inch (9-mm) stretch-resistant operating cord consisting of braided synthetic-fiber jacket over solid, synthetic-fiber, linear, center filaments.
 - 2. Track Lap Clamp: Metal to match track channel for attaching double-sectioned track at center overlap.
 - 3. Curtain Carriers: For track spaced at 12 inches (300 mm) o.c.
 - 4. Fold Guide: Equip carriers with rear-fold or backpack guide and rubber spacers to permit offstage curtain folding, sized for use with operating line if any.

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. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks and battens. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install curtain system according to track manufacturer's and curtain fabricator's written instructions.
- B. Install curtain only after all other adjacent work has been completed, including but not limited to flooring, painting, etc. Contractor shall protect installed curtain from damage and staining until completion of project. All costs for cleaning, repairing or replacing curtain shall be the responsibility of the contractor.

3.3 BATTEN INSTALLATION

- A. Install battens by suspending at heights indicated with trim and support cable spaced to support load, but do not exceed 10 feet (3 m)o.c.
 - 1. Cable: Secure cables either directly to structures or to inserts, eye screws, or other devices that are secure and appropriate to substrate and that will not deteriorate or fail with age or elevated temperatures. Attach other cable end to pipe clamps with turnbuckles, moused or fixed with nuts after adjustment, to prevent loosening.

3.4 TRACK INSTALLATION

- A. Ceiling-Mounted Tracks: Drill track at intervals not greater than manufacturer's written instructions for spacing, and fasten directly to structure.
- B. 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.
- C. Spacing: Do not exceed the following dimensions between supports:
 - 1. Heavy-Duty Track: 72 inches (1829 mm).

2. Curved Walk-Along Track: 48 inches (1219 mm). Provide additional supports at curves and splices.
- D. Install track for center-parting curtains with not less than 24-inch (600-mm) overlap of track sections at center, supported by special lap clamps.

3.5 CURTAIN INSTALLATION

- A. Track Hung: Secure curtains to track carriers with track manufacturer's special heavy-duty S-hooks or snap hooks.
- B. Batten Hung: Secure curtains to pipe battens with trim and support cable tie lines.

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to test system and to train Owner's personnel to rig, adjust, operate, and maintain stage curtains, tracks, and draw-curtain machines.

END OF SECTION 11 61 43

SECTION 11 66 23 - GYMNASIUM 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 the following gymnasium equipment:
 - 1. Basketball equipment.
 - 2. Wall-mounted safety pads.
- B. Related Sections include the following:
 - 1. Division 5 Section "Structural Steel" for structural supports not provided by gymnasium equipment manufacturer for supporting gymnasium equipment to building structure.
 - 2. Division 16 Sections for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized gymnasium equipment.
- C. Products furnished, but not installed under this Section, include floor insert sleeves for inserts to be cast in concrete subfloors and footings.

1.3 DEFINITIONS

- A. FIBA: International Basketball Federation (Federation Internationale de Basketball Amateur).
- B. NCAA: National Collegiate Athletic Association.
- C. NFHS: National Federation of State High School Associations.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Provide basketball backstops capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, features, and finishes. Include details of anchors, hardware, and fastenings. If applicable, include assembly, disassembly, and storage instructions.

1. Gymnasium Equipment Operators: Include operating instructions.
 2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: Show location and extent of fully assembled gymnasium equipment. Show location and extent of disassembled equipment and components and transport and storage accessories. Include elevations, sections, and details not shown in Product Data. Show method of field assembly, connections, installation details, mountings, floor inserts, attachments to other Work, operational clearances, and relationship to adjoining work.
1. Blocking and Reinforcement: Show locations of blocking and reinforcement required for support of gymnasium equipment.
 2. Setting Drawings: For cast-in floor insert sleeves for post standards.
 3. Design Calculations: Signed and sealed by a qualified professional engineer, currently licensed to practice in the state of Connecticut. Calculate requirements for supporting gymnasium equipment and for seismic restraint. Verify capacity of members and connections to support loads and verify loads, point reactions, and locations for attachment of gymnasium equipment to structure with those indicated on Drawings.
 4. Gymnasium Equipment Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
 5. Wiring Diagrams: Power, signal, and control wiring.
- C. Coordination Drawings: Court layout plans and elevations drawn to scale and coordinating floor-insert penetrations and game lines and markers applied to finished flooring.
- D. Samples for Initial Selection: For each type of gymnasium equipment indicated.
- E. Samples for Verification: For the following products:
1. Pad Fabric: Not less than 3 inches (80 mm) square, with specified treatments applied. Mark face of material.
 2. Basketball and Volleyball Net: Full size.
- F. Product Certificates: For each type of gymnasium equipment, signed by product manufacturer.
- G. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements. Include evidence of manufacturing experience.
- H. Qualification Data: For installer and professional engineer.
- I. Maintenance Data: For gymnasium equipment and gymnasium equipment operator to include in maintenance manuals.
- 1.6 QUALITY ASSURANCE
- A. Installer Qualifications: A qualified installer employing workers trained and approved by manufacturer.

- B. Source Limitations: Obtain each type of gymnasium equipment through one source from a single manufacturer.
- 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. Standards: Provide gymnasium equipment complying with or exceeding requirements of the National Federation of State High School Associations.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install gymnasium equipment until spaces are enclosed and weatherproof, 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.
- B. Field Measurements: Verify position and elevation of floor inserts and layout for gymnasium equipment. Verify dimensions by field measurements.

1.8 COORDINATION

- A. Coordinate installation of floor inserts with structural floors and finish flooring installation and with court layout and game lines and markers on finish flooring.
- B. Coordinate layout and installation of overhead-supported gymnasium equipment and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for each item of equipment 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:
 - 1. Basketball Equipment:
 - a. AALCO.
 - b. Basketball Products International; American Athletic, Inc.
 - c. Institutional Products, Inc.
 - d. Porter Athletic Equipment Co.
 - 2. Wall-Mounted Safety Pads:
 - a. AALCO.
 - b. AL, Inc.; ADP Lemco, Inc.

- c. American Athletic, Inc.
- d. Institutional Products, Inc.
- e. Performance Sports Systems, Inc.
- f. Porter Athletic Equipment Co.
- g. Draper Inc.

2.2 MATERIALS, GENERAL

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; mill finish or decorative, baked-enamel, powder-coat finish.
 - 1. Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 - 2. Cast Aluminum: ASTM B 179.
- B. Steel: Comply with the following:
 - 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M, hot-dip galvanized.
 - 2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53.
 - 3. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless another grade is required by structural loads.
 - 4. Steel Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513 or steel tubing fabricated from steel complying with ASTM A 569/A 569M and complying with the dimensional tolerances in ASTM A 500.
 - 5. Malleable-Iron Castings: ASTM A 47 (ASTM A 47M), grade required by structural loads.
 - 6. Support Cable: 1/4-inch- (6-mm-) diameter, 7x19 galvanized steel aircraft cable with a breaking strength of 7000 lb (3175 kg). Provide fittings complying with cable manufacturer's written recommendations for size, number, and method of installation.
 - 7. Support Chain: Proof coil chain, complying with ASTM A 413/A 413M, Grade 30, size and diameter as required by structural loads; plated or painted. Provide fittings complying with chain manufacturer's written recommendations for size, number, and method of installation.
- C. Particleboard: ANSI A208.1.
- D. Wood-Based, Structural-Use Panels: Comply with DOC PS 2; for plywood, comply with DOC PS 1.
- E. Equipment Mounting Pads: Wood, transparent or neutral color painted finish, size, and quantity as required to mount gymnasium equipment according to manufacturer's written recommendations.
- F. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed tamperproof, vandal and theft resistant. Provide as required for gymnasium equipment assembly, mounting, and secure attachment.
- G. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 with minimum strength recommended in writing by gymnasium equipment manufacturer.

2.3 BASKETBALL EQUIPMENT

A. Basketball Backstops: Main Court. (Quantity – 2)

1. Ceiling Suspended, Forward Fold and Rear Braced Backstop manufacturer/Model: Porter No.917, BPI No. 1017, AALCO No. 130FS.
 - a. Vertical front drop frame assembly “Center-Strut” shall consist of a main, center mast of 6-5/8” O.D. heavy wall structural steel tube with diagonal side sway braces of 2-3/8” O.D. structural pipe. Top horizontal mast, hinge spreader to be of a heavy 4” structural channel to form a rigid, back to back triangular design. Goal shall mount directly through bank and into a heavy structural steel weldment “Center-Strut” which shall be clamped to the vertical 6-5/8” O.D. center support to eliminate any strain on bank should a player hang on the front mounted goal.
 - b. Backstop shall be suspended by special adjustable hangers to provide for precise plumbing of frame during installation. Support hangers shall be offset 2” behind center line of “Center-Strut” to properly weight lock unit in playing position without the use of ropes, latches or springs.
 - c. Back brace assembly shall consist of heavy wall 1-7/8” O.D. pipe, with zinc plated internal telescoping tube arrangement to facilitate raising of backstop to overhead storage position. Brace shall be provided with adjustable collar to precisely plumb face of backboard.
 - d. Backstop shall be supported from 3-1/2” O.D. pipe anchored to roof framing members by means of heavy formed steel support fittings. All metal parts shall be painted one (1) coat of flat black enamel.
 - e. Electric Winch: Backstop shall be provided with heavy duty electric winch design to hold units at any position when raising or lowering. Units shall be individually operated by ½ H.P. (9AMP) capacitor type, 60 cycle, 115 VAC single phase electric motor with automatic thermal overload protection manufactured to NEMA specifications. All conduit, wiring, junction boxes and components not specified herein shall be furnished and installed by the electrical contractor.
 - f. Rectangular Tempered Glass Backboard. Porter No.208. Backboard shall be 3’-6” x 6’-0” to meet all NFHSA requirements. Backboard frame shall be of a welded, unitized construction fabricated from heavy wall rectangular steel tubing. Unitized frame shall include a vertical center strut with a unique spacer sleeve arrangement at the upper two goal mount hole locations to transmit undue loading during slam-dunks, etc. directly through the glass and into the rear frame. Glass shall be provided in ½” thick, fully tempered glass section with uniform load and impact strength. Official white border and target area is “fired in” permanently on front side of glass section so that it cannot wear way. Backboard shall be protected by a lifetime warranty.
 - g. Provide each backboard with a Porter No.326 Bolt on Safety Pad. Pad shall consist of two pieces with molded type square corners for maximum safety. Pads shall be molded from Polyurethane Foam with a 9 lb. density. A positive bolt on type attachment system shall be provided with internal, molded in steel attachment

channels that are secured to the backboard with special self-drilling, self-tapping attachment hardware. Pads, which are glued to that backboard, shall not be approved as equal. Color: Grey.

- h. Provide each unit with a Porter No.245-500 Ultra-Flex Goal. Goal shall incorporate a positive lock, pressure release mechanism to automatically release and pivot downward when a static force of 230 pounds is placed on the top of the ring at the point most distant from the backboard to meet the latest NCAA and NFSHSA specifications for movable goals. The pressure release mechanism is preset at the factory with a capability for field adjustment to comply with the latest NCAA recommendation to test goals for rebound elasticity to insure a 35 to 50 percent energy range of total impact energy (BR-28 Section 13). Rim shall be fabricated from 5/8" diameter cold drawn alloy steel, round formed to an 18" inside diameter ring. Inside diameter of ring shall be positioned 6" from face of back board by a heavy formed steel, hinged type housing with a formed steel cover. Rim shall be provided with a unique "tube-tie" net attachment system to eliminate the conventional wire-formed type net locks.
- i. Provide each backstop with a Porter No.797 basketball backstop safety lock. Lock shall be inertia sensitive to automatically lock a backstop in position at any time in storage or during the raising or lowering cycle. Safety lock shall incorporate a fully automatic reset requiring no poles, ropes, levers or buttons.

2.4 WALL-MOUNTED SAFETY PADS

- A. Safety Pad Surface-Burning Characteristics: Provide safety pads with flame-spread index of 25 or less and smoke-developed index of 450 or less, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Pad Covers: Provide safety pad fabric covers fabricated from puncture- and tear-resistant, not less than 14-oz. (397-g) PVC-coated polyester or nylon-reinforced PVC fabric treated with fungicide for mildew resistance, with the fire-test-response characteristics indicated, lined with fire-retardant liner.
 - 1. Flame-Resistance Ratings: Class 'A' Rating and complies with all of the following: NFPA 701, NFPA 255 and NFPA 286.
- C. Wall Safety Pads: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric cover, free from sag and wrinkles and firmly attached to back of backer board.
 - 1. Backer Board: Not less than 3/8-inch- (9.5-mm-) thick fire-retardant-treated plywood per AWP A C27, Interior Type A.
 - 2. Fire-Resistive Fill: Multiple-impact-resistant foam not less than 1-1/2-inch- (38-mm-) thick fire-resistive neoprene, 6-lb (2.7-kg) density.
 - 3. Size: Each panel section, 24 inches (600 mm) wide by 72 inches (1800mm) high.

4. Number of Panel Sections: As indicated on Drawings modular panel sections.
5. Installation Method: Permanent attachment with standard 1" nailing margins.
6. Fabric Cover Color: As selected by Architect from manufacturer's full range for two colors.

D. Basis of design product:

1. Manufacturer: Porter Athletic Equipment Company
2. Product: FR-SAFPAD, Certified fire retardant wall padding.

E. Acceptable Manufactures:

1. Provide specified product or a comparable product from one of the manufactures listed in part 2.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.
1. Verify critical dimensions.
 2. Examine supporting structure and below finished floor for subfloors and footings.
 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked for installers. Locate reinforcements and mark locations if not already done.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions. Complete equipment field assembly, where required.
- B. Unless otherwise indicated, install gymnasium equipment after other finishing operations, including painting, have been completed.
- C. Permanently Placed Gymnasium Equipment and Components: Rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.
1. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- D. Wall Safety Pads: Mount with bottom edge at 4 inches (100 mm) above finished floor.

- E. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed gymnasium equipment to structural support and for properly transferring load to in-place construction.
- F. Connections: Connect automatic operators to building electrical system.

3.3 ADJUSTING

- A. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING AND PROTECTION

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions acceptable to manufacturer and Installer that ensure gymnasium equipment is without damage or deterioration at time of Substantial Completion.
- C. Replace gymnasium equipment and finishes that cannot be cleaned and 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 gymnasium equipment. Refer to Division 1 Section " Demonstration and Training."

END OF SECTION 11 66 23

SECTION 11 66 43 – GYMNASIUM SCOREBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single-sided LED basketball scoreboard
- B. Single-sided LED Shot Timer (2 Required)

1.02 REFERENCES

- A. Standard for Electric Signs, UL-48, 13th Edition
- B. Standard for Control Centers for Changing Message Type Signs, UL-1433, 1st Edition
- C. Standard for CAN/CSA C22.2 No. 207-M89 for indoor use
- D. Federal Communications Commission Regulation Part 15
- E. National Electric Code

1.03 SUBMITTALS

- A. Product data: Submit manufacturer's product illustrations, data and literature that fully describe the scoreboards and accessories proposed for installation.
- B. Shop drawings: Submit mechanical and electrical product specification drawings.
- C. Maintenance data: Submit manufacturer's installation, operation, and maintenance manuals.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Product delivered on site.
- B. Scoreboard and equipment to be housed in a clean, dry environment.

1.05 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install scoring equipment until spaces are enclosed and weatherproof, 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
- B. intended use.
- C. Field Measurements: Coordinate scoreboard location and height with the customer. Verify dimensions by field measurements.
- D. Supply weight and mounting method for owner to verify that building structure is capable of supporting the scoreboard's weight in addition to the auxiliary equipment.

1.06 QUALITY ASSURANCE

- A. For indoor use only
- B. Source Limitations: Obtain each type of scoring equipment and electronic displays through one source from a single manufacturer.
- C. ETL listed to UL Standards 48 and 1433
- D. NEC compliant
- E. FCC compliant
- F. ETL listed to CAN/CSA 22.2

1.07 WARRANTY/SERVICE PLAN

- A. Provide 5 years of coverage

- B. Provide an exchange program to supply replacement parts for components that fail during the coverage period. To minimize downtime, the exchange parts are shipped on the same day the order is received or on the following day. The manufacturer will also enclose an air bill for return of the defective components.
- C. Provide access to a local Authorized Service Company.
- D. Provide a help desk staffed by experience technicians and coordinators who are thoroughly familiar with the scoreboard and available for technical support. This staff must be available at no additional cost to the customer and provide an "on-call" service during weekends.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Daktronics, Inc.
- B. Nevco Scoreboard Company
- C. Trans-lux Fair-Play Scoreboards

2.02 PRODUCTS (BASIS OF DESIGN)

- A. Scoreboards:
Daktronics BB-2103-13 single-sided basketball scoreboard can also score volleyball and wrestling. It scores HOME and GUEST to 199, team FLS (fouls) to 99, PLAYER # to 99, player FOUL to 9, period to nine, indicates possession and bonus, displays period time to 59:59 and during the last minute of the period, it displays time to 1/10 of a second.
- B. Shot Clocks:
Daktronics BB-2114-13 single-sided shot timer. Displays times up to 59 seconds and counts down from any preset number between 0 and 59.

2.03 SCOREBOARDS

- A. General information
 - 1. Dimensions: 6'-0" (1829 mm) high, 8'-0" (2438 mm) wide, 0'-6" (152 mm) deep
 - 2. Weight: 180 lb (82 kg)
 - 3. Power requirement: 200 W
 - 4. Color: Selected by Architect from Manufactures full range.
- B. Construction
 - 1. All-aluminum construction
 - 2. Scoreboard face and perimeter: 0.063" thick
 - 3. Scoreboard back: 0.050" thick
 - 4. Digit faceplates: 0.063" thick
 - 5. Cabinet withstands high-velocity impact from indoor sports balls without the need for protective screens.
- C. Digits

1. AS AlInGaP LED digits.
 2. Seven bar segments per digit
 3. LED digit technology: LED digits protrude through the digit faceplates for wide-angle viewing. Maximum viewing angle 140 degrees.
 4. Clock and score digits: 13" (330 mm) high
 5. PERIOD digit: 10" (254 mm) high
 6. Optional time outs left digits: 7" (178 mm) high
 7. Clock, colon, period digits and bonus indicators: amber LEDs
 8. Score digits and possession indicators: red LEDs
- D. Captions
1. HOME and GUEST captions: 6" (152 mm) high
 2. PERIOD caption: 4" (102 mm) high
 3. All captions: white vinyl applied directly to scoreboard face
- E. Logo/Sponsor Panels
1. There is space for two 17" (432 mm) high, 21" (533 mm) wide logo/sponsor panels on the top corners of the scoreboards.
- F. Horn
1. Vibrating horn: mounts behind scoreboard face
 2. Sounds automatically when period clock counts down to zero
 3. Sounds manually as directed by operator
- G. Power Cord
1. Cord is 11' (3353 mm) long
 2. Cord plugs into a standard grounded 120 V AC outlet
- H. Optional Equipment to be included as follows:
1. Vinyl team name caption in place of the home caption
 2. Programmable Team Name Message Centers
 3. Programmable message centers
 4. Protective screen
 5. Hardware for suspension installation

2.04 SHOT CLOCKS

- A. General information
1. Dimensions: 1'-7" (483 mm) high, 1'-10" (559 mm) wide, 0'-6" (152 mm) deep
 2. Weight: 15 lb (7 kg)
 3. Power requirement: 40 W
 4. Color: over 150 colors to choose from
- B. Construction
1. All-aluminum construction.
 2. Scoreboard face and perimeter: 0.063" thick
 3. Scoreboard back: 0.050" thick
 4. Digit faceplates: 0.063" thick
 5. Cabinet withstands high-velocity impact from indoor sports balls without the need for protective screens.
- C. Digits

1. AS AllInGaP LED digits
 2. Seven bar segments per digit
 3. LED digit technology: Digits protrude through the digit faceplates for wide angle viewing. Maximum viewing angle of 140 degrees.
 4. Clock and score digits: 13" (330 mm) high
 5. Shot clock digits: red LEDs
- D. Horn
1. Vibrating horn: mounts behind scoreboard face
 2. Sounds automatically when shot clock counts down to zero
 3. Sounds manually as directed by operator
- E. Power Cord
1. Cord is 11' (3353 mm) long
 2. Cord plugs into a standard grounded 120 V AC outlet

2.05 SCORING CONSOLE

- A. Console is an All Sport 5010 controller
- B. Capable of scoring basketball, volleyball, and wrestling through the use of keyboard inserts
- C. Capable of controlling other All Sport controlled scoreboards
- D. Console has a maximum power requirement of 5 watts
- E. Console recalls clock, score, and period information if power is lost
- F. Console includes:
 1. A rugged aluminum enclosure to house electronics
 2. A sealed membrane water-resistant keyboard
 3. A 32-character liquid crystal prompting display to verify entries and recall information currently displayed
 4. A 6' (1829 mm) power cord to plug into a standard grounded 120 V AC outlet
 5. A 20' (6096 mm) control cable to connect to the control receptacle junction box
 6. A practice timer mode
 - a. Can sound the horn at the end of each segment
 - b. Has 99 programmable segments
 - c. Displays the segment number and segment length
 - d. Has a programmable interval time
- G. Optional Equipment to be included as follows:
 1. 2.4 GHz spread spectrum radio for scoreboard control

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces scoreboard will be mounted on are ready to receive work. Verify that placement of conduit and junction boxes are as specified and indicated in plans and shop drawings.

3.02 INSTALLATION

- A. Power conduit, cable and outlet boxes to be provided and installed by the electrical contractor. Signal raceways conduit and boxes to be provided by the electrical contractor. Electrical

- contractor is responsible for pulling, signal wire and terminators between each scoreboard and control location. Scoreboard vendor to terminate signal wire of controller and conduit scoreboard.
- B. Mount scoreboards and interior displays to wall in location detailed and in accordance with manufacturer's instructions. Unit to be plumb and level.
 - C. Mount shot clock to backstop brackets in accordance with manufacturer's instructions. Unit to be plumb and level.

3.03 INSTALLATION—CONTROL CENTER

- A. Provide boxes, cover plates and jacks as required to meet control specification requirements. Control cables to control panels shall be concealed.
- B. Test the operation of the scoreboard, controller and all control jacks, leave control unit in carrying case and other loose items with owner's designated representative.
- C. Conduct operator training on the scoreboard/controller operation.

END OF SECTION 11 66 43

SECTION 11 68 23.35 - NET POSTS AND FOUNDATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract including General and Supplementary Conditions, and General Requirements apply to work specified in this Section.

1.2 SECTION INCLUDES

- A. Providing and installing all athletic equipment including foundations, anchoring components and appurtenances:
 - 1. Tennis net posts and foundations (4 sets) and wind screen netting for court fencing

1.3 RELATED SECTIONS

- A. Section 03 30 01 - Portland Cement Concrete (Site)
- B. Section 31 23 16 - Earthwork

1.4 SUBMITTALS

- A. Product Data: Manufacturer's catalog cuts, specifications and technical data indicating material compliance and specified options, including the following information:
 - 1. Detailed specification of construction and fabrication shop drawings.
 - 2. Manufacturer's installation instructions and/or recommendations.
 - 3. Maintenance literature.
 - 4. Product Warranty.
- B. Shop Drawings: Indicate pertinent dimensions, general construction, component connections, anchoring methods, hardware and installation procedures.
- C. Product certifications that equipment meets current National Federation of High School Associations standards for football.

1.5 WARRANTY

- A. Manufacturer shall submit to the Owner written product warranties for a minimum period of 18 months from date of substantial completion of all work performed under each phase of this contract and upon acceptance of the products. The Contractor shall promptly furnish, without cost to the Owner, any and all parts and labor which prove defective in material and workmanship.

PART 2 - PRODUCTS

2.1 Tennis nets, posts and wind screen.

1. Four sets of Permanent Tennis court poles model number TP-125 by Jaypro Sports LLC or as approved equal.
 - a. Ruggedly constructed of 3-1/2" O.D. heavy wall steel tubing poles with tough, powder-coated finish. Top pulley caps are cast aluminum with a 1-3/4" dia. aluminum pulley. Tensioning ratchet is cold-rolled steel painted green with a removable handle and spring-loaded safety latch. Includes all assembly hardware. Weight 69 lbs.
2. Four (4) Tournament Deluxe Tennis Net model TTN-3 by Jaypro Sports LLC or as approved equal.
 - a. Tournament Deluxe Tennis Net constructed of 3 mm braided black polyethylene netting. Quadruple stitched heavy-duty polyester web head-band with a 3/16" dia. vinyl-coated steel cable. Top five rows are double mesh. Includes synthetic-taped bottom edges and grommeted side pockets with dowels. 42'Lx42"W.
3. Tennis court net center strap and anchor models CS-1 and A-2 by Jaypro Sports LLC or as approved equal.
 - a. 2" wide adjustable nylon webbing with double snap hook and all-aluminum anchor with stainless steel drive pin.
4. Wind Screen
 - a. Vinyl coated closed mesh polyester 95% visual blockage screen. 9' high to form a effective visual barrier. Fastened on sides and center. Grommets: Heavy-duty solid brass every 18" on all four sides and down center. Fasteners: Galvanized snap hooks, steel cable, cable clamps, turnbuckles, etc. to secure screen to fencing. Color: Dark Green. Warranty: 3 years against cracking and peeling when installed with 50 lb. tie wrap. All fasteners and hardware to install.
 - b. Windscreens shall be installed on all four sides of the court complex.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install net posts, foundations and equipment as detailed and in conformance with the manufacturer's installation instructions.
- B. Installation of net posts shall conform to USTA standards and specifications for tennis courts.

END OF SECTION

SECTION 11 68 33 - ATHLETIC / RECREATIONAL EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract including General and Supplementary Conditions, and General Requirements apply to work specified in this Section.

1.2 SECTION INCLUDES

- A. Providing and installing all athletic and/or recreational equipment including foundations, anchoring components and appurtenances as indicated herein:
 - 1. Home Plate (1 req. baseball and 1 req. softball)
 - 2. Pitcher's Plate (1 req. baseball and 1 req. softball)
 - 3. 1ST, 2ND and 3RD Bases (1 set req. baseball and 1 set req. softball)
 - 4. 1ST Base – Safety Base (1 req. baseball and 1 req. softball)
 - 5. Permanent Foul Poles (2 req., baseball field only)
 - 6. Fence Top Protection
 - 7. Team Benches (8 req. – 4 each for baseball and softball)
 - 8. High School Football-Soccer Goal Set

1.3 RELATED SECTIONS

- A. Section 31 23 16 - Earthwork
- B. Section 32 18 23.15 - Clay Infield Surface

1.4 SUBMITTALS

- A. Product Data: Manufacturer's catalog cuts, specifications and technical data indicating material compliance and specified options, including the following information:
 - 1. Detailed specification of construction and fabrication shop drawings.
 - 2. Manufacturer's installation instructions and/or recommendations.
 - 3. Maintenance literature.
 - 4. Product Warranty.
- B. Shop Drawings: Indicate pertinent dimensions, general construction, component connections, anchoring methods, hardware and installation procedures.

- C. Product certifications that equipment meets current National Federation of H.S.A. standards.

1.5 WARRANTY

- A. Manufacturer shall submit to the Owner written product warranties for a minimum period of 18 months from date of substantial completion of all work performed under each phase of this contract and upon acceptance of the products. The Contractor shall promptly furnish, without cost to the Owner, any and all parts and labor which prove defective in material and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURER: Bolco Bases, A Division of Adams USA, Inc., Cookeville, TN 38501, Phone: 800-251-6857, website: www.adamsusa.com.

- A. HOME PLATE: Bolco "All Play Home Plate", Model No. 300-AS, as distributed by M.E. O'Brien and Sons, Inc. (860-568-8222).
- B. PITCHER'S PLATE: Bolco "4-Way-Las-Long" Adult Pitching Rubber, Model No. 450-C1, as distributed by M.E. O'Brien and Sons, Inc. (860-568-8222).
- C. 1ST, 2ND and 3RD BASES: Bolco "Major League Base", Model No. 175 MLB, as distributed by M.E. O'Brien and Sons, Inc. (860-568-8222). Size: 15" x 15" x 3"
- D. 1ST BASE – Safety Base: Bolco "Molded Double First Base", Model No. 110 DBL, as distributed by M.E. O'Brien and Sons, Inc. (860-568-8222). Size: 15" x 30" x 3"
- E. ALTERNATE MANUFACTURERS:
 - 1. Hollywood Bases Inc., Marysville, CA 95901, Phone: 916-741-9433.
 - 2. Athletic Training Equipment Company, Inc., Sparks, NV 89431, Phone: 800-998-ATEC or 775-352-2800, website: www.atecsports.com.
 - 3. Collegiate Pacific Inc., Dallas, TX, Phone: 972-243-8100, website: www.cpacsports.com.
 - 4. Tomark Sports, PO Box 1088, Corona, CA 92878, Phone: (800) 959-1844, Fax: (909) 278-9976, website: www.tomark.com.

2.2 FOUL POLES

- A. MANUFACTURER: Sportsfield Specialties Inc., Delhi, NY 13753. Phone: 888-975-3343, Fax: 607-746-8481, website: www.sportsfieldspecialties.com.
- B. PERMANENT FOUL POLE: Sportsfield Specialties Inc. "Long Gone Foul Pole". Foul pole shall be 20'-0" in height.
- C. ALTERNATE MANUFACTURERS:
 - 1. Manufacturer: Patterson-Williams Athletic Manufacturing Company (PW Athletic Mfg. Co.), Mesa, AZ 85203. Phone: 800-687-5768, Fax: 866-888-1110, website: www.pwathletic.com.
 - 2. Manufacturer: Aluminum Athletic Equipment Company (AAE), Royersford, PA 19468-1298. Phone: 800-523-5471 / 610-825-6565, Fax: 610-825-2378, website: www.aesports.com.
 - 3. Beacon Athletics, Middleton, WI 53562. Phone: 800-747-5985, Fax: 608-836-0724, website: www.beaconathletics.com.

2.3 FENCE TOP PROTECTION

- A. DISTRIBUTOR: Poly-Cap Protective Guard as distributed by Patterson-Williams (PW) Athletic Mfg. Co., Mesa, AZ, 1-800-687-5758, Fax: 1-866-888-1110 or approved equal.
- B. ALTERNATE DISTRIBUTOR: Coil Fence Crown as distributed by Jaypro Sports Equipment, or approved equal. Local Distributor, M.E. O'Brien & Sons, Inc., Medfield, MA, 1-800-835-0056, Fax: 1-508-359-2817.
- C. FENCE TOP PROTECTION: Yellow four (4) inch diameter corrugated plastic pre-slit protective cap secured with yellow tie wraps every 2 feet. Note: Round 4-inch diameter corrugated yellow plastic pipe is required for this item. No other variations of protective cap shall be allowed.

2.4 TEAM BENCHES

- A. MANUFACTURER: Webcoat Products, Mfg. By Visions Innovated Products, Inc., McAlester, OK 74502, Phone: 800-505-5101, Fax: 866-426-5924.
 - 1. Model No.: B10PLAYERINNVS
 - 2. Weight: 127 lbs.
 - 3. Color: To be selected by Owner
 - 4. Length: 10 feet
 - 5. Quantity: Two (2) required per team area; eight (8) total
 - 6. Finish: Framework and seating shall have powder coat finish.

7. Description: Backless bench, small hole #11 gauge punched perforated steel seats, rounded corners and edges, 2 3/8-inch diameter legs, in-ground mounted in concrete.

B. ALTERNATE MANUFACTURERS:

1. Manufacturer: Wabash Valley Manufacturing Inc., Silver Lake, IN 46982. Distributed by M.E. O'Brien & Sons Inc., Medfield MA 02052. Phone: 800-835-0056 / 508-359-4200, Fax: 508-359-2817, website: www.obrienandsons.com
 - a. Model No.: S398
 - b. Weight: 94 lbs.
 - c. Color: To be selected by Owner
 - d. Length: 10 feet
 - e. Quantity: Two (2) required per team area; eight (8) total
 - f. Finish: Framework and seating shall have powder coat finish.
 - g. Description: Backless bench, small hole #11 gauge punched perforated steel seats, rounded corners and edges, 2 3/8-inch diameter legs, in-ground mounted in concrete.
2. Manufacturer: KenCoat Brand of Products, distributed by New England Recreation Group Inc., Tolland CT 06084 and Westboro MA 01581. Phone: 800-861-1209 / 508-393-1963, Fax: 508-393-1927, website: www.kencoat.com
 - a. Model No.: Player's Bench Series 48 (Rolled Edge Seat)
 - b. Weight: Unknown
 - c. Color: To be selected by Owner
 - d. Length: 10 feet
 - e. Quantity: Two (2) required per team area; eight (8) total
 - f. Finish: Framework and seating shall have powder coat finish.
 - g. Description: Backless bench, small hole #11 gauge punched perforated steel seats, rounded corners and edges, 2 3/8-inch diameter legs, in-ground mounted in concrete.

2.5 HIGH SCHOOL SOCCER/FOOTBALL GOAL SET

- A. MANUFACTURER: Sportsfield Specialties Inc., Delhi, NY 13753. Phone: 888-975-3343, Fax: 607-746-8481, website: www.sportsfieldspecialties.com.
- B. HIGH SCHOOL SOCCER/FOOTBALL GOAL SET: Sportsfield Specialties Inc., Model "GoalPak®" SG 4980HSPL. Set includes removable 8' off-set football goals GP4380, soccer goals SG4900, soccer nets, field access kit SG2SGPPW, soccer goal safety clamp, "GoalPak" access cover plug and field access full cover plug. Note: Field access full cover plug shall be provided with 1-inch impact pad and synthetic turf as part of this contract to allow natural grass fields to be used safely when football goal is removed.

C. ALTERNATE MANUFACTURERS:

1. Manufacturer: Patterson-Williams Athletic Manufacturing Company (PW Athletic Mfg. Co.), Mesa, AZ 85203. Phone: 800-687-5768, Fax: 866-888-1110, website: www.pwathletic.com.
2. Manufacturer: Aluminum Athletic Equipment Company (AAE), Royersford, PA 19468-1298. Phone: 800-523-5471 / 610-825-6565, Fax: 610-825-2378, website: www.aaesports.com.
3. Beacon Athletics, Middleton, WI 53562. Phone: 800-747-5985, Fax: 608-836-0724, website: www.beaconathletics.com.

- D. FOUNDATION: Foundation shall be concrete footing; concrete psi, depth, size, embedment and reinforcement per manufacturer's requirements.

- 2.6 Note: Phone numbers are provided here for the Contractors convenience. Due to the continually changing phone market, Contractor is responsible for verifying the accuracy of the phone numbers listed.

PART 3 - EXECUTION

3.1 GENERAL

- A. All installations shall conform to National Federation of State High School Associations standards and specifications.
- B. Shop Drawings: Indicate pertinent dimensions, general construction, component connections, anchoring methods, hardware and installation procedures.

3.2 HOME PLATE AND PITCHER'S PLATE:

- A. Install home plate and pitcher's plate as detailed and in conformance with the manufacturer's installation instructions.

3.3 REMOVABLE BASES:

- A. Install permanent in-ground pegs / ground stanchions for 1ST Base, 1ST Base – Safety Base, 2ND and 3RD bases as detailed and in conformance with the manufacturer's installation instructions.
- B. Deliver removable 1ST Base, 1ST Base – Safety Base, 2ND and 3RD bases to the Owner's representative for installation by the Owner.

3.4 FOUL POLES:

- A. Install permanent in-ground foul poles as detailed and in conformance with the manufacturer's installation instructions.

3.5 FENCE TOP PROTECTION:

- A. Install fence top protection as detailed and in conformance with the manufacturer's installation instructions on all chain link athletic field fences ~~6 feet in height or less~~ as indicated on the drawings.

3.6 HIGH SCHOOL SOCCER/FOOTBALL GOAL SET

- A. Soccer/Football goal set shall be installed as recommended by the manufacturer's written instructions, as indicated on the drawings and as indicated herein.

3.7 TEAM BENCHES

- A. Deliver team benches to the Owner's representative for installation by the Owner.

END OF SECTION

SECTION 11 68 43 - SCOREBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sports Scoreboards and Wireless Control Systems.
- B. Item Deleted.
- C. Item Deleted.

1.2 RELATED SECTIONS

- A. Section 03 30 01 - Portland Cement Concrete (Site)

1.3 REFERENCES

- A. ASTM A 36 - Standard Specification for Carbon Structural Steel; 2005.
- B. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2005.
- C. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2003.
- D. ASTM C 33 - Standard Specification for Concrete Aggregates; 2003
- E. ASTM C 150 - Standard Specification for Portland Cement; 2005.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide a scoreboard ETL or ETL-C tested to UL standard.

1.5 SUBMITTALS

- A. Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.

- B. Shop Drawings: Submit plan, section, elevation, and perspective view details as necessary to depict proper field fabrication and installation, and provide details on connections, terminations and joints.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors.

1.6 QUALITY ASSURANCE

- A. Single Source Responsibility: Single manufacturer shall provide all components required to install the products specified in this section.
- B. Manufacturers Qualifications: Manufacturers must have five years of experience in the manufacturing of scoreboards and message displays of the type specified.
- C. Installer Qualifications: Factory-trained and experienced in the proper installation of scoreboards and message displays.
- D. Welders: AWS certified.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Physical inspection of items required at time of delivery; any shipping damages must be reported at delivery prior to storage.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

- A. Work shall commence only after associated trade work has been sufficiently completed and will not interfere with the installation of the equipment specified in this section.
- B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- C. Do not install when threatening weather conditions exist.
- D. CMR/Contractor shall furnish available soil boring information / report to scoreboard supplier to allow supplier to determine soil suitability for foundation installation.
- E. CMR/Contractor shall provide clearly marked all underground utility locations and notify the appropriate supplier/sub-contractors prior to work commencement.

1.9 WARRANTY

- A. Manufacturer shall submit to the Owner written product warranties for a minimum period of 18 months from date of substantial completion of all work performed under each phase of this contract and upon acceptance of the products. The Contractor shall promptly furnish, without cost to the Owner, any and all parts and labor which prove defective in material and workmanship.
- B. Manufacturer shall provide to the Owner that products are guaranteed against defects in workmanship and in materials for a minimum of 18 months on a factory exchange basis, at no additional cost to the Owner.
- C. Manufacturer extends this warranty for an additional four years on a participating basis on all electronic components.
- D. This warranty does not cover damage caused by misuse of shipping. Each system comes complete with operating instructions and maintenance manual. The scoreboard supplier shall maintain local service facilities with replacement stock inventory.

1.10 EXTRA MATERIALS

- A. Contractor is responsible for providing all hardware, sealants, welding materials and other secondary installation products required for installation. Architect shall approve each product before or during the pre-installation conference.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable manufacturers:
 - 1. Fair Play Scoreboards, DesMoines, Iowa
 - 2. Nevco Scoreboard Company, Greenville, Illinois
 - 3. Daktronic Scoreboards, Brookings, South Dakota
- B. The scoreboards/products listed below have been specifically referred to so as to enable the Owner to establish the level of quality and performance required for the scoreboards. Equipment by other acceptable manufacturers listed above shall meet or exceed materials chosen for the scoreboards.

2.2 BASEBALL AND SOFTBALL

- A. Basis of Design: Fair Play Model BA-7120-2. The scoreboard shall include all equipment as herein specified.
 - 1. Size: 20'-0" long x 6'-6" high x 10" depth.
 - 2. Total net weight: 436 pounds.
 - 3. Quantity: One (1) required at each field.
- B. Information displayed:
 - 1. Home and Visitor Total Scores 0 to 99, 15" high
 - 2. Visitor and Home Individual Innings 1 to 9, 15" high
 - 3. Balls, Strikes, Outs, single numeral, 18" numeral
 - 4. Item deleted
- C. Cabinet Color: Color to be selected by Owner from standard color chart
Vinyl Trim Tape Color: Color to be selected by Owner from standard color chart

2.3 SOCCER

- A. Basis of Design: Fair Play Model SC-8114-2. The scoreboard shall include all equipment as herein specified.
 - 1. Size: 14'-0" long x 6'-0" high x 10" depth.
 - 2. Total net weight: 400 pounds.
 - 3. Quantity: One (1) required.
- B. Information displayed:
 - 1. Home and Visitor Scores, 18" high
 - 2. Time Clock, 18" high
 - 3. Period, 15" high
 - 4. Shots on Goal, 15" high
- C. Cabinet Color: Color to be selected by Owner from standard color chart
Vinyl Trim Tape Color: Color to be selected by Owner from standard color chart

2.4 POWER REQUIREMENTS

- A. Model
 - 1. BA-7120-2, 120V AC single-phase, 60Hz, 271 Watts, 3 Amps
 - 2. SC-8114-2, 120V AC single-phase, 60Hz, 159 Watts, 2 Amps
- B. Day/night games, wide-angle amber LED's
- C. Control Console: 120V AC single-phase, 60Hz, 0.5 amps

2.5 ELECTRONIC SYSTEM

- A. Electronics to be solid state encased in one metal grounded plug-in@ processor pak for ease of service. Components to be designed for outdoor usage and shall be weather and moisture protected by epoxy coatings.

2.6 SCOREBOARD CONSTRUCTION

- A. Cabinet is all aluminum completely enclosed constructed of minimum 0.050" thick aluminum panels to form a rain-tight enclosure with no exposed wiring. Both front and rear sides are flat without protrusions. Scoreboard shall be designed to withstand 100 mph winds. Scoreboard is one completely assembled and wired unit for quick and easy installation.
- B. Four steel hanger brackets are provided for mounting to two uprights and lifting bolts are provided for hoisting into place.
- C. Finish is non-reflecting enamel over acid etched, anodized and chromate primed surfaces. Trim is gloss vinyl and caption lettering is white screened gloss enamel block style 9" high.
- D. Color: See Items 2.2.C and 2.3.C above.

2.7 ITEM DELETED

2.7 ACCESS

- A. All lamps and processor pack are serviced from the front of the scoreboard. Doors and hinged screens are secured in the closed position with screw fasteners.

2.8 CONTROL CONSOLE

- A. Provide the following wireless Scoreboard Controller:
 - 1. Model: MP-70 Scoreboard Control.
 - 2. Power Source: Battery.
 - 3. Wireless Connectivity.
 - 4. Provide one (1) scoreboard controller for each individual installed scoreboard.

2.9 HOOK-UP BOX

- A. Provide rain-tight control and hand switch boxes

2.10 E.T.L./ELECTRICAL TESTING LABORATORY APPROVAL

- A. This scoreboard carries the E.T.L. label signifying this organization's testing and approval as a safe and dependable design.

2.11 STEEL COLUMNS

- A. Steel column size shall be as indicated on the drawings.
- B. Finish: Semi-gloss black powder-coat.
- C. Scoreboard Attachment Bracket Finish: Semi-gloss black powder-coat to match columns.

2.12 FOUNDATION

- A. Concrete foundations shall be as indicated on the drawings and shall conform to specification Section 03 30 01 – Portland Cement Concrete (Site).

PART 3 EXECUTION

3.01 INSPECTION

- A. Contractor shall examine locations where grounding is to be installed and notify Architect/Engineer in writing of conditions detrimental to proper and timely completion of work.
- B. Verify that mounting structure is ready to receive scoreboard. Verify that placement of conduit and junction boxes are as specified and indicated in plans and shop drawings. Verify concrete has cured adequately according to specifications.
- C. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. All power and control cables to scoreboards and displays will be routed in conduit, power to the scoreboards/displays as well as raceways shown on electrical plans by the Electrical Contractor. Scoreboard control wiring including conduit will be the responsibility of the contractor assigned the scoreboard equipment.
- B. Install scoreboards and exterior displays to beams in location detailed and in accordance with manufacturer's instructions. Verify unit is plumb and level.
- C. Parts of the electrical installation to be grounded shall include, but not be limited to, the following: underground distribution, underground conduits, electric service system neutral, raceway for power distribution systems, cabinets, lighting poles, lighting fixtures, and other non current carrying metal parts of electrical equipment. The interconnecting of the service ground, system neutral, and equipment ground conductors shall be made within the service equipment assembly.

- D. All copper bars for grounding shall be medium hard drawn. After installation, the copper bar shall be painted with one coat of an approved lacquer.
 - E. Ground conductors shall be of sizes and material in accordance with the requirements of the National Electrical Code. Cable for grounding connections shall be bare in accordance with the latest revisions of ASTM Designations B3 and B8. All open bare grounding cable shall be secured in place with cast one hole malleable clamps and clamp backs, and 1/4 inch bolts.
 - F. Provide separate ground wire in each feeder. Ground wire shall be sized in accordance with NYCEC.
 - G. Ground wires shall be continuous without splices. There shall be no soldered joints in any ground connection. Connectors, clamps, etc. shall be solderless type.
 - H. Provide separate ground wire in each branch circuit. Ground wire shall be sized in accordance with NEC (NFPA 70).
 - I. Ground interrupted metallic raceways with ground conductors connected to metallic raceway at each end.
 - J. Ground rods shall be vertically driven with tops below grade. Where required to obtain the specified ground resistance, install multiple rods. Where multiple rods are installed, each rod shall be a minimum of one rod length from any other rod.
 - K. Separately ground center taps of wye connected transformers in accordance with National Electrical Code (NFPA 70).
 - L. Bond all conductive piping systems in the buildings to the electrical system ground. Bonding connections shall be made as close as practical to the water pipe or service equipment ground bay.
 - M. Where ground connections will be permanently concealed, make the connections by the exothermic process to form solid metal joints. Make accessible ground connections with mechanical pressure type ground connections.
 - N. Where rock prevents the driving of vertical ground rods, install grounding electrodes in horizontal trenches in accordance with NEC 250.53 (G) to achieve the specified resistance.
- 3.03 SCOREBOARD CONTROLLER TESTING
- A. Test wireless Scoreboard Controller and check for proper operation of control unit, each scoreboard and all features. Leave control unit in carrying case and other loose accessories with owner's designated representative.

3.04 FIELD QUALITY CONTROL

- A. Upon completion of grounding system, test system as per IEEE standard two point method for continuity and resistance to demonstrate compliance with requirements and submit certification to Architect that material and installation has been properly installed.
- B. Inspect all connections prior to concealing same.
- C. Verify earth ground does not exceed 15 ohms.

END OF SECTION

SECTION 12 24 00 - WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes manually operated window shades.

Note: Provide shades at each window in the building **except** the following areas:

- Corridors
- Lobbies
- Gymnasium
- Stairways
- The U-Series windows on the clerestory of the B-Wing
- The HR & LR windows in the Women's Locker Room where the glass is frosted
- The clerestory windows in the Media Center
- Storage Rooms that adjacent only to those rooms where shades are not required

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations sections, details, details of installation, operational clearances, and relationship to adjoining Work.
 - 1. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.
- C. Samples: For each exposed finish and for each color and texture required.
- D. Window Treatment Schedule: Use same room designations indicated on Drawings.
- E. Maintenance data.

PART 2 - PRODUCTS

2.1 MANUALLY OPERATED WINDOW SHADES

- A. Basis of Design Product: The design for manually operated window shades is based on Mechoshade, Inc. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. Draper Inc.

2. Hunter Douglas Window Fashions.
 - B. Type: Manually operated, vertical roll-up, fabric window shade with bead chain and clutch operating mechanism, mounting brackets, fasteners, and other components necessary for complete installation.
 - C. Method of Installation: As indicated on the Drawings.
 - D. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment of lubrication. Provide preset limit stops to prevent shade from being raised or lowered too far.
 1. Clutch mechanism: Fabricated from high carbon steel and molded fiberglass reinforced polyester or injected molded nylon.
 2. Control loop: Bead chain hanging at side of window, material and color as selected by Architect from manufacturer's full range.
 3. Chain location: As indicated on the Drawings.
 4. Provide crank type operation with extension rods as required at the Gymnasium windows.
 - E. Shade size: As indicated on the Drawings.
 - F. Roller: Fabricated from extruded aluminum, galvanized steel, or enamel steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade type and size. Provide roller idler assembly of molded nylon and zinc-plated steel pin. Sliding pin to allow easy installation and removal of roller.
 - G. End caps: Stamped steel with universal design suitable for mounting to ceiling, wall, and jamb. Provide size compatible with roller size and fasteners appropriate for installation conditions. Finish as selected by Architect from manufacturer's full range.
 - H. Brackets: Plated stamped steel suitable for mounting to ceiling, wall or jamb. Provide size compatible with roller size and fasteners appropriate for installation conditions.
 - I. Carrier Bearings: Stamped steel with molded nylon for supporting multiple shades on single roller. Bearing suitable for ceiling or mullion mounting. Provide one carrier bearing between each pair of adjoining shades.
 - J. Fascia: L shaped aluminum extrusion 0.06 inch wall thickness, to conceal shade roller and hardware.
 1. Attachment: Snaps onto end caps.
 2. Size: As required and indicated on the Drawings.
 3. Finish: AS selected by Architect from manufacturer's full range.

2.2 FABRIC

A. Material:

1. Basis of Design: Mechoshade – Euroveil 6000 Series. Openness factor - 3%.

2.3 FABRICATION

A. Unit Sizes: Fabricated in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Shade Units Installed between (Inside) Jamb:
 - a. Width: Equal to 1/4 inch (6 mm) per side or 1/2 inch (12 mm) total less jamb-to-jamb dimension of opening in which each shade is installed.
 - b. Length: Equal to 1/4 inch (6 mm), plus or minus 1/8 inch (3 mm), less than head-to-sill dimension of opening in which each shade is installed.
2. Shade Units Installed Outside Jams: 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.

B. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting head rail and operating hardware, and for hardware position and shade mounting method indicated.

C. Installation Fasteners: Not 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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install shades level and plumb and aligned with adjacent units according to manufacturer's written instructions. Install intermediate support as required to prevent deflection in head rail. Allow clearances between adjacent shades and for operating glazed opening's operation hardware, if any.
- B. Jamb Mounted: Install head rail flush with face of opening jamb and head.
- C. Head Mounted: Install head rail on face of opening head.
- D. Adjusting: Adjust shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- E. Cleaning: Clean shade surfaces after installation, according to manufacturer's written instructions.

END OF SECTION 12 24 00

PART 1 GENERAL

SECTION 123400-MANUFACTURED PLASTIC-LAMINATE-CLAD CASEWORK

1.01 RELATED DOCUMENTS

- A. Drawings and provisions of the contract including General Conditions, and Division 1, apply to this section.

1.02 NOT USED

1.03 WORK INCLUDED

- A. Furnish and install high-pressure laminate casework and accessories as shown and listed on drawings and specified herein. Include all countertops, sink cutouts, splashes, supports, shelving, and filler panels necessary for a complete casework installation.
- B. The casework contractor shall verify all critical building dimensions prior to fabrication of casework. The casework manufacturer shall re-configure the casework arrangements to dimensions requiring 2-1/2" or less of filler at each end of wall-to-wall elevations, and to ensure a complete and satisfactory installation.
- C. Provide all labor for unloading, distribution, and installation of casework and related items as specified.

1.04 WORK RELATED, NOT INCLUDED

- A. Division 6: Carpentry-blocking within walls to adequately support casework.
- B. Division 9: Resilient Base.
- C. Division 23: Mechanical-furnishing, installation, and hook-up of sinks, fixtures, outlets, strainers, tailpieces, traps, vacuum breakers, stops, etc., shall be performed by the mechanical contractor to state and local codes. In all cases, sink cutouts shall be by the casework contractor. Furnishings, installation, and final connections of all ductwork to range hoods and spray booths shall be by the mechanical contractor.
- D. Division 26: The electrical contractor to state and local codes shall perform electrical furnishing, installation, and final connections of wiring, conduit, and/or electrical items within casework.

1.05 SUBMITTALS

- A. Comply with Division 1.
- B. Product data: submit casework manufacturer's catalog showing model numbers, casework construction details, materials and hardware used.
- C. Submit color high-pressure decorative laminate brochures and edge chains samples.
 - 1. Provide a minimum of (150) laminate selections to choose from among solids, patterns and woodgrains in the standard matte or suede finish.
 - 2. Provide a minimum of (48) PVC 3mm and .020 inch color selections.

- D. Submit interior samples in three colors: (Frosty White: Wilsonart 1573, Natural Almond: Wilsonart D30, Fog: Formica 961)
- E. Submit three sets of laser quality, 11" x 17" shop drawings consisting of:
 - 1. Color and Hardware options selection sheet
 - 2. Small scale floor plan showing casework in relation to the building
 - 3. Large scale elevations and plan views
 - 4. Cross-sections; service runs; blocking locations; and sink centerlines
- F. Shop drawings to be submitted within 30 days after the notice to proceed or as specified in the general conditions of the contract documents.

1.06 DELIVERY, STORAGE, AND PROTECTION

- A. All casework shall be blanket wrapped for protection
- B. Disposable packaging materials causing un-necessary debris shall not be acceptable
- C. All products shall be direct shipped on premium air-ride furniture vans by a licensed hauler to ensure that the casework joinery is not weakened or damaged
- D. Ambient relative humidity must be maintained between 25 – 55% prior to delivery and throughout the life of installation. Temperature must be controlled above 55°F. Casework shall not be stored in non-climate controlled conditions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Case Systems, Inc., 2700 James Savage Road, Midland, Michigan 48642 (989) 496-9510
- B. LSI Corporation of America. 2100 Xenium Lane Minneapolis, MN 55441 (763) 559-4664
- C. TMI Design: 50 South Third Avenue West, Dickinson, ND 58601-5595 (800) 456-6716
- D. Stevens Advantage Laboratory: 704 West main Street, Teutopolis, IL 62467 (217) 540-3100
- D. Substitutions: In order to be an approved equal, the following information must be provided in writing no less than 10 days prior to the specified bid date. Failure to supply this information 10 days prior to bid will be grounds for rejection.
 - 1. List of all deviations from the specified construction. Any items not indicated to be different from the specified construction will be assumed to be provided as written.
 - 2. List of 5 installations with references of the same or greater size and basic scope of work completed within the last 3 years

3. Provide the architect with a full-scale door and drawer base cabinet. The sample shall represent typical construction and materials for the product the casework manufacturer proposes, meeting the quality standards set forth by this specification. The sample may be impounded by the owner for comparison to products delivered to the project site and not returned.
4. The casework manufacturer shall be able to offer the same warranty as Case Systems, a limited lifetime warranty to the original owner against defective material and workmanship. In addition, all non-casework items not manufactured at Case Systems, Inc. such as sinks, fixtures, apparatus, fume hoods, keyboard trays, spray booths, lights, power outlet strips, shall be covered under the original manufacturers warranty.
5. Casework manufacturer must be duly certified for premium grade from the AWI Quality Certification Program for sections 400 (Architectural Cabinets) and 1600 (Modular Cabinets).
6. Provide written documentation of test results in compliance with Section 2.08 of this specification. All testing shall be performed by SEFA certified independent testing facilities and be in compliance with the SEFA 8PL procedures specified.
7. The owner, or its designated representative, reserves the right to reject any proposal that in his/her opinion fails to meet the criteria established by this specification. Such a decision shall be final.

2.02 MATERIALS

A. Core

1. Particleboard

- a. All particleboard shall be Grade M-3 Industrial, according to the American National Standard (ANSI) for Mat-Formed Wood Particleboard, ANSI-A208.1-1999 and shall meet or exceed all requirements set forth by said document.

- 1) Density 40-50 lbs/cu.ft.
- 2) Moisture Content 10% Max
- 3) Modulus of Rupture 2393 psi
- 4) Modulus of Elasticity 398,900 psi
- 5) Internal Bond 80 psi
- 6) Hardness 500 pounds Min
- 7) Linear Expansion 0.35%
- 8) Thickness Tolerance +/- 0.008"
- 9) Face Screw Holding 247 pounds Min
- 10) Edge Screw Holding 225 pounds Min

2. Hardboard

- a. All hardboard shall be tempered with a "S2S" surface finish and must meet or exceed the hardboard product standard ANSI-A135.5.

B. Edge Banding

1. PVC
 - a. 3mm and .020" PVC shall be color through and be applied utilizing hot melt adhesive and radiused by automatic trimmers. Hand tool applying and trimming of edge shall not be allowed. Edging shall be available in a minimum 48 color coordinated options. See section 2.07 for additional information.

C. Laminate

1. High-Pressure Laminate
 - a. "High Pressure Laminates" shall meet the definition and performance requirements of ANSI/NEMA 3 LD – 2000. Vertical grade laminate shall be VGS, GP-28 balanced with a minimum grade of CLS. Countertops shall be HGS, GP-50 as specified. Minimum 150 color options. See section 2.07 for additional information.
 - b. Provide at all exposed exterior cabinet surfaces including wall cabinet bottoms and also interiors of open cabinets or those with glazed doors.
2. Thermally Fused Melamine Laminate
 - a. Thermally Fused Laminate shall meet the performance requirements of ANSI/NEMA 3 LD – 2000 for GP-28. Cabinet manufacturer shall submit panel manufacturers' current published specification stating ANSI core properties and NEMA finish properties. Color shall match interior, Almond, Grey, or White. Surface texture shall be similar to exterior finish.
 - b. Provide at all semi-exposed and concealed surfaces, all surfaces that are not exposed when doors and drawers are closed except where balancing of GP-28 laminate is required.
3. Cabinet Liner
 - a. .020" thick, high- pressure cabinet liner conforming to ANSI/NEMA 3 LD – 2000, CLS. Color shall match interior, Almond, Grey, or White. Surface texture shall be similar to exterior finish.
 - b. Provide on semi exposed surfaces where exterior surface is GP-28 laminate for proper balancing. Surfaces are such as semi exposed face of doors, drawer heads, finished end panels, etc...

D. Adhesives

1. PVA
 - a. Adhesive shall be mechanically applied; no contact adhesive will be permitted.
2. EVA
 - a. Adhesive shall be mechanically applied; no contact adhesive will be permitted.

2.03 HARDWARE

A. Hinges

1. 5 Knuckle hinges / reveal overlay
 - a. Hinges shall be model #HH020 .095" steel five-knuckle hospital-tip institutional grade quality with .187" diameter tight pin. Residential, kitchen type pivot, plain butt, or hinges with removable pins "shall not be acceptable". Each hinge shall be secured with a minimum of nine No. 8 screws. Hinge shall permit door to swing 270 degrees without binding. Doors less than 48" in height shall have two hinges. Doors over 48"

in height shall have three hinges. A minimum of three color finishes shall be available.

B. Pulls

1. One pull shall be located at the centerline of the drawer, regardless of width, to ensure ease of operation and maximize drawer slide life. One selection from standard options per color scheme. See Color Selection Section 2.07 for additional color information.
 - a. DP030 plastic bow pull, 10mm diameter with 96mm O.C. mounting holes.
 - b. DP070 anodized aluminum wire pull, 8mm diameter with 96mm O.C. mounting holes.
 - c. DP080 plastic contour pull, surface mounted, 35mm x 116 mm overall size with 96mm O.C. mounting holes.

C. Drawer Slides

1. Standard drawer: DS230 Self-closing, bottom mount epoxy coated with captive roller and positive in stop. Slide shall have 100lb. load rating, must be self-closing and must prevent drawer fronts from contacting the cabinet body.
2. File drawer: DS430 Full extension, bottom mount epoxy coated with captive roller and positive in-stop. Slide shall have 100lb. load rating, must be full extension, and prevent drawer fronts from contacting the cabinet body.

D. Mod-Eez

1. All cabinet body components shall be secured utilizing concealed interlocking mechanical fasteners as approved by the Architectural Woodwork Institute Quality Standards 8th Edition -2003 Sections 400A-T-12, 400B-T10 and 1600-T-11. The Mod-Eez is also an approved fastener by the Woodwork Institute "Manual of Millwork".

E. Wall Shelving Hardware

1. Standard duty wall shelving hardware
 - a. Shelving standards shall be KV800 in an anochrome finish.
 - b. Shelving brackets shall be KV810 in an anochrome finish
2. Heavy duty wall shelving hardware
 - a. Shelving standards shall be KV870 in an anochrome finish.
 - b. Shelving brackets shall be KV880 in an anochrome finish.

F. Shelf Clips

1. Plastic
 - a. Shelf clips shall be SC240 injected molded clear plastic, with a double pin engagement 32mm on center and shall have 3/4" and 1" anti-tip locking tabs as approved in AWI 400B-T-9 for premium grade.
 - b. Shelf clips shall be SC200 single pin plastic shelf clip with anti-tip locking tabs, used for all 1/4" hardboard shelves.

G. Coat Hooks

1. Single prong and double prong zinc plated.

H. Closet Rods

1. 1" diameter zinc plated rod with captive sockets.

I. Mirrors

1. Teacher wardrobe mirrors to be 8" x 10".

J. Locks, model # LK010 (Where shown or noted only)

1. Five disc tumbler cam locks with chrome plated steel face plate.
 2. All locks keyed alike or keyed differently by room and master keyed. Shall permit a minimum of 166 keying options.
 3. Lock core is removable with a control key, permitting owner to easily change lock arrangements without tools.
 4. Inactive door of base and wall cabinets shall be secured by using an elbow catch or a chain bolt for tall cabinets.
- K. Casters
1. Shall be available in both 4" (3" diameter wheel) and 6" (5" diameter wheel) nominal heights.
 2. Shall be ball bearing with 360 swivel.
 3. Shall have non-marring wheels available in both locking and non-locking.
 4. 4" casters must have a minimum load rating of 165 lbs per caster and the 6" casters must have a minimum load rating of 200 lbs per caster.
- L. Chain Pulls, model # CP200
1. Zinc plated, spring loaded door catch used to hold door securely shut.
- M. Chain Stops, model # CS010
1. Zinc plated looped chain used to limit door swing, mounting plate at each end of chain shall use (4) #7 x 5/8" screws to secure to cabinet door and end panel.
- N. Elbow Catch, model # EC010
1. Chrome plated, spring loaded door catch used to hold door securely shut.
- O. Roller Catch, model # RC010 (not used with self-closing hinges)
1. Heavy-duty spring-loaded roller, with molded plastic bumper mounted at door top to keep door securely shut.
- P. Magnetic Catch, model # MC010 (not used with self-closing hinges)
1. White plastic housing with two 32mm spaced, elongated holes for screw attachment to allow adjustability.
- Q. Tote Tray and Supports
1. High Impact resistant polystyrene, white in color, with label holder permanently attached to face of tray.
 2. Supported by individual polycarbonate channels mounted to cabinet ends and partitions with two integral 5mm diameter pins and secured with one euro style screw. Height adjustable on 32mm (1-1/4") centers.
- R. Countertop Supports
1. Powder-coated, formed metal supports using .25" X 1.50" steel bar stock. Must provide attachment points to counter top and wall. See Color Selection Section 2.07 for color information.
- S. Metal grilles in radiation enclosures and countertops:
1. Model CT-PP-O, 0 deg. deflection, extruded aluminum supplied with type 13 border, manufactured by Titus Products- Div. Phillips Industries in lengths and widths as indicated on the drawings or as otherwise required. Finish: Color as selected from manufacturer's full range.

T. Metal grills in toe space of millwork unit and where otherwise required:

1. Model 2000 FP pencil proof linear bar floor grille, 0 deg. deflection, extruded aluminum manufactured by Metal Industries, Inc. in lengths and widths indicated or as required. Finish color: As selected from manufacturer's full range.

2.04 CASEWORK FABRICATION

A. General Cabinet Construction

1. All structural components shall be min. 3/4" thick with balanced surfaces.
2. All fastening devices and screws shall be treated to deter or resist corrosion.
3. Mounting stretchers are 3/4" thick structural components fastened to end panels by mechanical fasteners, and are concealed by the cabinet back.
4. When the rear of a cabinet is exposed, a separate finished 3/4" thick decorative laminate back panel may be applied.
5. A 5mm diameter row hole pattern 32mm (1-1/4") on center shall be bored in cabinet ends for adjustable shelves. This row hole pattern shall also serve for hardware mounting and replacement and/or relocation of cabinet components.
6. All door and drawer fronts and finished ends shall be balanced construction with "high-pressure" laminate bonded to both sides of a M-3 engineered board core.
7. Fixed interior components such as fixed shelves, dividers, and cubicle compartments shall be full 3/4" thick M-3 engineered board core attached with concealed interlocking mechanical fasteners.
8. All joints are tight fitting and will not rupture or loosen due to the following:
 - a. Dimensional changes in the engineered board.
 - b. Racking of casework during shipment and installation.
 - c. Normal use.
 - d. Seismic shock as tested and approved by the Woodwork Institute for casework used in schools and hospitals.

B. Cabinet Box

1. Each end panel to be secured with mechanical fasteners for a total tensile strength of 2,450 pounds. (excluding tall cabinets)
2. All tall cabinet end panels to be secured with mechanical fasteners for a total tensile strength of 3,850 pounds. All tall cabinets to also be provided with an intermediate fixed shelf to maintain internal dimensional stability under heavy loading conditions as well as an intermediate 3/4" thick stretcher located behind the back panel and be secured to the cabinet ends with mechanical fasteners. Where an intermediate shelf is present, the stretcher shall also be secured to the shelf with #8 x 2" plated flat head screws.
3. All base cabinets, except sink cabinets, shall have a solid 3/4" thick sub-top of M-3 engineered board core fastened to the ends with interlocking mechanical fasteners.
4. All wall cabinet bottoms shall be of 1" thick M-3 engineered board core mechanically fastened to end panels and secured to the bottom back stretcher. A lower 3/4" thick stretcher shall be located behind the back panel and attached to the end panels with mechanical fasteners. The stretcher is also secured to the cabinet bottom.
5. All sink cabinets shall incorporate a split removable back panel. A formed front brace and steel corner gussets shall be utilized to support and securely fasten top in all four corners. Front brace shall be powder coated black with attached trim, matching box edge trim color.
6. An upper 3/4" thick stretcher shall be located behind the back panel and attached to the end

panels with mechanical fasteners. This stretcher is also fastened to the full sub-stop thus capturing the back panel

- C. Backs, all back panels shall be;
 - 1. 1/2" thick surfaced both sides for balanced construction.
 - 2. Fully captured on both sides and bottom; face-mounted, stapled backs are not acceptable.
- D. Base
 - 1. Individual bases constructed of exterior grade plywood, factory applied to base and tall cabinets shall support and carry the load of the end panels, and the cabinet bottom, directly to the floor. The base shall be let in from the sides and back of the cabinet to allow cabinets to be installed tightly together and tight against a wall. Also to conceal the top edge of applied vinyl base molding. There shall be a front to back center support for all bases over 30" wide.
- E. Drawers
 - 1. All drawer components shall be 1/2" thick M-3 engineered board core surfaced both sides for balanced construction.
 - 2. Drawer box shall be constructed with a full 1/2" thick, non-racking, non-deflecting platform bottom that is carried directly by "L" shaped, bottom mount drawer glides. Sides are secured with 1-1/2" long screws driven through the platform and into the sides.
 - 3. Sides, back, sub-front and bottom shall be 1/2" thick M-3 engineered board core surfaced both faces with (Frosty White: Wilsonart 1573, Natural Almond: Wilsonart D30, Fog: Formica 961) thermally fused melamine. The top edge shall be nominal 1mm (.020") PVC matching the drawer color.
 - 4. Corners shall be joined with fluted hardwood dowels and glue spaced at a minimum of 32mm o/c.
 - 5. Drawer fronts shall be removable and attached to drawer box sub-front with screws from inside of drawer.
 - 6. Horizontal parting rails between drawers shall be 3/4" M-3 engineered board with balanced surfaces, secured to and further reinforcing cabinet ends. When drawers are keyed individually within a cabinet, or when drawers are fitted with lock hasps, the parting rail shall run full depth of cabinet to prevent pilfer.
 - 7. Drawers with 1/4" bottoms requiring hot melt glue or intermediate supports will not be permitted. No exceptions will be permitted.
 - 8. File drawer box shall have full height sides supporting a heavy-duty support rail for hanging file folders. Painted steel supports or metal file frames set into the drawer are not acceptable.
- F. Doors
 - 1. Solid Doors
 - a. Solid 3/4" M-3 engineered board core with HPL front and liner back used for balanced construction.
- G. Adjustable Shelves
 - 1. Laminate Shelves
 - a. Adjustable shelves shall be M-3 engineered board core with balanced surfaces and have a nominal 1mm (.020") thick PVC front edge.
 - b. Adjustable shelves 36" wide and over shall be 1" thick.
 - c. All adjustable shelves in open cabinets shall be 1" thick, except for special use cabinets such as mail, cubical or locker type units.
 - d. All other shelves shall be 3/4" thick.

2.05 SPECIALTY CABINETS

A. Library Cabinets

1. See Library specification.

B. Rail Mounted Cabinets

1. Wall mounted continuous support rail and cabinet mounted interface hooks shall be anodized finished extruded aluminum.
2. Wall mount support shall come factory pre-drilled 8" on center for mounting to 16" or 24" on center studs and in-wall blocking. Blocking is required per manufacturers' recommendations and is supplied and installed by specified trade.
3. Cabinet interface hooks shall be pre-mounted at the factory with deep thread 7mm x 70mm specialty screws. Screws shall not be visible in cabinet interior. Three hook styles shall be available for single, double and triple height adjustment based on the cabinet model number.
4. Cabinet lower leveling bar shall be adjustable from cabinet interior and shall allow for plus or minus 3/8" plumb adjustment without additional materials. Fixed plastic channels shall not be acceptable.
5. Recommended maximum load capacity for base cabinets with a 1 1/8" standard laminate countertop, wall cabinets and tall cabinets shall be 100 lbs per linear foot. Optional leg supports shall be available to accommodate heavier loads for tall and base rail cabinets.
6. Rail mounted casework shall be vertically and horizontally adjustable.
7. Core material only available in particleboard.

D. Mobiles

1. Mobile top shall have 3mm edging as specified and shall have an overhang at front, sides and rear to act as a bumper. Mobile top shall be available in a color that is different from the cabinet box.
2. Mobile unit shall be constructed on a 1" thick M-3 core platform with 3mm black edging. Sides, back and casters will be securely fastened using mechanical fasteners.
3. Mobile units shall be available with either 4" or 6" nominal height casters. See section II Product Construction (B Hardware, 11 for caster specifications).
4. Mobile back shall be 1" thick M-3 core.

2.06 COUNTERTOPS

A. Materials

1. High-Pressure Decorative Laminate, Nominal 1 1/8" Thick:
 - a. General Purpose, HGS high-pressure decorative laminate on horizontal surface, conforming to NEMA Standard LD3-1995. See section 2.07 for color options.
 - b. Laminate bonded to 1" thick M-3 particleboard core with PVA rigid adhesives. Contact method shall NOT be allowed. Counter top and backsplash core shall be balanced with HPL backer.
 - c. All joints shall be secured with adhesive and tight joint fasteners.
 - d. Provide 4" high back splashes where shown and at all ends abutting walls and adjacent cabinets.
 - e. Countertops shall conform to ANSI A161.2-1979 performance standards for fabricated high-pressure decorative laminate countertops.
 - f. Counter top and backsplash edges shall have 3mm radiused PVC machine applied with hot-melt adhesives. Contact method shall NOT be allowed. See color selection section 2.08 for color options.

- g. The bottom edge of all back and side splashes shall have .020" PVC applied to further seal against water penetration.
 - h. All sink cutouts shall be coated with sanding sealer or polyurethane to protect against water damage.
2. Epoxy Resin Top and Sinks
- a. Manufacturers:
 - 1. Durcon/Laboratory Tops, Inc.
 - 2. Epoxyn Products
 - 3. Kewaunee Scientific
 - b. Epoxy resin products blended to provide maximum chemical resistance and physical strength. Oven cured for maximum physical chemical stability.
 - c. Each epoxy top to be examined before fabrication to inspect for variances in thickness. Each corner of top shall not deviate more than plus or minus 1/32" (.793mm) from normal.
 - d. Each epoxy top to be examined before fabrication to inspect for flatness. To be measured in unrestrained condition. The tops are accepted for use if there is no gap exceeding 1/16" in a 36" span or 3/32" in 96" span.
 - e. Countertops to be 1" thick with 4" applied curb. Coordinate opening size for plumbing fixtures. Provide continuous drip groove at all exposed edges of counter.
 - f. Provide epoxy resin sinks where required on drawings. Provide with removable strainer and threaded tailpipe. All sinks to be drop-in style. See drawings for sizes.
 - g. Color to be Black.
 - h. Chemical Resistance Properties:

Test Method A	PANEL RATING
CHEMICAL	
Acetone	Excellent
Amyl Acetate	No Effect
Benzene	Excellent
Butyl Alcohol	No Effect
Carbon Tetrachloride	No Effect
Chloroform	Excellent
Diethyl Ether	No Effect
Dimethyl Formamide	Excellent
Dioxane	Excellent
Ethyl Acetate	Excellent
Ethyl Alcohol	No Effect
Formaldehyde	No Effect
Heptane	No Effect
Kerosene	No Effect
Methyl Alcohol	No Effect
Methyl Ethyl Ketone	Excellent
Toluene	Excellent
Trichloroethylene	Excellent
Turpentine	No Effect
Xylene	No Effect
Test Method B	

CHEMICAL	PANEL RATING
98% Acetic Acid	No Effect
5% Acetic Acid	No Effect
28% Ammonium Hydroxide	No Effect
10% Ammonium Hydroxide	No Effect
Aqua Regia	Excellent
Sat. Calcium Hypochlorite	No Effect
40% Chromic Acid	Good
10% Citric Acid	No Effect
Dichromate Cleaning Solution	Failure
88% Formic Acid	No Effect
Furfural	Good
37% Hydrochloric Acid	No Effect
10% Hydrochloric Acid	Excellent
48% Hydrofluoric Acid	Fair
3% Hydrogen Peroxide	Excellent
Mineral Oil	No Effect
70% Nitric Acid	Good
40% Nitric Acid	Excellent
30% Nitric Acid	No Effect
10% Nitric Acid	No Effect
Oleic Acid	No Effect
88% Phenol	Excellent
8% Phenol	Excellent
85% Phosphoric Acid	No Effect
10% Silver Nitrate	Good
50% Sodium Hydroxide	Excellent
40% Sodium Hydroxide	Excellent
10% Sodium Hydroxide	Excellent
1% Sodium Hydroxide	No Effect
20% Sodium Carbonate	No Effect
2% Sodium Carbonate	No Effect
Sat. Sodium Chloride	No Effect
10% Sodium Chloride	No Effect
5% Sodium Hypochlorite	No Effect
96% Sulfuric Acid	Failure
77% Sulfuric Acid	Excellent
30% Sulfuric Acid	Excellent
3% Sulfuric Acid	Excellent
Sat. Zinc Chloride	No Effect

Physical Properties Testing
Material Tested: Modified Epoxy Resin II

Flexural Strength (ASTM D-790-71)	10,000 lbs./sq.in.
Rockwell "M" Hardness (ASTM D-785-65)	100

Water Absorption
(ASTM D-570-77) .01%

Other testing of uncommon requirements has been conducted. Results of these tests and others you may require are available upon request.

2.07 COLOR SELECTION

A. Edge Banding

1. PVC

- a. Thick (3mm) coordinating and contrasting edge solutions are to be available in minimum (48) color-thru standard colors with a low gloss smooth finish. No hand tool trimming allowed.
- b. Thin (Nominal 1mm, actual .020") coordinating and contrasting edge solutions are to be available in minimum (48) color-thru standard colors. No hand tool trimming allowed.

B. Laminate

1. High Pressure Laminate for cabinets or counter tops are to be available in a minimum (150) manufacturers' standard line suede finishes from selected laminate manufacturers, including WilsonArt® in a "60" matte finish and Nevamar® in a "T" textured finish. Specialty and other manufacturer finishes are available with additional cost and longer lead times.
2. Thermally Fused Melamine Laminate available in Natural Almond (WilsonArt D30), Fashion Gray (Wilsonart D381) and Frosty White (Wilsonart 1573) for the standard interior cabinet surface at no up-charge. Fusion Maple (WilsonArt 7909), Oiled Cherry (Pionite WC421) and Golden Oak (WilsonArt 7888) may also be specified, but will result in additional cost when used on standard casework. Library cabinets are priced to include the added cost of the wood grain thermally fused material and therefore do not get an up-charge.

C. Misc. Hardware

1. Table Frames

- a. Available in light beige, grey or black

2. Countertop Support

- a. X0500 Support available in grey, light beige, black and white

3. Pulls

- a. DP030 Plastic wire pull available in white, light beige, greystone, surf white, haze, clay, taupe, black, hunter green, slate grey, burgundy, platinum, victorian teal, shadow blue, brittany blue, pepperdust, mauve blush, or marine blue.
- b. DP070 Clear anodized aluminum wire pull
- c. DP080 Plastic contour pull available in almond, grey, black and white.

4. Hinges

- a. HH020 5 Knuckle hinge are available in black, almond and platinum in an epoxy powder coat.

5. Grommets

- a. GR650 Paper grommet is available in black
- b. GR660 Round grommet is available in black, almond, grey or white.
- c. GR620 Oval grommet is available in black.

2.08 PRODUCT QUALITY TESTING

A. Cabinet Joinery

1. Base Cabinet

a. Base cabinet testing shall be done in accordance with SEFA 8PL Recommended Practices Paragraph 4.0 Base Cabinets. All testing shall be performed by SEFA certified independent testing facilities. The following tests shall be performed:

- 1) The SEFA test procedures are accessible on-line at www.sefalabs.com The ANSI/NEMA 3 LD – 2000 test procedures are available on-line at www.global.ihs.com
- 2) Test Paragraph
- 3) Cabinet Load 4.2
- 4) Cabinet Concentrated Load 4.3
- 5) Cabinet Torsion 4.4
- 6) Cabinet Submersion 4.5

2. Doors

a. Door testing shall be done in accordance with SEFA 8PL Recommended Practices Paragraph 5.0 Doors. The following tests shall be performed:

- 1) Test Paragraph
- 2) Door Hinge Test 5.1
- 3) Door Cycle Test 5.2

3. Drawers

a. Drawer testing shall be done in accordance with SEFA 8PL Recommended Practices Paragraph 6.0 Drawers. The following tests shall be performed:

- 1) Test Paragraph
- 2) Drawer Static Test 6.1
- 3) Drawer Impact Test 6.2
- 4) Drawer Internal Rolling Test 6.3
- 5) Drawer Cycle Test 6.4

4. Cabinet Surface Finish

a. Cabinet surface finish tests shall be done in accordance with SEFA 8PL Recommended Practices Paragraph 8.0, Cabinet Surface Finish Tests. The following testing shall be performed:

- 1) Test Paragraph
- 2) Chemical Spot Test 8.1
- 3) Boiling Water Resistance Test 8.2 (ANSI/NEMA LD 3 -2000 Paragraph 3.5)
- 4) Ball Impact Resistance Test 8.3 (ANSI/NEMA LD 3 -2000 Paragraph 3.8)
- 5) Dart Impact resistance Test 8.4 (ANSI/NEMA LD 3 – 2000 Paragraph 3.9)

5. Edge Delaminating Test

a. Edge delaminating tests shall be done in accordance with SEFA 8PL Recommended Practices Paragraph 8.5, Edge Delaminating Test.

6. Plastic Laminate Abrasion Test

a. Plastic laminate abrasion tests shall be done in accordance with SEFA 8PL

Recommended Practices Paragraph 8.7 Plastic Laminate Abrasion Test (ANSI/NEAM LD 3 – 2000 Paragraph 3.13).

7. Wall, Counter Mounted, and Tall Cabinets Load test
 - a. The wall mounted cabinet load test shall be done in accordance with SEFA 8PL Recommended Practices Paragraph 9.0.

PART 3 EXECUTION

3.01 SHIPPING

- A. All casework shall be blanket wrapped and delivered to the jobsite in air-ride furniture vans.

3.02 CASEWORK INSTALLATION

- A. Casework shall not be delivered or stored at the jobsite until building has become adequately dry and secure. The ambient relative humidity must be maintained between 25% and 55% prior to delivery and through the life of the installation.
- B. Installation shall be by CASEWORK MANUFACTURER'S authorized representative.
- C. Casework is to be installed plumb and true, and is to be securely anchored in place. Scribe casework fillers as necessary for a tight fit.
- D. Wall cabinets shall be securely fastened to horizontal blocking, not to plaster, lath, or wallboard. Appropriate trade shall provide reinforcement of stud walls during erection of walls. CASEWORK MANUFACTURER shall accurately locate blocking requirements on shop drawings.
- E. Install countertops on base cabinets using screws.

3.03 CLEANING AND PROTECTION

- A. Empty drawers of dirt and dust. Wipe out cabinets interiors to remove dirt and dust. Remove pencil or other marks, excess adhesive, etc. from cabinets and countertops. Remove all packaging, scraps, and debris resulting from casework installation activities.
- B. Make final adjustments to doors and drawers. Doors shall swing freely, catches shall hold securely, and all other doors shall be aligned both vertically and horizontally. Drawers shall open and close smoothly, without binding and without excessive slide play.
- C. Keys shall be appropriately labeled and turned over to the Owner.

3.04 SCHEDULE

- A. See Interior Elevation Drawings

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of contract, including General and Supplementary Conditions and Division-1 Specification apply.

1.02 SUMMARY

A. this section includes wood laboratory casework located in the following areas:

1. Art Rooms, including Work Rooms & Storage Rooms associated with the Art Room
2. Science Rooms and Labs, Science Prep Rooms and Science Storage Rooms

1.03 QUALIFICATIONS

- A. All laboratory equipment covered by this specification and the relevant project drawings shall be furnished by a single source to facilitate coordination between the various manufacturers and eliminate divided responsibility.
- B. Equipment Contractor shall submit a list demonstrating the completion of at least ten (10) projects of equal or greater size than this project and that have been in service for five (5) years or longer.
- C. Those seeking to bid, other than the supplier of the specified products must apply for approval at least seven (7) days prior to bid opening. Full-sized samples of wall, base, and tall cabinets along with relevant specifications must be submitted to the architect.

1.04 QUALITY ASSURANCE

A. Basis of Design and Quality

1. All Wood Casework except Laboratory Tables: CIF Lab Solutions
2. Student & Instructor Laboratory Tables: Labscape, LLC.

B. Provide certification that furniture meets the performance requirements described in SEFA 8.

C. Acceptable Manufacturers:

1. CIF Lab Solutions
2. Labscape, LLC
3. Sheldon Laboratory Systems
4. Kewaunee Scientific Corp.

1.05 WORK BY EQUIPMENT CONTRACTOR

- A. Furnishing, delivering to the jobsite, uncrating, setting in place, leveling and securing all casework and equipment listed in the specification or equipment schedule and/or shown on the drawings.
- B. Furnishing plumbing fixtures and fittings only as defined by specifications or noted on project drawings and/or as included in manufacturer's standard model number. Assembling and securing fixtures to casework and equipment shall be by the Plumbing Contractor as part of their final connections.
- C. Furnishing electrical service fixtures as defined by specification or noted on project drawings and/or included in manufacturer's standard model number. Assembling or securing fixtures to casework and equipment shall be by the Electrical Contractor as part of their final connections.
- D. Furnishing and installing sink bowls and cup sinks, complete with required overflows, plugs and strainers as called for in the specifications, equipment list and/or shown on the drawings.
- E. Furnishing and installing filler panels and scribes as required for finished installation.
- F. Furnishing and installing locks at doors and drawers when specifically noted in the specifications or project drawings. (If locks are not noted or called for, they will be excluded from Equipment Contractor's scope of work.)
- G. Removal of all debris, dirt, and rubbish accumulated as a result of installation of this equipment, leaving premises broom clean and orderly. Debris and rubbish to be deposited in dumpsters provided by General Contractor.

1.06 WORK BY OTHERS

- A. Plumbing Work
Service rough-ins, shut-off valves, internal piping, support brackets, or final connection to plumbing fixtures (Service fixtures, when provided, are installed by the Plumbing Contractor.)
- B. Electrical Work
Service rough-ins, junction boxes, internal conduit and wiring, support brackets, or final connection to electrical fixtures. (Electrical receptacles, when provided, are installed by Electrical Contractor.)
- C. Sink Drains
Waste rough-ins, hubs, vents, adapters, internal piping, support brackets, traps, tailpieces, or final connection to sink outlet.
- D. Fume Hood Duct Work, Fans, and Blowers
Exhaust and supply duct, fans, exhaust stacks, mounting brackets, adapters, safety disconnects, magnetic starters, conduit and wiring to fans or final connection to equipment.
- E. Appliances, Data Outlets, Wall-Mounted Chalkboard and Tack Boards
Chalkboards and tack boards are provided when they are an integral part of the Labscape product.

- F. Locks
Except where specifically called for.
- G. Demolition Work
- H. Caulking Between Tops, Walls, Battens, and Equipment
All caulking to be by General Contractor.
- I. Framing or Reinforcements
Any framing or reinforcement of walls, floors, and ceilings required to support the equipment provided under this section, including but not limited to threaded rods, uni-strut, and plaster grounds shall be provided and installed by the respective trade. Equipment supplier shall provide detailed drawings showing types and locations of required blocking and securement apparatus.
- J. Furnishing, installing, and connecting of all vents, revents, steam fittings and special plumbing fixtures or piping to meet local codes, even though not specifically called for in the specifications and/or shown on the drawings.
- K. Furnishing and installation of all rigid or flexible conduit, wire, pulling of wire, fittings, special electrical equipment and accessories including boxes, receptacles; flush plates sent loose. Included are those in box curbs or tops which are not installed at Equipment Contractor's plant due to inconvenience of shipping. Wiring and connection of switch to fume hood lights and blower motors.
- L. Furnishing any miscellaneous materials generally classified as maintenance or supply items.

1.07 SUBMITTALS

Submit the following in accordance with General Conditions of contract specifications.

- A. Product data for each type of casework, hardware and accessories specified. Provide data indicating compliance with SEFA 8 standards.
- B. Shop drawings for countertops showing sizes, shapes, edge and backsplash profiles, cutouts for plumbing fixtures and methods of joining.
- C. Shop drawings for casework showing location and size of each type of casework, accessories, materials, finishes, hardware types and locations, and filler panels. Include fully dimensioned plans, elevations and sectional details of all equipment included in this specification. Shop drawings shall show the construction and interface of all equipment included in this specification.
- D. Samples for initial selection purposes of manufacturer's color charts showing the full range of colors, textures and patterns for each type of material included in this specification.
- E. Samples for verification purposes must be based on the following specifications and not a "manufacturers standard" product. Manufacturer will be allowed to submit only one (1) set of samples for approval. Samples not meeting the following specification will be grounds for rejection of bid. Upon request of the Architect/Owner, samples must be submitted within thirty (30) days and may be held until project completion. Samples that may be required are as follows:

1. One (1) combination drawer and cupboard base cabinet showing construction details.
2. Sample of countertop material.
3. Specifications and product literature indicating deviations from the project specifications.

1.08 MAINTENANCE AND OPERATING INSTRUCTIONS

This Contractor shall include in its bid, the cost of providing a technically qualified representative for a period of one (1) day to thoroughly instruct the Owner's personnel in correct procedures of operating and maintaining this contract.

1.09 GUARANTEE

This Contractor shall guarantee all materials and workmanship of equipment provided on this contract for a period of eighteen (18) months from the date of final acceptance. Any defective materials or faulty workmanship occurring within that time shall be replaced or corrected without charge.

PART 2 – MATERIALS

2.01 HARDWOOD PLYWOOD (for this specification, all language refers to Northern Red Oak.

White Maple or Birch may be substituted in lieu of Northern Red Oak.)

- A. Plywood used for exterior surfaces and exposed to view after installation or for interior surfaces of open face cabinets or cabinets having glazed doors shall have A-1 plain sliced face grade veneers and shall be of thickness described under Part 3 – Construction of this specification.
- B. Plywood used for exterior surfaces unexposed to view after installation or interiors of cabinets with doors or drawers shall be hardwood Grade D veneer face, Grade 3 back.

2.02 LUMBER

- A. All lumber used for exposed cabinet members shall be selected northern grown hardwood, matching that of the hardwood plywood selected, free from cracks, checks and knots.
- B. All lumber used for interior construction shall be hardwood as selected by the manufacturer and free from structural defects.
- C. All solid lumber shall be thoroughly air-dried, then kiln dried to a moisture content of 6 – 7% and finally environmentally tempered before fabrication.

2.03 HARDBOARD

- A. Hardboard shall be ¼“ thick, composed of wood fibers and resinous binder compressed under heat and pressure to form a hard, smooth surface.

2.04 HIGH DENSITY FIBERBOARD

- A. High Density Fiberboard shall be ¾“ thick, composed of wood fibers and resinous binder formed with heat and pressure to form a hard, smooth surface.

2.05 EDGING

- A. All exposed cabinet doors, drawer and drawer fronts and shelf edges shall be edged with
3 mm solid oak banding applied with hot melt adhesive under extreme heat and pressure.
- B. Unexposed shelf edging shall be edged with 3MM solid oak banding applied with hot melt adhesive under extreme heat and pressure.

2.06 GLASS

- A. Framed sliding and swinging doors shall be $\frac{3}{16}$ ” thick tempered glass.
- B. Unframed sliding glass doors shall be ¼” thick tempered glass.
- C. Fume hood glass shall be $\frac{7}{32}$ ” thick laminated safety float glass.

2.07 DOWELS

- A. Dowels used to assemble rails and panels shall be 8MM diameter fluted hardwood.

2.08 HARDWARE

A. Hinges

1. Hinges shall be 5 knuckle hospital tip institutional grade quality, .083” thick, offset type
for swinging doors. Hinges shall be 2½” long with a non-removable pin and be satin
finish stainless steel.
 - a. Doors under 48” in height shall receive two (2) hinges.
 - b. Doors exceeding 48” in height shall receive three (3) hinges.
 - c. Hinges are mounted using four (4) flat head screws to the cabinet end and five (5)
flat head screws to the door resulting in a minimum weight load capacity of
200
pounds.

B. Door and Drawer Pulls

1. Pulls shall be zinc coated steel bow or wire type, nominally 4" O.C.
 - a. Pulls shall be surface mounted and attached using two (2) machine screws.
 1. All doors shall receive one (1) pull per door.
 2. Drawer fronts up to 24" wide shall receive one (1) pull.
 3. Drawer fronts exceeding 24" wide shall receive two (2) pulls.
 2. Flush pulls for sliding doors shall be recessed providing a finger grip and be satin finish chrome plated steel.
- C. Locks
1. Locks, when specified and called for on the drawings, shall be 5-disc tumbler with an interchangeable cylinder. Finish shall be satin nickel.
 - a. Locks shall have the capacity for 200 primary key changes.
 - b. Cam shall fit securely into mortised slot located in cabinet bottom, side or intermediate rail.
- D. Catches
1. Base and wall cabinets shall have roller catches consisting of two (2) spring-loaded polyethylene rollers and metal catch.
 - a. Double door cabinets without locks shall have a catch on each door.
 2. Tall cabinets shall employ a 3-point latch mechanism.
- E. Drawer Slides
1. Standard drawers shall be equipped with a ¾ extension slide assembly consisting of a 2-part slide mechanism of epoxy coated steel and captive nylon rollers. Minimum dynamic load rating shall be 100 pounds.
 - a. Drawer slide member shall have two (2) legs formed at 90° wrapping side and bottom of drawer.
 - b. Cabinet slide member shall be U-shaped formed to capture nylon roller and be mounted with screws to the side of the cabinet.
 2. Full extension slide, when specified, shall be a 3-part slide mechanism consisting of zinc plated cold rolled steel and captive steel ball bearings. Minimum dynamic load rating of 100 pounds.
 - a. Drawer slide members are side mounted with screws.
- F. Shelf Supports
1. Shelf supports shall be heavy-duty nylon or injection molded plastic with a double stem engagement system inserted into pre-drilled holes in the cabinet ends or partition.

Pre-
drilled holes shall be located 32MM (1¼") on center.

2. Shelf supports shall have molded locking tabs, that will accept ¾" and 1" shelving, to prevent accidental tipping.

G. Wardrobe Hangar Rod

1. 1¼" diameter chrome plate steel rod supported by end mounted captive sockets.

H. Tote Trays

1. Impact resistant polystyrene of tan color.

I. Leg Boot / Floor Glides

1. All table legs shall receive 2½" black rubber leg boots to conceal leveling device.
2. Leg leveling device shall be of non-skid, non-marring material 1" in diameter with a minimum of 5/8" height adjustment.

J. Base Molding

1. Base molding shall be provided and installed by others.

K. Upright Rod Assemblies

1. Upright rods and cross rods, when specified, shall be ¾" diameter aluminum.
2. Rod sockets shall be aluminum and secured through the work surface with a lock nut and washer.

L. Sliding Glass Doors

1. Framed Doors

- a. Double extruded aluminum track with hanging nylon rollers secured to the cabinet top and door top. An aluminum U-channel is secured to the bottom of the cabinet for guidance.

2. Unframed Glass Doors

- a. Double extruded aluminum track with roller bearings secured to the bottom of the cabinet. An aluminum U-channel is secured to the top of the cabinet for guidance.

PART 3 – CONSTRUCTION

3.01 STUDENT SCIENCE LABORATORY TABLES

A. General

1. The basis of design for student laboratory table shall be model #16000 AXIS3 sit-down lecture (30"h.) stand-up (36"h.) lab functions and meet ADA accessibility requirements. Work surface is electronically adjustable from 30" to 36", converting from lecture height to lab height without the use of tools and without altering sink height or mechanical/electrical connections.
2. Work surface is curvilinear shaped and measures 96" x 50". The half round sink inside dimensions are 15" x 22" x 5-1/2" deep. It is cantilevered from steel understructure and supported by heavy-duty steel assembly. Integral ledge is used for mounting of service fixtures.
3. Top of sink is mounted at a fixed height of 34" to comply with ADA Guidelines, and all piping under sink is enclosed with contoured metal removable panels. Drain is offset at handicap accessible units to allow for wheelchair accessibility.
4. Countertop is 1" thick black molded epoxy resin with integral raised edge, and should accommodate wheelchair accessibility around entire perimeter of student work area with no obstructions.

B. Construction

1. **Steel support structure** with **motorized height adjustment mechanism** and **locking mechanism** to stabilize countertop; continuous adjustment from 30"H. to 36"H.
2. Cantilevered top with steel support members.
3. 1" thick **solid epoxy resin** countertop with **molded-in raised edge**.
4. One piece cantilevered half round molded epoxy resin sink and service ledge- **inside dimensions-15"x22"x5-1/2" deep**. ADA accessible.
5. Two vandal resistant, **solid cast brass**, combination hot water, cold water & gas fixtures with **powder coat finish**.
6. Four G.F.I. duplex electrical outlets.
7. One multi-outlet strip with surge protector.
8. Four clamp on upright roots with two cross arms and four connectors.
9. Upright rod assembly storage compartment.

3.02 INSTRUCTORS SCIENCE LABORATORY TABLES

A. General

1. The basis of design for Instructors laboratory table shall be model #16500 stand-up (34"h.) lab functions and meet ADA accessibility requirements.
2. Work surface is curved "boomerang" shaped and measures 10'-0" x 5'-6". The oval shaped sink inside dimensions are 17" x 33" x 5 1/2" deep. It is cantilevered from steel understructure and supported by heavy-duty steel assembly. Integral ledge is used for mounting of service fixtures.

3. Top of sink is mounted at a fixed height of 34" to comply with ADA Guidelines, and all piping under sink is enclosed with contoured metal removable panels. Drain is offset at handicap accessible units to allow for wheelchair accessibility.

4. Countertop is 1" thick black molded epoxy resin with integral raised edge, and should accommodate wheelchair accessibility around entire perimeter of work area with no obstructions.

C. Construction

1. **Steel support structure** to stabilize countertop; 34" high fixed height.
2. Cantilevered top with steel support members.
3. 1" thick **solid epoxy resin** countertop with **molded-in raised edge**.
4. One piece oval shaped molded epoxy resin sink and service ledge-
inside dimensions - 17"x33"x5-1/2" deep. ADA accessible.
5. Two vandal resistant, **solid cast brass**, combination hot water, cold water & gas fixtures with **powder coat finish**.
6. Four G.F.I. duplex electrical outlets.
7. One multi-outlet strip with surge protector.
8. Four clamp on upright roots with two cross arms and four connectors.
9. Upright rod assembly storage compartment.

3.03 BASE CABINETS

A. Cabinet End Panels

1. Shall be 3/4" thick 7-ply veneer core plywood with 1/4" solid Red Oak edge banding on the front edge.
2. Shall have two (2) rows of 5MM holes vertically row bored, 32MM on center, on each end panel to accept drawer slides and shelf supports.
3. Shall be notched 4" high x 2 1/4" deep on the front bottom edge to receive a 4" x 3/4" piece of hardwood plywood forming a totally enclosed toe space.
4. Shall receive a 1/4" x 1/4" vertical dado 3/4 of an inch in from the rear edge to accept a 1/4" thick back.

B. Cabinet Bottom

1. Shall be 3/4" thick 7-ply veneer core plywood with 1/4" solid Red Oak edge banding, multiple doweled. Dowels are to be glued securely to end panels and clamped under pressure to ensure joint integrity and unit squareness.

C. Horizontal Top Frame

1. At the front of the cabinet, rail shall be 2 1/2" x 1" solid oak.
2. At the rear of the cabinet, rail shall be 2 1/2" x 1" solid hardwood.
3. At the sides of the cabinet, rails shall be 1 1/2" x 3/4" hardwood.

4. All rails shall be multiple doweled. Dowels are to be glued securely to end panels and clamped under pressure to ensure joint integrity and unit squareness, resulting in a fully framed cabinet.

D. Horizontal Intermediate Rails

1. Shall be 2½" x ¾" solid oak, multiple doweled and glued securely to end panels.
2. Shall be located at the front of the cabinet between stacked drawers and between doors and drawers.

E. Backs

1. Shall be ¼" high density fiber board at unexposed interiors.
2. Shall be ¼" 5-ply hardwood plywood at exposed interiors.
3. In all base cabinets, the back will fit snugly into a ¼" deep dado in the end panels and bottom, and be secured by hot melt adhesive.

F. Hang Rails

1. Shall be 3" x ¾" 7-ply hardwood plywood, multiple doweled and glued securely to the cabinet ends at the top and bottom of the cabinet.

G. Drawers

1. Drawer sides, back and sub-front shall be 7/16" thick 9-ply Birch plywood.
2. Drawer bottom shall be ¼" thick hardboard with a thermally fused laminated interior surface.
3. Sides, back and sub-front shall be assembled using multiple dovetail joints and glue at all four corners.
4. Drawer bottoms shall be set and glued into ¼" dados on all four sides.

H. Shelves

1. Shelves 30" wide or less shall be ¾" thick 7-ply veneer core plywood with ¼" solid oak edge banding on the front edge.
2. Shelves over 30" shall be 1" thick 9-ply veneer core plywood with ¼" solid oak edge banding on the front edge.

I. Doors and Drawer Fronts

1. Shall be ¾" thick solid core material with oak veneer both sides.
 - a. All four (4) edges to be banded with 3 mm solid oak.
 - b. Drawer fronts and swinging doors shall overlap the cabinet opening on all four (4) sides by ¼".
2. An astragal shall be applied to the inside face of the left door and shall extend beyond the rear of the right door, thus securing the left door when locks are required as the right door shall receive the lock.
3. Glass-framed doors shall be 7/8" thick x 2¾" wide solid oak framing.
 - a. The rear inside edge of the opening shall be rabbeted to accept 3/16" thick tempered glass. Glass shall be held in place with plastic retainer.

3.04 WALL CABINETS

A. Cabinet End Panels

1. Shall be $\frac{3}{4}$ " thick 7-ply veneer core plywood with $\frac{1}{4}$ " solid Red Oak edge banding on the front and bottom edge.
2. Shall have two (2) rows of 5MM holes vertically row bored, 32MM on center, on each end panel to accept shelf supports.
3. Shall receive a $\frac{1}{4}$ " x $\frac{1}{4}$ " vertical dado $\frac{3}{4}$ of an inch from the rear edge to accept a $\frac{1}{4}$ " thick back.

B. Cabinet Top and Bottom Panels

1. Shall be 1" thick 9-ply veneer core plywood with $\frac{1}{4}$ " solid Red Oak edge banding, multiple doweled. Dowels are to be glued securely to end panels and clamped under pressure to ensure joint integrity and unit squareness.
2. Shall receive a $\frac{1}{4}$ " x $\frac{1}{4}$ " dado the length of the member $\frac{3}{4}$ of an inch in from the rear edge to accept a $\frac{1}{4}$ " thick back resulting in a fully captured back panel.

C. Backs

1. Shall be $\frac{1}{4}$ " thick high density fiberboard at unexposed interiors.
2. Shall be $\frac{1}{4}$ " thick 5-ply hardwood plywood at exposed interiors.
3. In all wall cabinets, the back will fit snugly into a $\frac{1}{4}$ " deep dado located in the cabinet end panels and top and bottom panels, resulting in a fully captured back. Back shall be secured by hot melt adhesive.

D. Hang Rails

1. Shall be 3" x $\frac{3}{4}$ " 7-ply hardwood plywood, multiple doweled and glued securely to the end panels at the top and bottom of the cabinet.

E. Shelves

1. Shelves 30" wide or less shall be $\frac{3}{4}$ " thick 7-ply veneer core plywood with $\frac{1}{4}$ " solid oak edge banding on the front edge.
2. Shelves over 30" shall be 1" thick 9-ply veneer core plywood with $\frac{1}{4}$ " solid oak edge banding on the front edge.

F. Doors

1. Shall be $\frac{3}{4}$ " thick solid core material with oak veneer both sides.
 - a. All four (4) edges to be banded with $\frac{1}{4}$ " solid oak.
 - b. Swinging doors shall overlap the cabinet opening on all four (4) sides by $\frac{1}{4}$ ".
2. An astragal shall be applied to the inside face of the left door and shall extend beyond the rear of the right door, thus securing the left door when locks are required as the right door shall receive the lock.
3. Glass-framed doors shall be $\frac{7}{8}$ " thick x $2\frac{3}{4}$ " wide solid oak framing.

- a. The rear inside edge of the opening shall be rabbeted to accept $\frac{3}{16}$ " thick tempered glass. Glass shall be held in place with plastic retainer.

3.05 FULL HEIGHT CABINETS

A. Cabinet End Panels

1. Shall be $\frac{3}{4}$ " thick 7-ply veneer core plywood with $\frac{1}{4}$ " solid Red Oak edge banding on the front edge.
2. Shall have two (2) rows of 5MM holes vertically row bored, 32MM on center, on each end panel to accept drawer slides and shelf supports.
3. Shall be notched 4" high x $2\frac{1}{4}$ " deep on the front bottom edge to receive a 4" x $\frac{3}{4}$ " piece of hardwood plywood forming a totally enclosed toe space.
4. Shall receive a $\frac{1}{4}$ " x $\frac{1}{4}$ " vertical dado $\frac{3}{4}$ of an inch in from the rear edge to accept a $\frac{1}{4}$ " thick back.

B. Cabinet Bottom

1. Shall be $\frac{3}{4}$ " thick 7-ply veneer core plywood with $\frac{1}{4}$ " solid Red Oak edge banding, multiple doweled. Dowels are to be glued securely to end panels and clamped under pressure to ensure joint integrity and unit squareness.

C. Cabinet Top and Bottom Panels

1. Shall be 1" thick 9-ply veneer core plywood with $\frac{1}{4}$ " solid Red Oak edge banding, multiple doweled. Dowels are to be glued securely to end panels and clamped under pressure to ensure joint integrity and unit squareness.
2. Shall receive a $\frac{1}{4}$ " x $\frac{1}{4}$ " dado the length of the member $\frac{3}{4}$ of an inch in from the rear edge to accept a $\frac{1}{4}$ " thick back resulting in a fully captured back panel.

D. Hang Rails

1. Shall be 3" x $\frac{3}{4}$ " 7-ply hardwood plywood, multiple doweled and glued securely to the cabinet ends at the top, center and bottom of the cabinet.
2. Shelves 30" wide or less shall be $\frac{3}{4}$ " thick 7-ply veneer core plywood with $\frac{1}{4}$ " solid oak edge banding on the front edge.
3. Shelves over 30" shall be 1" thick 9-ply veneer core plywood with $\frac{1}{4}$ " solid oak edge banding on the front edge.

E. Backs

1. Shall be $\frac{1}{4}$ " thick high density fiberboard at unexposed interiors.
2. Shall be $\frac{1}{4}$ " thick 5-ply hardwood plywood at exposed interiors.
3. In all tall cabinets, the back will fit snugly into a $\frac{1}{4}$ " deep dado located in the cabinet end panels and top and bottom panels, resulting in a fully captured back. Back shall be secured by hot melt adhesive.

F. Doors and Drawer Fronts

1. Shall be $\frac{3}{4}$ " thick solid core material with oak veneer both sides.
 - a. All four (4) edges to be banded with $\frac{1}{4}$ " solid oak.

- b. Drawer fronts and swinging doors shall overlap the cabinet opening on all four (4) sides by ¼”.
2. An astragal shall be applied to the inside face of the left door and shall extend beyond the rear of the right door, thus securing the left door when locks are required as the right door shall receive the lock.
3. Glass-framed doors shall be 7/8” thick x 2 ¾” wide solid oak framing.
 - a. The rear inside edge of the opening shall be rabbeted to accept 3/16” thick tempered glass. Glass shall be held in place with plastic retainer.

PART 4 – CABINET FINISH REQUIREMENTS

4.01 WOOD SURFACE PREPARATION

- A. Smoothly sand all wood surfaces to remove any and all scratches and abrasions. Dust shall be removed by compressed air.

4.02 EXPOSED EXTERIOR AND INTERIOR FINISH

- A. All exposed exterior surfaces and semi-exposed interior surfaces shall receive one (1) coat of non-fiber lifting stain to achieve the selected color.
- B. One (1) coat of penetrating sealer shall be applied, thoroughly dried, sanded and all dust removed. A second coat of sealer shall then be applied and thoroughly dried.
- C. Two (2) successive coats of a water base synthetic polymer finish shall then be applied and thoroughly dried, resulting in a highly acid, alkali, solvent, water and abrasion resistant semi-gloss finish.
- D. Curing of finishes shall be made under controlled environmental conditions and aided by infrared radiant heat.

4.03 UNEXPOSED INTERIOR FINISH

- A. Two (2) successive coats of water base synthetic polymer finish shall be applied and thoroughly dried.

4.04 PERFORMANCE TEST RATING AND RESULTS

- A. Terms referred to in PERFORMANCE TEST RESULTS are as follows:
 - ”A” (**Excellent**) – Indicates excellent to superior integrity of finish film. Includes no effect to slight allowable change in gloss (dulling or increase in gloss) and slight discoloration.
 - ”B” (**Good**) – Indicates good to very good integrity of finish film. Allows change of gloss or discoloration. Any effect can be removed from the tested area by abrading with 325-mesh silica powder and water, indicating that the discoloration is only superficial and that the finish film is good below the surface.
- B. Chemical Spot Tests
Chemical spot tests shall be made by applying 5 drops of each reagent to the surface to be tested. Each reagent (except those marked **) shall be covered with a 24MM watch glass, convex side down to confine the reagent. Spot tests of volatile solvents marked ** shall be tested as follows: A ball of cotton shall be saturated with solvent

and placed on the surface to be tested. The cotton ball shall then be covered by an inverted 1-ounce wide mouth bottle to retard evaporation. All spot tests shall be conducted in such a manner that the test surface is kept wet throughout the entire test period, and at a temperature of $77^{\circ} \text{F} \pm 3^{\circ} \text{F}$. At the end of the test period, the reagents shall be flushed from the surface with water, and the surface scrubbed with a soft bristle brush under running water, rinsed and dried. Volatile solvent test areas shall be cleaned with a cotton swab soaked in the solvent used on the test area. Immediately prior to evaluation, 16 to 24 hours after the reagents are removed, the test surface shall be scrubbed with a damp paper towel and dried with paper towels. Per the SEFA standards, no more than four (4) of the 49 chemicals/concentrations tested shall fail.

<u>Reagent</u>	<u>Ratings</u>
Acetate Amyl **	Pass
Acetate Ethyl **	Pass
Acetic Acid 98%	Pass
Acetone **	Pass
Acid Dichromate 5%	Pass
Alcohol Butyl **	Pass
Alcohol Ethyl **	Pass
Alcohol Methyl **	Pass
Ammonium Hydroxide 28%	Pass
Benzene **	Pass
Carbon tetrachloride **	Pass
Chloroform **	Pass
Chromic Acid 60%	Pass
Cresol	Pass
Dichloro Acetic Acid	Fail
Dimethylformamide	Pass
Dioxane	Pass
Ethyl Ether **	Pass
Formaldehyde 37% **	Pass
Formic Acid 90%	Pass
Furfural	Pass
Gasoline **	Pass
Hydrochloric Acid 37%	Pass
Hydrofluoric Acid 48%	Pass
Hydrogen Peroxide 3%	Pass
Iodine **	Pass
Methyl Ethyl Ketone **	Pass
Methylene Chloride	Pass
Mono Chlorobenzene **	Pass

Reagent	Ratings
Naphthalene **	Pass
Nitric Acid 20%	Pass
Nitric Acid 30%	Pass
Nitric Acid 70%	Pass
Phenol 90%	Fail
Phosphoric Acid 85%	Pass
Silver Nitrate	Pass
Sodium Hydroxide 10%	Pass
Sodium Hydroxide 20%	Pass
Sodium Hydroxide 40%	Pass
Sodium Hydroxide Flake	Pass
Sodium Sulfide, Saturated	Pass
Sulfuric Acid 33%	Pass
Sulfuric Acid 77%	Pass
Sulfuric Acid 96%	Fail
Sulfuric Acid 77 % and Nitric Acid 70%	Pass
Toluene **	Pass
Trichloroethylene **	Pass
Xylene **	Pass
Zinc Chloride Saturated	Pass

* Where concentrations are indicated, percentages are by weight.

** Indicates these solvents tested with cotton and jar method.

C. Heat Resistance

Hot water (190° F – 205° F) shall be allowed to trickle on the finished surface, which shall be set at an angle of 45° from horizontal, for a period of five (5) minutes. After cooling and wiping dry, the finish shall show no visible effect from the hot water treatment.

D. Moisture Resistance

A cellulose sponge (2" x 3" x 1") shall be soaked with water and placed on the finished surface for a period of 100 hours. The sponge shall be maintained in a wet condition throughout the entire test period. At the end of the test period, the surface shall be dried and no visible effect shall be shown on the finish.

E. Impact Resistance

A one (1) pound ball (approximately 2" in diameter) shall be dropped from a distance of one (1) foot onto the finished surface of a ¾" thick plywood panel supported underneath by a solid surface. There shall be no evidence of cracks or checks in the finish due to impact upon close examination.

PART 5 – TOPS, SINKS AND ACCESSORIES

5.01 EPOXY RESIN TOPS

- A. Tops shall be 1" thick and black in color. Backsplash and end splashes shall be 4" high, unless otherwise noted on drawings, and shall be applied to the top of the work

surface at all adjoining walls. Means of attachment shall be a two (2) part epoxy adhesive applied at all joints.

B. Physical and mechanical properties shall meet the following criteria:

Tensile strength, psi	10,700 PSI
Compressive strength, psi	30,600 PSI
Flexural strength, psi	12,800 PSI
Hardness, Rockwell "M"	105
Density, gr/cc	2.03 G/CC

5.02 SINKS, TROUGHS, AND SERVICE TURRETS

- A. Epoxy resin black one-piece construction. Inside corners and bottoms coved for easy cleaning. All sinks to be drop-in type, flush mounted.
- B. Provide appropriate sink outlet with stopper at all sinks. Tailpiece and trap by others.

5.03 PLUMBING FITTINGS

- A. All service fittings to meet SAMA standards with all working parts removable and interchangeable with fittings of same type and number. Buttons clearly marked in accordance with SAMA standard color code.
 - 1. Plumbing fittings and turret type mountings – cast from red brass (85-5-5-5) an alloy of 85% copper, 5% tin, 5% lead, and 5% zinc.
- B. Water fittings – all working parts removable and interchangeable with fittings of same type and number. Fixtures furnished with hose connection and/or vacuum breakers when indicated.
 - 1. Valve stems – held in place by large packing nut with brass and fiber washer and preformed long life packing. Valve stem assembly removable without disturbing installation of fixture. Double acme thread on valve stem and fixture body.
 - 2. Seat – interchangeable bronze. Surface highly polished.
 - 3. Goosenecks – $1\frac{1}{16}$ " O.D. brass, threaded to accommodate $\frac{3}{8}$ " I.P.S. accessories.
 - 4. Water handles – four-arm type, forged from high grade brass with recessed snap-in index buttons.
- C. Ground key cocks for gas – ground key cocks shall have a forged brass valve body, with a straight ten (10) serration hose end integral with the valve body. Valve plug shall be forged brass with an oversize operating handle held in place with a non-removable solid stainless steel pin, and shall have a color coded screw-on type index disc which permits full visibility of the color from the side. Ground key cocks shall be individually ground, lapped and sealed and shall be individually tested at 100 PSI under water. The maximum working pressure for ground key cocks shall be 40 PSI.
- D. Fitting Finish – Chrome polished heavy duty triple stage high bright nickel and chrome over copper plate. Plating to meet Federal Specifications WWP-541-B-Type A.

5.04 TECHNICAL PRODUCT

General

The following specifications are provided to accurately describe the technical products shown on the drawings. Because of the specific educational function of these items, any deviations from this section will not be considered.

1. ADA FUME HOOD – Basis of Design: Sheldon Model # 91273

The exterior of the superstructure is fabricated of cold rolled furniture steel finished in color selected from manufacturers standard range of colors. Exterior finish is a chemical resistant powder coat. The entire interior of the hood is lined with ¼" thick phenolic resin.

The inner lining and exterior finished panels are attached to a framework constructed of 16 and 18 gauge steel. This framework is welded and bolted together to form a rigid assembly and is painted with a black rust inhibitive finish. All steel parts are treated with an iron phosphate bath to resist corrosion and insure adhesion to finish materials. The inner lining material is securely fastened to this frame assembly.

Vertical sliding sash is constructed of 18 gauge steel, welded into a rigid frame, and has removable glass retainers for glazing. A flush, full length finger lift is located at the bottom of the sash. Nylon glides are located on each side. Sash guides are stainless steel. The sash is glazed with 7/32" clear laminated safety glass set in a "U" shaped neoprene channel. The sash is counter balanced using a single weight at the rear of the hood, and is attached to the sash with 1/16", 7X7 plastic coated aircraft-type cable; total diameter .105". Cables ride on six 2" diameter nylon ball bearing pulleys.

Understructure support is wood as specified in Part 2-Products of this specification. Countertop is 1" thick, dished, black epoxy resin. Top of counter is 30-1/4" above the finished floor.

Electrical services included incandescent light fixture (bulbs not included), light switch, blower switch and (2) duplex electrical outlets.

Plumbing services include (1) cup sink (6-1/2" deep max.), (1) remote controlled cold water gooseneck faucet and (1) remote controlled gas fixture. All interior fixtures shall have a powder coat finish for maximum chemical resistance.

Fume Hood Blower to be provided by equipment contractor.

Fume hood must meet current "ADA Guidelines for Wheelchair Accessibility".

PART 6 EXECUTION

6.01 COORDINATION

The casework contractor shall coordinate all deliveries and installation of this equipment with the General Contractor and associated trades.

- A. Lab casework shall not be delivered to the jobsite until the following conditions have occurred.
 - 1. Overhead ceiling work – ductwork, lighting, acoustical ceiling, etc. is complete.
 - 2. Windows and exterior doors are installed. Building is secure and weather-tight.
 - 3. Air circulation control system is functioning and maintaining relatively constant temperature and humidity conditions closely approximating those to be maintained by the Owner.
- B. It is recommended that all painting and overhead work be completed in the areas in which casework is to be installed prior to such installation.

6.02 CABINET INSTALLATION

- A. The casework shall be delivered to the building in pre-finished modular units. It shall be set in place, leveled, secured to walls or floors as necessary, trimmed or scribed to make a neat installation. Installation shall be under the direction of a factory approved superintendent.
- B. Provide filler panels where required to close spaces between casework and walls.
- C. The casework contractor shall deliver to the appropriate contractor all sinks, troughs, service fixtures, etc., as supplied in this section, for installation and connection by the appropriate trades.

6.03 CLEANING AND PROTECTION

- A. Remove all debris, dirt, rubbish and excess material accumulated as a result of the installation of this equipment and leave casework clean and orderly. All debris to be deposited in dumpsters provided by General Contractor
- B. Advise contractor of procedures for protection of installed material from damage from work of other trades.

END OF SECTION 12 35 53

SECTION 12 35 70 - HEALTHCARE CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Stainless-steel medical casework.
2. Stainless-steel countertops and integral sinks.
3. Stainless-steel shelving.

B. Related Sections:

1. Division 6 Section "Miscellaneous Carpentry" for wood blocking for anchoring casework.
2. Division 15 Sections for installing service fittings specified in this Section, including connecting service utilities.
3. Division 16 Sections for electrical connection of light fixtures and other electrical devices built into casework.

1.3 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 locations of blocking and reinforcements required for installing casework.
2. Indicate hardware locations.
3. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and equipment.
4. Indicate locations of field-made joints in stainless-steel countertops.

- C. Samples for Initial Selection: For units with factory-applied color finishes.

- D. Samples for Verification: Full-size units of each type of exposed hardware indicated.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain healthcare casework through one source from a single manufacturer.
- B. Product Designations: Drawings indicate sizes and configurations of healthcare casework by referencing designated manufacturer's catalog numbers. Other manufacturers' metal medical casework of similar sizes, similar door and drawer configurations, and complying with the Specifications may be considered. Refer to Division 1 Section "Product Requirements."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 by a qualified testing agency , and marked for intended location and application.
- D. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying requirements.
- E. Accessibility Requirements: Provide fixed tables, work surfaces, and tall cabinets that comply with requirements, including knee clearances and reach ranges, in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)", the Uniform Federal Accessibility Standards (UFAS), including Section 504 and the Rehabilitation Act of 1973.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.6 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements for support of healthcare casework.

1.7 EXTRA MATERIALS

- A. Furnish complete touchup kit for each type and color of healthcare casework provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged casework finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Blickman Inc. products or comparable product by one of the following:
 - 1. Blickman Inc.

2. Carr Corporation.
3. Continental Metal Products Co. Inc.
4. Getinge USA.
5. InnerSpace Corporation.
6. Inter Dyne Systems, Inc.
7. Jamestown Metal Products.
8. Scientek Technology Corp.
9. Skytron.
10. Steris Corporation.

2.2 CASEWORK MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, stretcher-leveled standard of flatness.
- B. Nominal Stainless-Steel Thicknesses for Stainless-Steel Medical Casework:
 1. Sides, Ends, Fixed Backs, Bottoms, Cabinet Tops, Soffits, and Items Not Otherwise Indicated: 0.050 inch (1.27). Bottoms may be 0.038 inch (0.95 mm) if reinforced.
 2. Back Panels, Doors, Drawer Fronts and Bodies, and Shelves: 0.038 inch (0.95 mm) except 0.050 inch (1.27 mm) for unreinforced shelves more than 36 inches (900 mm) long.
 3. Intermediate Horizontal Rails, Center Posts, Tubular Legs, and Top Gussets: 0.062 inch (1.59 mm).
 4. Drawer Runners and Hinge Reinforcements: 0.078 inch (1.98 mm).
 5. Leveling and Corner Gussets: 0.109 inch (2.78 mm).
- C. 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.
- D. Clear Tempered Glass Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; 6.0 mm thick; with exposed edges seamed before tempering.
- E. Pegboard: Perforated stainless-steel sheet, 0.050-inch (1.27-mm) nominal thickness.

2.3 CABINET FABRICATION

- A. General: Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Integrally frame and weld to form a dirt and vermin-resistant enclosure. Maintain uniform clearance around door and drawer fronts of 1/16 to 3/32 inch (1.5 to 2.4 mm).
- B. Metal Flush Doors: Outer and inner pans that nest into box formation, with full-height channel reinforcements at center of door. Fill doors with noncombustible, sound-deadening material.

- C. Glazed Doors: Hollow-metal stiles and rails of similar construction as flush doors, with glass held in resilient channels or gasket material.
- D. Hinged Doors: Mortise for hinges and reinforce with angles welded inside inner pans or hollow metal stiles at hinge edge.
- E. Metal Drawers: Fronts made from outer and inner pans that nest into box formation, with no raw metal edges at top. Sides, back, and bottom fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal.
- F. Metal Shelves: Front, back, and ends formed down, with edges returned horizontally at front and back to form reinforcing channels. Provide clips, brackets, pilasters or other means to support shelves from cabinet ends and allow height of shelves to be adjusted in increments of not more than 2 inches (50 mm).
- G. Sloping Tops: Unless tops are concealed by other construction, provide sloping tops on cabinets with tops 60 inches (1524 mm) or more above the finished floor. Slope tops 25 degrees or more and construct of same material and with same finish as cabinets.
- H. Toe Space: Unless casework is indicated to be built-in, provide metal toe space, fully enclosed, 4 inches (100 mm) high by 3 inches (75 mm) deep, with no open gaps or pockets.
- I. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets and with hemmed or flanged edges.
- J. Trim Flanges: Formed metal trim fabricated from same material and with same finish as cabinets. Provide at perimeter of recessed cabinets.

2.4 STAINLESS-STEEL FINISH

- A. Grind and polish surfaces to produce uniform, directional satin finish matching No. 4 finish with no evidence of welds and free of cross scratches. Run grain with long dimension of each piece.
- B. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces clean.

2.5 CABINET HARDWARE

- A. General: Provide healthcare casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
- B. Hinges: Stainless-steel 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and hospital tips. Provide 2 for doors 48 inches (1200 mm) high or less and 3 for doors more than 48 inches (1200 mm) high.
- C. Hinged Door and Drawer Pulls: stainless-steel back-mounted pulls.

1. Design: Wire pulls
 2. Overall Size: 1 by 4-1/2 inches
- D. Door Catches: Nylon-roller spring catches. Provide 2 catches on doors more than 48 inches (1200 mm) high.
- E. Drawer Slides: Side-mounted, epoxy-coated steel, self-closing, ball-bearing drawer slides; designed to prevent rebound when drawers are closed; complying with BHMA A156.9, Type B05091.
1. Heavy Duty (Grade 1HD-100 or Grade 1HD-200): Full-overtravel-extension type.
- F. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately 1 by 2 inches (25 by 50 mm), attached with screws or rivets. Provide where indicated.
- G. Locks: Cam or half-mortise type; brass with chrome-plated finish; complying with BHMA A156.11, Type E07281, E07111, or E07021.
1. Provide minimum of two keys per lock and two master keys.
 2. Provide locks on all drawers and doors.
 3. Keying: Key locks as directed.
 4. Master Key System: Key all locks to be operable by master key.
- H. Sliding-Door Hardware Sets: Healthcare casework manufacturer's standard, to suit type and size of sliding-door units.
- 2.6 STAINLESS-STEEL, COUNTERTOPS, SHELVES AND SINKS
- A. Countertops: Provide units with smooth surfaces in uniform plane free of defects. Ease exposed edges and corners. Provide front and end overhang of 1 inch (25 mm) over base cabinets.
1. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, not less than 0.062-inch (1.59-mm) nominal thickness, with No. 4 directional satin finish.
 2. Extend top down 1 inch (25 mm) at edges with a 1/2-inch (13-mm) return flange under frame. Apply heavy coating of heat-resistant, sound-deadening mastic to undersurface.
 3. Form backsplash coved to and integral with top surface.
 4. Provide rolled edge unless otherwise indicated.
 5. Provide raised (marine) edge around perimeter of countertops containing sinks; pitch two ways to sink to provide drainage without channeling or grooving.
 6. Reinforce underside of countertop with channels or use thicker metal sheet where necessary to insure rigidity without deflection.
 7. Weld shop-made joints.
 8. Fabricate units for installation without field-made joints.
 9. Fabricate units for field assembly, where necessary, using tight-fitting butt-joints mechanically bolted through continuous channels welded to underside at edges of joined ends.

10. Where stainless-steel sinks or cup sinks occur in stainless-steel countertops, factory weld into one integral unit.
 11. After fabricating and welding, grind surfaces smooth and polish as needed to produce uniform, directionally textured finish with no evidence of welds and free of cross scratches. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
- B. Sinks: Provide sizes indicated or healthcare casework manufacturer's closest standard size of equal or greater volume as approved by Architect.
1. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, not less than 0.050-inch (1.27-mm) nominal thickness. Fabricate with corners rounded and coved to at least 5/8-inch (16-mm) radius. Slope sink bottoms to outlet. Provide double-wall construction for sink partitions with top edge rounded to at least 1/2-inch (13-mm) diameter. Provide continuous butt-welded joints. After fabricating and welding, grind surfaces smooth and polish as needed to produce uniform finish with no evidence of welds and free of cross scratches. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
 2. Punch holes for fittings at factory.
 3. Provide with stainless-steel strainers and tailpieces, NPS 1-1/2 (DN 40) unless otherwise indicated.
 4. Where indicated, provide stainless-steel overflow of standard beehive or open-top design with separate stainless-steel strainer. Height 2 inches (50 mm) less than sink depth.
 5. Apply 1/8-inch- (3-mm-) thick coating of heat-resistant, sound-deadening mastic to undersink surfaces.

2.7 WATER AND COMPRESSED-AIR SERVICE FITTINGS

- A. 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.
- B. Materials: Fabricated from cast or forged red brass unless otherwise indicated.
1. Reagent-Grade Water Service Fittings: Polypropylene, PVC, or PVDF for parts in contact with water.
- C. Finish: Chromium plated.
- D. Water Valves and Faucets: Provide units complying with ASME A112.18.1, with renewable seats, designed for working pressure up to 80 psig (550 kPa).
1. Vacuum Breakers: Provide ASSE 1035 vacuum breakers on water fittings with serrated outlets.
 2. Aerators: Provide aerators on water fittings that do not have serrated outlets.
 3. Self-Closing Valves: Provide self-closing valves where indicated.
 4. Handles: Provide three- or four-arm, forged-brass handles for valves unless otherwise indicated.

- E. Needle Valves for Compressed Air: Provide units with renewable, self-centering, floating cones and renewable seats of stainless steel or Monel metal, with removable serrated outlets.
 - 1. Provide units designed for working pressure up to **100 psig (690 kPa)**.
 - 2. Handles: Provide knurled molded plastic handles.
- F. 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.

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 healthcare casework.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF CABINETS

- A. Install level, plumb, and true; shim as required, using concealed shims. Where healthcare 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 (1.5 mm in 3 m).
 - 2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet (3 mm in 3 m).
 - 3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet (3 mm in 3 m).
 - 4. Variation of Adjacent Cabinet Surfaces from a True Plane (Lippage): 1/32 inch (0.8 mm).
 - 5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch (1.5 mm).
- B. Base Cabinets: Fasten cabinets to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches (600 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
- 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 (600 mm) o.c.
- D. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.
- E. Adjust healthcare 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. Abut top and edge surfaces in one true plane with flush joints and with internal supports placed to prevent deflection. Locate joints only where shown on Shop Drawings.
- B. Field-Made Joints: Provide welded joints in tops. Grind and polish surfaces to produce uniform, directionally textured finish with no evidence of welds and free of cross scratches. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.
- C. Field-Made Joints: Provide tight-fitting joints in tops using adhesives and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required.
- D. Fastening: Secure countertops to cabinets with Z-type fasteners or equivalent, using two or more fasteners at each cabinet front, end, and back.
- E. Provide chemical-resistant, permanently elastic sealing compound for closures at junctures of top, curb, and splash with walls as recommended by sealant manufacturer.

3.4 INSTALLATION OF SERVICE FITTINGS

- A. Comply with requirements in Division 15 Sections for installing water and compressed-air service fittings.
- B. Install fittings according to Shop Drawings 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 healthcare casework unless otherwise indicated.

3.5 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- (0.15-mm-) thick polyethylene or other suitable water-resistant covering. Tape to underside of countertop at minimum of 48 inches (1200 mm) o.c.

END OF SECTION 12 35 70

SECTION 12 48 13 - FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Entrance mats in recessed frames.
- 2. Entrance mats in surface-mounted frames.

- B. Related Sections include the following:

- 1. Division 3 Section "Cast-in-Place Concrete" for slab depression for recessed mats and frames.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: Show the following:

- 1. Items penetrating floor mats and frames, including the following:
 - a. Door control devices.
- 2. Divisions between mat sections.
- 3. Perimeter floor moldings.

- C. Samples for Initial Selection: For each type of product indicated.

- D. Samples for Verification: For each type of product indicated.

- 1. Floor Mat: 12-inch- (300-mm-) square, assembled sections of floor mat.
- 2. Tread Rail: 12-inch- (300-mm-) long Sample of each type and color.
- 3. Frame Members: 12-inch- (300-mm-) long Sample of each type and color.

- E. Maintenance Data: For floor mats and frames to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain floor mats and frames through one source from a single manufacturer.
- B. Accessibility Requirements: Provide installed floor mats 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)." Sections 302 and 303 in ICC A117.1.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Indicate measurements on Shop Drawings.

1.6 COORDINATION

- A. Coordinate size and location of recesses in concrete with installation of finish floors to receive floor mats **and frames**.

1.7 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. Entrance Tiles: Full-size units equal to 2 percent of amount installed for each size, color, and pattern indicated, but no fewer than 10 units.

PART 2 - PRODUCTS

2.1 ENTRANCE MATS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ARDEN Architectural Specialties, Inc.
 - 2. C/S Group.
 - 3. Mats, Inc.
- B. Resilient Link Mats: 1-1/2" thick, reversible rubber link mats with galvanized spring-steel wire link rods, vulcanized edge-nosing trim, steel-reinforced end trim, and links consisting of rectangular units or continuous strips in a heel-proof, close-weave pattern with openings between links not exceeding 1/8 inch wide.
 - 1. Color: As selected by Architect from manufacturer's full range.
 - 2. Mat Size: Per drawings.

C. Surface-Mounted Frames:

1. Tapered Frames: Tapered flexible vinyl edge-frame members, not less than 1-1/2 inches wide, attached to mat at all 4 edges, with welded mitered corners.
2. Color: As selected by Architect from manufacturer's full range.

D. Recessed Frames:

1. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6061-T6 or Alloy 6063-T5, T6, or T52.
2. Color: As selected by Architect from manufacturer's full range.

2.2 CONCRETE FILL AND GROUT MATERIALS

- A. Provide concrete grout and fill equivalent in strength to cast-in-place concrete slabs for recessed mats and frames. Use aggregate no larger than one-third fill thickness.

2.3 FABRICATION

- A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.
- B. Surface-Mounted Frames: As indicated for permanent surface-mounted installation, complete with corner connectors, splice plates or connecting pins, and postinstalled expansion anchors.
- C. Recessed Frames: As indicated, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.
1. Fabricate edge-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.
- D. Coat surfaces of aluminum frames that will contact cementitious material with manufacturer's standard protective coating.

2.4 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 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 and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.
 - 1. For installation in terrazzo flooring areas, provide allowance for grinding and polishing of terrazzo without grinding surface of recessed frames. Coordinate with other trades as required.
 - 2. Install necessary shims, spacers, and anchorages for proper location and secure attachment of frames.
 - 3. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.
- B. Install surface-type units to comply with manufacturer's written instructions at locations indicated; coordinate with entrance locations and traffic patterns.
 - 1. Anchor fixed surface-type frame members to floor with devices spaced as recommended by manufacturer.

3.3 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 12 48 13

SECTION 12 56 53 FIXED COMPUTER TABLES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The work of this section includes, but is not limited to, the following:
 - 1. Fixed Table System in Computer Rooms & Computer Labs as called out on drawings.

1.02 RELATED SECTIONS AND WORK

- A. All of the contract documents, including general and supplementary conditions and Division 1 general requirements, apply to the work of this section.

1.03 QUALITY ASSURANCE

- A. Source: For each type of seating required for the work of this section, provide products of one manufacturer including accessories, mounting and installation components.
- B. Fire Characteristics: Provide upholstered chairs whose fire performance characteristics comply with Connecticut Building Code.
- C. Installers Qualifications: Installer shall be approved by the seating manufacturer and shall have at least five years documented experience in installation, repair, and service of auditorium seating of the type required for this project.
- D. Mock-Up: Provide one complete chair as specified. Approved mock-up may be incorporated into the finished work.
- E. Accessibility Requirements: Provide fixed tables that comply with requirements in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)", the Uniform Federal Accessibility Standards (UFAS), including Section 504 and the Rehabilitation Act of 1973.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's product and installation instructions. Provide independent certification stating that materials comply with requirements including performance requirements.
- B. Shop Drawings: Provide large scale shop drawing for fabrication, installation, and erection of all parts of the work. Provide plans, elevations, and details of anchorage's, connections, and accessory items. Show exact seating layout, chair sizes, and aisle widths. Provide sectional view showing profile dimension of seating and back to back row dimensions. Layout the work so that, aisle standards are aligned from first rows to last rows; spacing meets code standards; total seating shown is achieved.
- C. Initial Selection Samples: Submit minimum 3" x 3" samples showing complete range of colors, textures, and finishes available for each material used including, metal finishes, and plastic.

- D. Verification samples: Submit at least two representative samples of each material that is to be exposed in the finished work, showing the full range of color and finish variations expected.
- E. Installer Qualifications: Demonstrate installer's qualifications and experience. Provide list of similar completed projects with the names of project, names of project owners, and names of project architects.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver seating in manufacturer's standard cartons. Store and protect in strict compliance with manufacturer's instruction and recommendations. Protect from all possible damage. Sequence deliveries to avoid delays, but minimize on-site storage.
- B. Install seating only when space is enclosed, dry, and wet-work, painting, and ceiling work in building is complete. HVAC system shall be operational and maintaining conditions similar to permanent conditions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Acceptable Manufacturers: Provide products which meet or exceed the requirements of these specifications from the following manufacturers.
 - 1. Irwin Seating Company – 900 Series Tables (Basis of Design)
 - 2. Hussey Seating – comparable product
 - 3. American Seating – comparable product

2.02 FIXED TABLE SYSTEM

- A. Independently mounted system of fixed tables supported by steel pedestals.
- B. Continuous row lengths with 30" table depth minimum.
- C. Rectangular tubular pedestals of 11 ga. Steel. Provide a minimum of 30", or 36" clear between support pedestals, based on spacing shown on drawings
- D. Floor mounting feet of formed steel to concrete floor
- E. Provide power and data management system including powered receptacles, and accommodation for data system serving each station.
- F. Provide modesty panels for entire table row. The bottom of the modesty panels shall be a minimum of 9" and maximum of 16" above the floor.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Pre-installation examination required: The installer shall examine previous work, related work, and conditions under which this work is to be performed and notify contractor in writing of deficiencies and conditions detrimental to the proper completion of this work. Beginning work means installer accepts substrates, previous work and conditions.
- B. Manufacturer's Instructions: Strictly comply with manufacturer's instructions and recommendations except where more restrictive requirements are specified in this section.

3.02 ADJUSTING, CLEANING AND PROTECTION

- A. Adjust operating parts to work easily, smoothly, and correctly. Adjust seats to align in rows with no noticeable variation.
- B. Touch-up damaged coatings and finishes and repair minor damage to eliminate all evidence of repair. Clean exposed surfaces using materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully cleaned or repaired.
- C. Provide temporary protection to ensure work is without damage or deterioration at time of final acceptance. Remove protections and re-clean as necessary immediately before final acceptance.

END OF SECTION 12 56 53

SECTION 12 57 16 - TRADE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions and requirements of Division 1, apply to the work specified in this Section.

1.2 SECTION INCLUDES

- A. All labor, materials, and equipment necessary to furnish and install Trade Equipment as shown on the Drawings and/or as specified herein.
1. Welding Curtains & Support Rods
 2. Welding Tables

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Mechanical Connections, Division 23
- B. Electrical Connections, Division 26

1.4 QUALITY CRITERIA

- A. The product provided under this Section establishes the quality, performance, and functional standards required. The actual products bid upon must be as specified or as deemed equal by the Architect.
- B. Manufacturers: Companies specializing in manufacture of Welding Equipment with a minimum five years experience.
- C. All equipment shall be fabricated and installed and designed to operate in accordance with the requirements of the following:
- ANSI/FM 4950
 - NFPA-91 Standard for Exhaust Systems for Air Conveying of Materials
 - NFPA-101 Life Safety Code
 - NFPA-70 National Electrical Code
 - NFPA-13
 - OSHA Safety and Health Standards (29CFR 1910, 1910.107)
 - IFC International Fire Code
 - IBC International Building Code
 - IMC International Mechanical Code

1.5 SUBMITTALS

- A. Submit the following for all items specified herein or called out on the drawings.
 - 1. Manufacturer's Data: Submit to the Architect for approval all cuts, technical data, and shop drawings for all equipment. Show service connections and wiring diagrams for control systems, all penetrations to the building envelope, all mechanical components.
 - 2. Submit manufacturers installation instructions.
 - 3. Submit to the Owner, through the Architect, all manufacturer warranties, guarantees, and product literature.
 - 4. Submit detailed schedule of all equipment using unit designation.
 - 5. Submit samples and color chips showing full range of colors available for each item of equipment.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. General: Package, ship, and handle appliances to prevent damage. Do not deliver to the project until ready to install.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- D. Store and protect products in accordance with manufacturer's instruction, with seals and labels intact and legible. Store in weather-tight, climate controlled enclosures.

1.7 WARRANTY

- A. Provide one-year manufacturer's warranty.
- B. Warranty: Include coverage of scheduled equipment, including disconnection of defective unit, and connection of replacement unit.

PART 2- PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Products: The basis of design for Welding Curtains are products manufactured by Tempro Tec Inc. Subject to compliance with requirements provide the named products or comparable products.
- B. All items shall be provided with manufacturer's approved installation mounting kits, all associated hardware necessary for installation as shown on drawings, unless provided for specifically on the drawings/ specifications.

2.2 WELDING CURTAINS

- A. PRODUCT: TECGLASS GL 2025/9383

- B. Temperature Resistance: 1000° F
 - C. Content: 100% Fiberglass Yarns
 - D. Weave: Plain
 - E. Weight: 24 oz/yd²
 - F. Thickness: 0.005” Thick
 - G. Color: Beige
 - H. Count: Warp: 19
 - J. Fabric Finish: Plain or 9383 (Heat Cleaned)**
 - K. USCG Specifications: 164.009 “Test for incombustibility”

 - L. Panel Size: 72” length as shown on drawings—reinforced top & bottom panels with grommets and roller hooks.
- 2.3 CURTAIN ROD
- A. Stainless steel rod of size (diameter) to span the lengths shown on drawings.

PART 3 - INSTALLATION

- 3.1 Installation shall be as called for in coordination with Division 23 and 22 of the Specifications and applicable Drawings.
- 3.2 Curtain shall be installed at the length shown by graphic on the drawing. String sections of curtains side by side to accommodate the full length shown by dashed line.

END OF SECTION 12 57 16

SECTION 12 93 00 - SITE FURNISHINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract including General and Supplementary Conditions, and General Requirements apply to work specified in this Section.

1.2 SECTION INCLUDES

- A. Providing and installing all site furnishings including foundations, anchoring components and appurtenances:
 - 1. Standard and curved benches
 - 2. Ornamental metal trash receptacles
 - 3. Metal bicycle racks
 - 4. Skate Deterrents
 - 5. Plaque Anchors
 - 6. Collapsible Bollards

1.3 RELATED SECTIONS

- A. Section 03 30 01 – Portland Cement Concrete (Site)

1.4 SUBMITTALS

- A. Product Data: Manufacturer's catalog cuts, specifications and technical data indicating material compliance and specified options, including the following information:
 - 1. Detailed specification of construction and fabrication shop drawings.
 - 2. Manufacturer's full range of color option information.
 - 3. Manufacturer's installation instructions and/or recommendations.
 - 4. Maintenance literature.
 - 5. Product Warranty.
- B. Shop Drawings: Indicate pertinent dimensions, general construction, component connections, anchoring methods, hardware and installation procedures.
- C. Product certifications.

1.5 WARRANTY

- A. Manufacturer shall submit to the Owner written product warranties for a minimum period of 18 months from date of substantial completion of all work performed under each phase of this contract and upon acceptance of the products. The Contractor shall promptly furnish, without cost to the Owner, any and all parts and labor which prove defective in material and workmanship.

PART 2 PRODUCTS

2.1 BENCHES:

A. STANDARD BENCH (Acceptable Models and Manufacturers):

1. Model, #62-729-6 embedded mount backless bench, 72", without arms. Bench and seat made of steel, metal powder coat. Manufactured by DuMor Site Furnishings. Locally distributed by O'Brien and Sons, Medfield, MA. (1-800-835-0056)
2. Model, "Midtown" embedded mount backless bench, 72", without arms. Bench and seat made of steel, metal powder coat. Manufactured and distributed by Keystone Ridge Designs. (1-800-284-8208) Contact Keystone Ridge Designs with custom fabrication specifications.
3. Model, "Arcata" embedded mount backless bench, 72", without arms. Seat made of aluminum, frame metal powder coat. Manufactured and distributed by Landscape Forms, Inc. (1-800-814-4432).

B. CURVED BENCH (Acceptable Models and Manufacturers):

1. Model, #65-173 embedded mount backless bench, 120" radius, without arms. Bench and seat made of steel, metal powder coat. Manufactured by DuMor Site Furnishings. Locally distributed by O'Brien and Sons, Medfield, MA. (1-800-835-0056)
2. Model, "Midtown" embedded mount backless bench, 120" radius, without arms. Bench and seat made of steel, metal powder coated. Manufactured and distributed by Keystone Ridge Designs. (1-800-284-8208) Contact Keystone Ridge Designs with custom fabrication specifications.
3. Model, "Plexus II" embedded mount backless seat, 120" radius, without arms. Bench and seats made of steel, metal powder coated. Manufactured and distributed by Landscapeforms, Inc. (1-800-814-4432).

- 2.2 TRASH RECEPTACLE (Acceptable Models and Manufacturers):
- A. Model, #107-22, 22 gallon receptacle. Metal powder coated. Manufactured by DuMor Site Furnishings. Locally Distributed by O'Brien and Sons, Medfield, MA. (1-800-835-0056)
 - B. Model, MT3-22, "Midtown" 22 gallon receptacle. Metal powder coated. Manufactured and distributed by Keystone Ridge Designs. (1-800-284-8208)
 - C. Model, "Scarborough" 30 gallon receptacle. Metal powder coated. Manufactured and distributed by Landscapeforms, Inc. (1-800-814-4432)
- 2.3 BICYCLE RACK (Acceptable Models and Manufacturers):
- A. Model, #130-50-PC Multi-Loop bike rack, metal powder coated standard color black. Manufactured by DuMor Site Furnishings. Locally distributed by O'Brien and Sons, Medfield, MA. (1-800-835-0056)
 - B. Model, TB 11 Thunderbolt Series, metal powder coated. Manufactured and distributed by Creative Pipe, Inc. (1-800-644-8467)
 - C. Model, H36-11-IG-PC Challenger Series, metal powder coated. Manufactured and distributed by Madrax. (1-800-448-7931)
- 2.4 SKATE DETERRENTS:
- A. Manufacturer: SKATESTOPPERS (Intelliccept), El Cajon CA 92020. Phone: 619-447-6374, Fax: 619-447-6396, website: www.skatestoppers.com
 - A. Model: SKATESTOPPERS Model #FRO.5 Skate Deterrent with Smart Pins Plus anchoring system. Anchoring adhesive shall be per manufacturer recommendation.
 - B. Model Finish : Clear Anodize
- 2.5 PLAQUE ANCHORS:
- A. Field drill 2-inch embedment. Coordinate drill locations with individual plaques. Drill hole shall be hidden by plaque when installation is complete.
 - B. Use epoxy embedded female anchor in wall. The material of anchor embedment to match individual plaque metal type.
 - C. Anchor plaque to wall using tamper-resistant male screws to match female anchor. The material of anchor screw to match individual plaque metal type.

2.6 COLLAPSIBLE BOLLARD

- A. TrafficGuard Direct, Inc., P.O. Box 201, Geneva, IL 60134, Tel 877-727-7347, Fax 800-814-7194, Website <http://www.trafficguard.net>; or approved equal.
- B. Model number for collapsible bollard is LPHDHB (or approved equal) – 4” clearance, 30” Height.
- C. Materials:
 - 1. Bollards supplied should be free from surface blemishes and defects where exposed to view in the finished installation
 - 2. Steel Tube: ASTM A500
 - 3. Steel Plate: ASTM A36
 - 4. Steel Pins: 18-8 Stainless Steel
 - 5. Concrete Footing and associated materials: comply with specification section 03300.
- D. Fabrication
 - 1. After fabrication, all units are prepared by removing scale and slag through the sand blasting process.
- E. Finish
 - 1. All surfaces are primed with rust and corrosion resistant, zinc rich primer with 5,000 our salt spray performance.
 - 2. Standard finish, TGIC Polyester outdoor finish RAL1028 Yellow. TGIC Polyester powder definition; meets decorative and functional requirements for gloss retention, physical properties, chemical resistance and weatherability.

2.7 FINISH COLOR

The color of all site furnishings are to be determined by the architect based on selection from the full range of available colors supplied by the manufacturer. The manufacturer shall submit a color selection chart to the architect for selection.

2.8 CONCRETE FOOTINGS

Shall conform to Section 03 30 01, Portland Cement Concrete (Site)

2.9 SITE FURNISHING COORDINATION

Site furnishings for benches and trash receptacles shall be purchase together from a single manufacturer to provide continuity and compatibility.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install all site furnishings as detailed in the Drawings and in conformance with the manufacturer's installation instructions.

3.2 SKATE DETERRENTS:

- A. Install all skate deterrents as detailed in the Drawings and in conformance with the manufacturer's installation instructions.

3.3 PLAQUE ANCHORS:

- A. Install all plaques using plaque anchors as detailed in the Drawings and in conformance with the manufacturer's installation instructions.

3.4 COLLAPSIBLE BOLLARD:

- A. Install all collapsible bollards per manufacturer installation drawings and requirements.
- B. Clean up all debris from installation procedures, including but not limited to bituminous concrete and base material overflow or other surfaces. Remove from site all excess materials, debris and equipment. Contractor shall dispose of debris material legally.
- C. Repair damage resulting from installation of bollard and footing.

END OF SECTION

SECTION 13 34 16 - PORTABLE BLEACHERS

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.
- B. The International Building Code, 2003 edition, with all State of Connecticut amendments and supplements.

1.2 SUMMARY

- A. Design and fabrication of Portable Bleachers.
- B. Purchase, installation and anchorage of Portable Bleachers.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer must have ten years of experience in the manufacture of bleachers; welders must be AWS certified.
- B. Source Quality Control: Mill Test Certification
- C. Bleachers shall be in full compliance with The International Building Code, 2003 edition, with all State of Connecticut amendments and supplements.

1.4 WARRANTY

- A. Manufacturer shall submit to the Owner written product warranties for a minimum period of 18 months from date of substantial completion of all work performed under each phase of this contract and upon acceptance of the products. The Contractor shall promptly furnish, without cost to the Owner, any and all parts and labor which prove defective in material and workmanship under normal use.
 - 1. Warranty period shall begin on date of substantial completion for projects installed by Manufacturer, or its subcontractors.
 - 2. Warranty period shall begin on date of ~~final delivery~~ substantial completion to the contract project site on projects installed by others.

- B. Plank extrusions shall be covered by a five year warranty against loss of structural strength or finish deterioration due specifically to exposure to varying weather conditions or ultra-violet rays.
- C. Manufacturer shall provide Owner with signed standard written copy of all warranties.
- D. Damage resulting from abnormal use, vandalism or improper installation will render warranties above null and void. Discoloration of mill finish aluminum due to galvanic reaction is not covered by warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: National Recreation Systems, Inc., P.O. Box 11487, Fort Wayne, IN, 46858-1487, Phone: (888) 568-9064 or (260) 482-6023, Fax: (260) 482-7449, website: www.bleachers.net.
- B. Alternate Manufacturer: Dant Clayton Corporation, 1500 Bernheim Lane, Louisville, KY, 40210, Phone: (800) 626-2177, Fax: (502) 637-9983, website: www.dantclayton.com.
- C. Alternate Manufacturer: Tomark Sports, PO Box 1088, Corona, CA 92878, Phone: (800) 959-1844, Fax: (909) 278-9976, website: www.tomark.com.
- D. Alternate Manufacturer: Outdoor Aluminum, Inc., PO Box 118, Geneva, AL, 36340, Phone: (800) 225-4249, Fax: (334) 684-2231, website: www.outdooraluminum.com.
- E. Alternate Manufacturer: E&D Specialty Stands, Inc., North Collins, NY 14111. Phone: 800-525-8515, fax: 716-337-2903, website: www.edstands.com.
- F. Alternate Manufacturer: All Star Bleachers, Inc., Lakeland, FL 33815. Phone: 800-875-3141, fax: 863-688-8129, website: www.allstarbleachers.com.
- G. Note: Phone numbers are provided here for the Contractors convenience. Due to the continually changing phone market, Contractor is responsible for verifying the accuracy of the phone numbers listed.

2.2 PORTABLE BLEACHERS

- A. Bleacher ~~Model~~ Style/Size

~~1. Model No.: National Recreation Systems, Inc. Model NB-0518A-DLX~~

- 1. Bleacher Style: Non-elevated with aluminum under-structure in conformance with the current State of Connecticut Building Code including any amendments and supplements.

2. Number Rows:
 - a. Softball Field: Five (5) Rows
 - b. Baseball Field: Three (3) Rows
3. Length: 27'-0"
4. Quantity:
 - a. Softball Field: One (1) required
 - b. Baseball Field: Two (2) required
5. Finish: Mill finish for all aluminum members except guardrails, seats and miscellaneous accessories as indicated. Guardrails, seats and miscellaneous accessories as indicated shall be clear anodized aluminum.

B. Production Description

1. Rise and Depth Dimensions: Vertical rise and horizontal depth per row: 8 inches x 24 inches, seat is 17" above its respective tread.
2. Framework: Prefabricated aluminum or aluminum square tube bleacher frames are spaced at 6' intervals and joined by angle crossbraces.
3. Seats: Nominal 2" x 10" clear anodized (AA-M10C22A31) aluminum plank with 2" x 10" end caps.
4. Treads: Nominal two (2) 2" x 10" mill finish aluminum plank with end caps.
5. Risers:
 - a. 1" x 6" mill finish aluminum plank for all applicable rows except top row.
 - b. Top row riser to be 2" x 10" mill finish aluminum. Riser planks beginning under seat row 4 when aisles are not included, or under seat row 1 for non-elevated with aisles and for all elevated bleachers.
6. Joint Sleeve Assembly: Included on large continuous units to maintain true alignment in joining two planks together.
7. Aisles to be 48" - 60" wide, with mid-aisle handrail (36" wide at end aisles with handrail at side).
8. Handicap Seating: As required by Federal Section 504 of the Rehabilitation Act of 1973 (including the referenced Uniform Federal Accessibility Standards).
9. Guardrail: Bleachers shall have guardrails on back and two sides. Guardrails be in compliance with The International Building Code, 2003 edition, with all State of Connecticut amendments and supplements. Rails shall be anodized aluminum with end plugs and elbows where required. All rails shall be secured to angle supports with

galvanized fasteners. All top rails at sides, rear & front shall be 42" high. Rear and side rails shall extend down to the 3rd row on non-elevated units, and to the 1st row on elevated systems.

10. Guardrail System: Galvanized chain link fencing shall be used, 9 gauge, 2" mesh, with additional aluminum pipe at bottom to close triangular opening to less than 4" between seat, foot and riser.

C. Materials/Finishes

1. Aluminum Framework: Structural fabrication with aluminum alloy 6061-T6, or mechanically equivalent mill finish.
2. Extruded Aluminum:
 - a. Seat Planks: Extruded aluminum alloy 6063-T6, clear anodized 204R1, AA-M10C22A31, Class II.
 - b. Tread Planks, Riser Planks: Extruded aluminum alloy 6063-T6, mill finish.
 - c. Joint Sleeve Assembly: Extruded aluminum alloy 6063-T6, mill finish.
3. Accessories:
 - a. Channel End Caps: Aluminum alloy 6063-T6, clear anodized 204R1, AA-M10C22A31, Class II.
 - b. Hardware: Bolts, Nuts, hot-dipped galvanized.
 - c. Hold-Down Clip Assembly: Aluminum alloy 6061-T6, mill finish.
 - d. Guardrail: Aluminum Pipe: 1.66 O.D., schedule 40, Aluminum alloy 6105-T5, clear anodized 204R1, AA-M10C22A31, Class II.
 - e. Guardrail Chain Link Fencing: galvanized chain link fencing, 9 gauge, 2" mesh, with additional pipe at bottom to close triangular opening to less than 4" between seat, foot and riser. Guardrail chain link fencing shall conform to all requirements of Specifications Section 02830 included herein. Black vinyl-coated chain-link fabric shall be used if it is available as a standard option from the manufacturer. Vinyl-coating shall conform to Specifications Section 02830 included herein.

D. Fabrication:

1. Design Load:
 - a. Uniform Load Structure: 100 psf
 - b. Uniform Load Seat and Tread Plank: 120 plf
 - c. Lateral Sway Load: 24 plf seat plank
 - d. Perpendicular Sway Load: 10 plf seat plank
 - e. Guardrail: Uniform Horizontal Load: 50 plf

- f. Uniform Vertical Load: 100 plf
- g. Concentrated Horizontal Load: 200 lbs.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install bleacher unit in accordance with manufacturer's installation procedures and recommendations.

- B. **All bleachers units shall be anchored to the concrete bleacher pad per manufacturer's design/recommendation for wind load resistance and to meet State of Connecticut Building code compliance.** Bleachers shall not be delivered to the site unless they can be anchored in place the same day or adequately secured to the ground to prevent over-turning in high wind. It is the responsibility of the contractor to take adequate precautions during storage and installation to prevent the bleacher from over-turning in high wind.

END OF SECTION

SECTION 14 42 00 - WHEELCHAIR LIFTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Vertical platform lifts.

B. Related Sections:

- 1. Division 3 Section "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
- 2. Division 4 Section "Unit Masonry Assemblies" for setting sleeves, inserts, and anchoring devices in masonry.
- 3. Division 9 Section "Painting" for field painting of lift equipment.
- 4. Division 16 Sections for electrical service to lifts, including fused disconnect switches.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, dimensions, electrical characteristics, safety features, controls, and finishes.

- B. Shop Drawings: For each lift. Include plans, elevations, sections, details, and attachments to other work.

- 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- 2. Wiring Diagrams: For power, signal, and control wiring.

- C. Samples for Initial Selection: For surfaces and components with factory-applied color finishes.

- 1. Include similar Samples of accessories involving color selection.

- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

- 1. Metal Finish: Manufacturer's standard-size unit, not less than 3 inches (75 mm) square.

2. Wood Finish: Manufacturer's standard-size unit, not less than 3 inches (75 mm) square.
3. Tubular Products and Running Trim: Manufacturer's standard-size unit, 6 inches (150 mm) long.
4. Hardware: Manufacturer's standard, exposed, door-operating device.

- E. Qualification Data: For qualified Installer.
- F. Manufacturer Certificates: Signed by lift manufacturer certifying that runway, ramp or pit, and dimensions as shown on Drawings and that electrical service as shown and specified are adequate for lift being provided.
- G. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted use of lifts.
- H. Operation and Maintenance Data: For each type of lift to include in operation and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:
1. Parts list with sources indicated.
 2. Recommended parts inventory list.
- I. Warranty: Sample of special warranty.
- J. Continuing maintenance proposal.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- B. Regulatory Requirements:
1. In addition to requirements of authorities having jurisdiction, comply with ICC/A117.1, NEC, and ASME A18.1, "Safety Standard for Platform Lifts and Stairway Chairlifts." and "Guidelines for Vertical Platform Lifts in Public Places".
 2. Comply with ASME A17.1, "Safety Code for Elevators and Escalators".
 3. Accessibility Requirements: Provide Wheelchair Lifts that comply with requirements in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)", the Uniform Federal Accessibility Standards (UFAS), including Section 504 and the Rehabilitation Act of 1973.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lifts that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

1.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months full maintenance by skilled employees of lift Installer. Include quarterly preventive maintenance and repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper lift operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500.
- C. Steel Pipe: ASTM A 53/A 53M; standard weight (Schedule 40) unless otherwise indicated or required by structural loads.
- D. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel (CS), Type B, exposed, matte finish.
- E. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel (CS), Type B, pickled.
- F. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 (Z275) zinc coating,
- G. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- H. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required:
 - 1. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
 - 2. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 5005-H15.

- I. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing structural members, guide rails, machines, and other lift components where installation of devices is specified in another Section.
- J. Expansion Anchors: Anchor-bolt-and-sleeve assembly of material indicated below with capability to sustain a load equal to 10 times the load imposed as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Group 1, Alloy 304 or Alloy 316, stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).
- K. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

2.2 VERTICAL PLATFORM LIFTS

- A. Vertical Platform Lifts: Manufacturer's standard pre-engineered Screw Drive Lift Systems as indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Concord Elevator Inc.
 - b. Inclinator Company of America.
 - c. Liftavator, Inc.
 - d. Lift-U; Division of Hogan Mfg., Inc.
 - e. National Wheel-O-Vator Co., Inc. (The).
 - f. ThyssenKrupp Access; a ThyssenKrupp company.
- B. Platform Size: 37 inches by 51 inches minimum.
- C. Door Operation and Clear Opening Width: Low-energy, power-operated doors that remain open for 20 seconds minimum; end door with minimum 32-inch clear opening width.
- D. Rated Speed: 9 fpm.
- E. Rated Load: 750 pound capacity minimum.
- F. Lifting Height: As per Drawings
- G. Power Supply: 115/120 V, 60 Hz, 1 phase, 1 HP motor.
- H. Self-Supporting Units: Support vertical loads of units only at base, with lateral support only at landing levels.

- I. Platform: 12 Gauge minimum Galvanized-steel sheet with black non-skid rubber flooring. Platform shall be equipped with a grab rail.
- J. Platform Low-Profile Carriage: Fabricate platform floor assembly to total thickness not exceeding 1-1/2 inches (38 mm).
- K. Platform Enclosure and Door: Rectangular steel-tube frame with flush steel-sheet panels. Doors shall be equipped with mechanical lock with positive opening electrical contacts. Core shall be consistent with master keying system.
- L. Platform Top: Provide a non-load-bearing top, matching construction of enclosure walls. Permanently mark top to indicate that it cannot sustain a load.
- M. Retractable Ramp: Provide ramp matching platform to provide transition from lower floor to lift platform. Ramp lowers to floor automatically when lifts reach lower landing and door opens. Ramp rises automatically when lift control is activated for lift to leave lower landing.
- N. An emergency stop / illuminated alarm switch shall be provided on the car as a means of signaling for assistance in the event of an emergency.
- O. The main lift nut shall be equipped with a continuous lube system to distribute lubrication between the main lift nut and the drive screw.
- P. Operation: Controls and operating mechanisms shall be operable with one hand, without the use of keys, and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate the controls shall be no greater than 5 lbf. Provide clear floor and set highest operable part of controls and operating mechanisms as required by UFAS / Section 504.

2.3 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.

2.4 FINISHES

- A. Steel Factory Finish:
 - 1. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat.
 - 2. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Wiring Method: Conceal conductors and cables within housings of units or building construction. Do not install conduit exposed to view in finished spaces. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
- B. Coordinate runway doors with platform travel and positioning, for accurate alignment and minimum clearance between platforms, runway doors, sills, and door frames.
- C. Position sills accurately and fill space under sills solidly with nonshrink, nonmetallic grout.
- D. Coordinate platform doors with platform travel and positioning.
- E. Adjust stops for accurate stopping and leveling at each landing, within required tolerances.
 - 1. Leveling Tolerance: 1/4 inch (6 mm) up or down, regardless of load and direction of travel.
- F. Adjust retractable ramps to meet maximum allowable slope and change-in-elevation requirements, and to lie fully against landing surfaces.
- G. Lubricate operating parts of lift, including drive mechanism, guide rails, hinges, safety devices, and hardware.
- H. Test safety devices and verify smoothness of required protective enclosures and fascias

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of lift installation and before permitting use of lifts, perform acceptance tests as required and recommended by ASME A18.1 and authorities having jurisdiction.

- B. Operating Test: In addition to above testing, load lifts to rated capacity and operate continuously for 30 minutes between lowest and highest landings served. Readjust stops, signal equipment, and other devices for accurate stopping and operation of system.
- C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on lifts.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lifts. Include a review of emergency systems and emergency procedures to be followed at time of operational failure and other building emergencies.
- B. Check operation of lifts with Owner's personnel present and before date of Substantial Completion. Determine that operating systems and devices are functioning properly.
- C. Check operation of lifts with Owner's personnel present not more than one month before end of warranty period. Determine that operating systems and devices are functioning properly.

END OF SECTION 14 42 00